

**THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION
ACTIVITIES MODEL FOR SCHOOL THROUGH
KNOWLEDGE MANAGEMENT**



**A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF DOCTOR OF EDUCATION
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MAHIDOL UNIVERSITY
2008**

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Thesis
Entitled
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THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION ACTIVITIES MODEL FOR SCHOOL THROUGH KNOWLEDGE MANAGEMENT

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ABSTRACT

The research aimed to study the results of the implementation of an environmental education activities model for school through knowledge management. The study was conducted from two secondary schools in Nakornpathom province, Thailand by means of participatory action research methodology. The research process was divided into two phases as follows: Phase 1, Construction of environmental education activities model through knowledge management and; Phase 2, Implementation of the constructed environmental education activities model.

Research findings showed that environmental education activities model for school through knowledge management was a process model that used for environmental club, which consisted of three stages as follows: Stage I, Preparation consisted of club establishment, selection of club's committee and identification of environmental issue; Stage II, Practice consisted of the club's knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing and knowledge usage from the identified environmental issue and; Stage III, Production consisted of activities' assessment. Results from the model showed that learners had environmental knowledge, participation in environmental conservation, and to become enthusiastic learners. Club's advisors were able to obtain greater knowledge, and gain more understanding and skills in environmental education activities. The Schools had the better surrounding of environmental development.

This research provided recommendations that the developed environmental education activities model for school through knowledge management should be applied to other schools. It should be adapted to be congruent with the learners and the school context as well as give importance to the related departments, both public and private sectors, in each local area in order to establish networks of environmental development in the future.

KEYWORDS: ENVIRONMENTAL EDUCATION/ KNOWLEDGE MANAGEMENT
ENABLING ACTIVITIES

149 pp.

การพัฒนาแบบแผนการจัดกิจกรรมสิ่งแวดล้อมศึกษาในโรงเรียนโดยการจัดการความรู้
(THE DEVELOPMENT OF ENVIRONMENTAL EDUCATION ACTIVITIES
MODEL FOR SCHOOL THROUGH KNOWLEDGE MANAGEMENT)

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บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนาแบบแผนและศึกษาผลการใช้รูปแบบการจัดกิจกรรมสิ่งแวดล้อมศึกษาในโรงเรียนโดยการจัดการความรู้ ศึกษาในโรงเรียนมัธยมศึกษา อำเภอบางเลน จังหวัดนครปฐม จำนวน 2 โรงเรียน ด้วยวิธีการวิจัยเชิงปฏิบัติการแบบมีส่วนร่วม ขั้นตอนการวิจัยแบ่งเป็น 2 ระยะ คือ ระยะที่ 1.การสร้างรูปแบบการจัดกิจกรรมสิ่งแวดล้อมศึกษาในโรงเรียนโดยการจัดการความรู้ ระยะที่ 2. การนำรูปแบบที่พัฒนาขึ้นไปใช้

ผลการวิจัย พบว่า รูปแบบการจัดกิจกรรมสิ่งแวดล้อมศึกษาในโรงเรียนโดยการจัดการความรู้ เป็นรูปแบบเชิงกระบวนการที่ใช้สำหรับการจัดกิจกรรมชุมนุมสิ่งแวดล้อม แบ่งเป็น 3 ขั้นตอน ได้แก่ ขั้นเตรียมปฏิบัติการ ประกอบด้วย การจัดตั้งชุมนุม, การเลือกคณะกรรมการบริหารชุมนุม และการกำหนดประเด็นทางสิ่งแวดล้อม ขั้นปฏิบัติการ ประกอบด้วย ชุมชนกำหนดความต้องการความรู้, การแสวงหาความรู้, การสร้างความรู้, การแลกเปลี่ยนเรียนรู้และการใช้ความรู้จากประเด็นทางสิ่งแวดล้อมที่กำหนดขึ้น ขั้นประเมินผลการปฏิบัติ โดยผลของการใช้รูปแบบที่พัฒนาขึ้น พบว่า ผู้เรียนมีความรู้ทางสิ่งแวดล้อม และมีส่วนร่วมในการอนุรักษ์สิ่งแวดล้อม ตลอดจนมีความใฝ่รู้ใฝ่เรียน นอกจากนี้ยังพบว่า ครูที่ปรึกษาชุมนุมมีความรู้ ความเข้าใจและทักษะในการจัดกิจกรรมสิ่งแวดล้อมศึกษาเพิ่มขึ้นและโรงเรียนได้รับการพัฒนาสิ่งแวดล้อมภายในโรงเรียน

การวิจัยครั้งนี้ มีข้อเสนอแนะว่า การนำรูปแบบการจัดกิจกรรมสิ่งแวดล้อมศึกษาในโรงเรียนโดยการจัดการความรู้ที่พัฒนาขึ้นไปประยุกต์ใช้กับโรงเรียนอื่นๆ ควรมีการปรับให้สอดคล้องกับบริบทของผู้เรียนและโรงเรียน และควรให้ความสำคัญกับหน่วยงานที่เกี่ยวข้องทั้งภาครัฐและเอกชนที่มีอยู่ในพื้นที่ เพื่อร่วมเป็นภาคีเครือข่ายพัฒนาคุณภาพสิ่งแวดล้อมต่อไป

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CHAPTER I

INTRODUCTION

1.1 Background and significance of the study

When consider overall environmental situation in Thailand, it is not significantly different from the current world's environmental crisis. The number of population is rapidly increasing and climate change and loss of biodiversity are all important crises of the country whereby such problems have never occurred in Thailand before. In contrast, what was found at that time was abundance of natural resources and environment, and existence of ancestors. In the past, it was the period of simplicity and affiliation to the environment; until the expansion of industrial economy occurs, which leads to the application of modern technologies and strategies for greater exploitation from natural resources and environment. The advancement of information technology enables the populations from all over the world to simultaneously receive news and information. This highly contributes to change in consumption behavior of the people. Sufficient consumption has been shifted to extravagant consumption; forest and mineral resources decline; soil abundance decreases and there is also depletion of water resource and air due to pollutants from human activities.

From crucial crises as mentioned above, it can contribute to environmental management principles in two ways, including root-cause problem solving or preventive approach, and end-of-pipe problem solving or clean-up approach. If consider in term of method of practice, root-cause problem solving seems to be more efficient. When consider more deeply, it is found that root-cause problem solving requires human management as an important cause of the crisis (Manus Suwan, n.d.: 91), which is the management by environmental education.

School is an important organization or institution in the process of education provision, its main role is to create learning society for young members or in another

word, school is mainly responsible for preaching and training young members of the society to obtain desired characteristics in the society. This way, school, acts as a socializing agent, which is similar to other social organizations, for examples: family, religious institution, occupational sources, and mass media. However, school obtains some special characteristics that are different from other social organizations. Such difference is that school is the place where a number of young members of the society in similar age range gather together and mutually conduct learning activities and continuously spend time in the school system for many years. Furthermore, learning system implemented in schools tends to have certain model, for examples: curriculum, instruction system, and system of measurement and evaluation. It is the social organization that is given high credibility in education. As a result, school is expected by the society to create learning and shape thinking system and value systems as well as skills that are necessary for sustenance of young society members more than any other social organizations. This is the reason that the operation of environmental education has utilized schools as a prime mover. (Uthai Dulyakasem, 2005)

Concerning environmental education, the Basic Education Curriculum identified strand and standards in the subject areas, especially the subject area of science, the subject area of social studies, religion and culture, and the subject area of physical education (Ministry of Education, 2002: 5)

In addition to environmental education management for secondary school consisting of integration with all subject areas and environmental education process. There are also Enabling Activities and environmental projects by receiving cooperation from both public and private sector.

Even though there are various forms of environmental education management throughout the long period of time, management of environmental education still encounters several problems and constraints as follows (Arisara Chuchart, 2004; Monthip Tabuganon, 2004; Orapin Aiemsiri, 2002; Somboon Silphrungham, 2004)

1. Policy aspect: lack of preciseness of the policy of Ministry of Education is not supportive to the operation that will lead to school plan and concrete activities that have effects on lacking of personnel and budget for environmental education. Moreover, such curriculum also identifies specific related subject areas,

which are science subject area, subject areas of social, religious and cultural studies, and subject areas of physical education, making teachers of other subject areas not perceive of their importance and not employ them.

2. Instructional aspect: still focuses on the contents relating to the environment more than the application of the process of environmental education in the issues related to sustainability and also focuses on practice. Instruction lacks of process integration that emphasizes on analytical process, problem-solving, decision-making and communication to create understanding in term of organization of environmental education activities in order to create learning from direct experience and connection of what is learnt to the real practice in daily life. The curriculum still focuses on the environmental issues that are world's environmental problems or on natural resources and ecosystems that are distant from the actual way of practice of learners.

3. Teacher aspect: current instruction of environmental education is in accordance with readiness of the teachers or depended on school principal who perceives its importance. There is also the lack of knowledgeable teachers in environmental education; teachers still believe that working in the area of environmental education is a burden apart from full-time work and environmental education is also time-consuming.

4. Network and participation aspect from all sectors: they still focus on the forms of materials rather than mutual work. The projects that all sectors cooperate with schools are mostly short-term project rather than long-term cooperation; therefore, it lacks sustainability. When the project finishes, environmental education activities in school also finish accordingly. When a new project begins, new principles or methods of operation also occur, resulting in the lack of connection with previous projects. Moreover, such projects also have no extension of results to other schools across the country. Most activities are organized in order to be in line with the purpose of each project or each operating unit; therefore, the forms are different and are undertaken only on those congruent with their unit.

With the above constraints of environmental education for school; there are, therefore, obstacles to environmental education development. Scholars attempt to propose guidelines to environmental education organization as appeared in many

research reports, show that research on scenarios of environmental education curriculum in Basic Education Commission in the next decade (during 2004-2014) by Somboon Silrungham (2004); scenarios of Basic Education management for sustainable environment in the next decade (2012) by Udomsit Jitwijarn (2002); and introduction of environmental education model for 21st century by Palmer (1998: 272). Study results indicate that environmental education approach to achieve the goal of environmental education requires the application of the environmental concept that emphasizes realistic world's perception by using direct experience as a foundation that will lead to the creation of knowledge and awareness in practice to the environment in order to bring about sustainable development.

The concept of environmental education as mentioned above is consistent to National Education Act 1999 and Amendments (Second National Education Act 2002), which give importance to the learning process that emphasizes learners to gain knowledge and experience (way of life), learning by doing, activity based learning and learning from direct experience. Therefore, the curriculum of environmental education should be related to the local curriculum; environmental education process should be integrated from the ways of life by holding learners as local researcher, and teachers are supporters of management. And teachers also learning along with learners as well as develop learners to become smart, to gain knowledge, understanding, attitude and skills toward self-sustenance and sustenance of mankind and the world of nature as well as to live happily within the society. Education institution is a part of complete social. New approach of environmental education for the future that all humans must be prepared for changes that will occur together with change of environmental education paradigm, which takes balance in three dimensions into account, which are social, economic and environmental dimensions, by having the goal to create learning at full capacity to be ready for being a good member in that society requires concrete practice that is congruent with complex and rapid-changing in social context.

Thai society is currently moving toward a knowledge-based society, which is the period that everyone and every organization must acquire knowledge creation and ability to apply knowledge as a social force. Therefore, environmental education management must have strategies that are different from the previous ones. One of the strategies that will help contributing to goal achievement of environmental education

management is the strategy called “knowledge management”, which is a new concept of learning that focuses on learning by doing, resulting in experience and knowledge management. It concerns not only one person, but instead it involves many people working together as well as emphasizes on tacit knowledge (Vijarn Panich, 2005: 63). Furthermore, knowledge management is also the strategy that enables people to acquire desired knowledge within appropriate time as well as helps creating knowledge exchange and application in order to improve and create network that will lead to the development and capacity utilization of human in terms of physical, mental, social and intelligence capacity (Pravet Wasee, 2005: 47). However, knowledge management is not the direct management tool of knowledge; it is the method that contributes to knowledge sharing (Carla et al., 1998: 3-9).

From the concept of knowledge management mentioned above, it can be seen to be consistent to the approach of environmental education management, which emphasizes on learning by doing, learning from group work skills, which consisted of knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing, and knowledge usage. Operation of environmental education activities model for school is the learning process rather than environmental contents. The researcher is interested in applying such concept to develop the environmental education activities model for secondary schools by focusing on Enabling Activities for learners which emphasized on overall development of humanity and ability to participate in activities based on learners’ interests, leading to desired characteristics, and developed teacher and school as a whole, which is consistent to Basic Education Standards and suitable for contextual area.

1.2 Research questions

1.2.1 What are characteristics of effective environmental education activities model for school through knowledge management?

1.2.2 What are the results of the implementation of environmental education activities model for school through knowledge management?

1.3 Research objectives

Objectives of this research are:

1.3.1 To develop environmental education activities model for school through knowledge management.

1.3.2 To study the results of the implementation of environmental education activities model for school through knowledge management.

1.4 Scope of the thesis research

1.4.1 This research aims to develop environmental education activities model for secondary school in terms of activities that are based on skills and interests of learners called Club Activity, which is one type of Enabling Activities according to the Curriculum of Basic Education 2001.

1.4.2 Schools used in this study are two secondary schools under the supervision of Office of the Basic Education Area 2, Nakhon Pathom province, Banglen district, consisting of Banglen Witthaya School and Bangluang Witthaya School.

1.4.3 The duration in developing environmental education activities model was in 2nd Semester of 2006 in Banglen Witthaya School whereas the duration of the implementation was in 1st Semester of 2007 in Bangluang Witthaya School.

1.5 Definition of terms

Enabling Activities refer to activities that are organized in process in various forms and methods to develop learners in terms of physical, mental, intelligent, emotional, and social development and aim to promote attitude and value of life, to implant morals and desired values, to support learners to know and understand themselves.

Club activity refer to activities based on skills and interests of learners by organizing activities in addition to activities in 8 subject areas and having time

management in learners' schedule as well as an evaluation that is not a grading system, but simply pass/not pass evaluation.

Club's Advisor refers to the teacher who gives advice and also organizes the school environmental club.

Desired characteristics refer to characteristics that aim to happen to learners, including:

1. Environmental knowledge means facts and details in important environmental issues that learners mutually identify and establish from searching, from experience, and from conducting environmental education activities by measuring from knowledge note-taking and summarizing knowledge from learners' meetings.
2. Environmental conservation means action that expresses concerns for the environment by participating in activities and persuading others to take part in activities, suggesting ways to environmental conservation as well as supporting conservation and protesting environmental degradation, by measuring from desired characteristics' evaluation form.
3. Learning enthusiasm means learners have enthusiasm to usefully utilize free time by searching for knowledge or retrieving information from learning sources both within and outside school, knowledge note-taking and summarizing knowledge, by measuring from desired characteristics' evaluation form.

Environmental education activities model for school through knowledge management refers to the structure which show the method to organize environmental club for secondary school under the concept of environmental education as the fundamental construction. Including organize Enabling Activities based and knowledge management cycle as the tool in action learning by following the environmental issue which was selected by the learners.

Knowledge management refers to the tool that is developed for human to create learning by doing and apply tacit knowledge that is derived from experience, beliefs, and explicit knowledge.

Knowledge management cycle refers to the process of knowledge management which is flexible cycle can be applied with organizing the club in the stage of doing activities to be as a tool in driving force environmental issue which was selected by the learners consisted of

1. Knowledge Identification refers to identification of needs for knowledge and search for the main knowledge that is crucial and necessary for work or operation.
2. Knowledge Acquisition refers to study, research, and acquisition of knowledge from various sources both internally and externally, in the forms of individual, documents, and others.
3. Knowledge Creation refers to create new knowledge that is derived from understanding, by applying the data and information obtained from knowledge acquisition and sharing or tacit knowledge into analysis in order to utilize in action or extension of new knowledge.
4. Knowledge Sharing refers to share and exchange knowledge and transfer knowledge by face to face, in person or in group.
5. Knowledge Usage refers to the application of knowledge to the operation to bring about benefits and achievement.

1.6 Research contributions

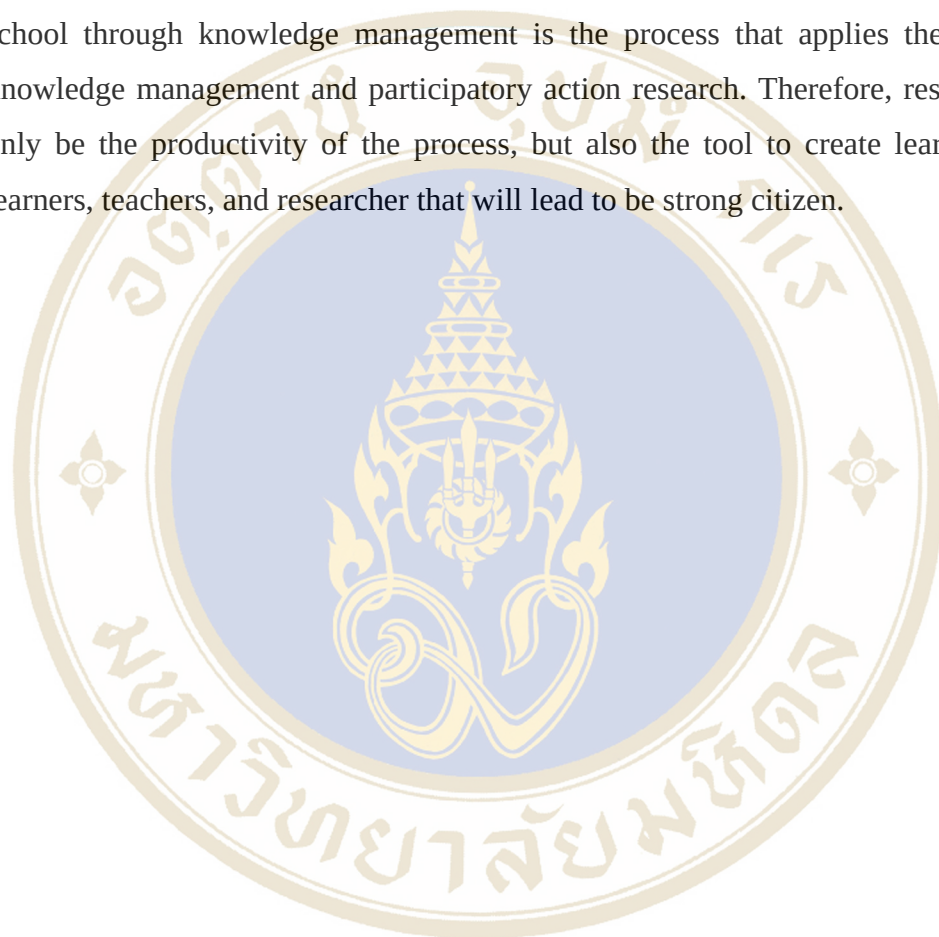
Research on the development of environmental education activities model for school through knowledge management contributes to the following research benefits:

1.6.1 The environmental education activities model for school through knowledge management could be applied in appropriation with the context of the schools in Banglen district.

1.6.2 The environmental education activities model for school through knowledge management is one of useful models for those individuals related to the

organizing units of education in the level of education area and environmental organization, such as, provincial and regional environmental department, in order to be used as a guideline to mutually identify plan for sustainable development of environmental quality.

1.6.3 The development of environmental education activities model for school through knowledge management is the process that applies the concept of knowledge management and participatory action research. Therefore, results will not only be the productivity of the process, but also the tool to create learning among learners, teachers, and researcher that will lead to be strong citizen.



CHAPTER II

LITERATURE REVIEW

The purpose of this research is to develop environmental education activities for school through knowledge management. The researcher proposed concepts and related research as follows:

- 2.1 Environmental Education
- 2.2 Enabling Activities
- 2.3 Knowledge Management
- 2.4 Participatory Action Research
- 2.5 Related Research

2.1 Environmental education

2.1.1 Definition and objectives of environmental education

The conference of International Union for Conservation of Nature and Natural Resources (IUCN) in Nevada, the United States of America, in 1970 provided the definition of “Environmental Education” as follows:

“Environmental Education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his biophysical surroundings. Environmental Education also entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality”.

The International Workshop on Environmental Education in Belgrade, it listed the aims objectives and guiding principles of it in a document prepared at the meeting known as “The Belgrade Charter”.

The objectives for environmental education prepared at Belgrade are summarized as follows:

1. Awareness: to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.
2. Knowledge: to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.
3. Attitude: to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.
4. Skills: to help individuals and social groups acquire the skills for solving environmental problems.
5. Evaluation ability: to help individuals and social groups evaluate environmental measures and education programmer in terms of ecological, political, economic, social, esthetic, and educational factors.
6. Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.

Tbilisi conference provides declaration incorporation a set of goals and principle for environmental education. The goals for environmental education became delineated as:

1. To foster clear awareness of, and concern about , economic, social, political and ecological inter –dependence in urban and rural areas.
2. To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment.
3. To create new patterns of behavior of individuals ,groups and society as whole, towards the environment. (UNESCO, 1976: 3)

In 1987, the word “Sustainable Development” was first appeared in the report of World Commission on Environmental and Development – Our Common

Future, which is well-known in the name of “Brundtland report”. The report provided the definition of sustainable development that “Sustainable development is development that meets the need of the present without compromising the ability of future generations to meet their own needs”.

Until 1992, the United Nation Conference on Environment and Development (UNCED), or “The Earth Summit” was organized in Rio de Janeiro. Representatives of private organizations from 170 countries around the world mutually agreed and approved to comply with Agenda 21 (Agenda 21: The Rio Declaration on the Environment and Development), which was the world’s model scheme for the implementation that would lead to sustainable development in terms of society, economics, and environment. One of the important approaches was that Chapter 36 emphasized that education is critical for promoting sustainable development and improving capacity of the people to address environmental and developmental issues. Ever since sustainable development has been a common concern in all United Nation conferences and there has been a common consensus that education is a driving force for the change needed. It has also been pointed out that peace, health, and democracy are mutually reinforcing prerequisites for sustainable development.

The IUCN/CEC recognized that education for sustainable development has a strong link with social, political, and development education. Figure 1 show how of environmental education is shifting towards ESD (Education for Sustainable Development). The original meaning of environmental education including changes in behavior, attitude, knowledge, awareness, skills and understanding. Overtime, it gradually moved to include other aspects shown in the center. Through this, environmental education reaches the stage of ESD, where equity, quality of life, human rights and environmental quality are achieved. It shows ESD as the success or of environmental education.

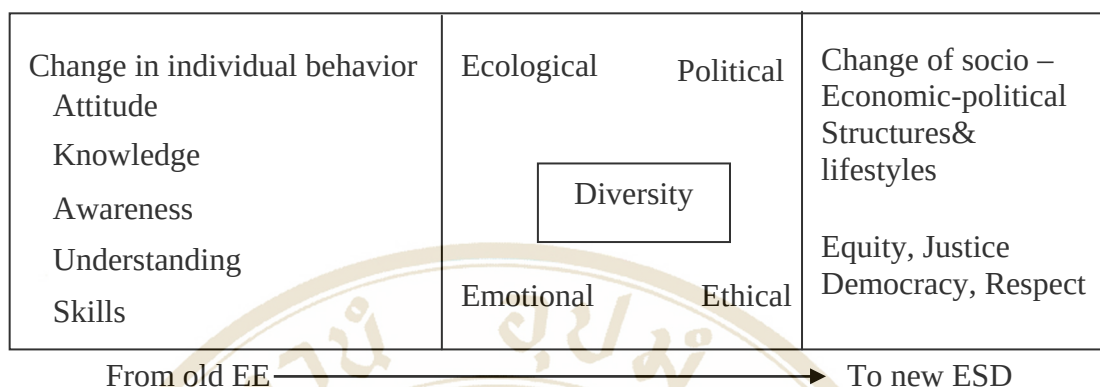


Figure 1 : Environmental Education in Transition : Broadening the scope or a new paradigm (Hesselink et al., 2000 : 4 cited by Bhandari, Bishnu B. & Abe , Osamu.,2000: 167)

United Nation Conference on Environment and Development (UNCED) in 2002 in Johannesburg, South Africa, announced action plan called “United Nations Decade of Education for Sustainable Development 2005-2014” (United Nation, 2005: 5-6) with the purpose to bring about the integration of principles and values and approach to sustainable development into all parts of education and learning in order to create behavioral changes, leading to sustainability in terms of environment, economics and justice in the current and the future society.

Shift in paradigm was the Environmental Education for Sustainable Development with the purpose to promote and support learners to grow up as the quality population in a democratic society and to become strong citizen as follows:

1. Being a knowledgeable person who has correct understanding and creativity toward the issues of conflicts in exploitation of natural resources and impacts on the environment.
2. Having process analysis, vision, reasonability, creativity, and capacity in actual action in terms of thinking, decision-making, cooperation to work and wise utilization and conservation of natural resources.
3. Being a learning person who has the heart of philosopher and friendliness. Learners are able to learn meaningfully and able to apply knowledge in connection with the development of quality of life of oneself and of community as

well as with the quality of sustainable natural resources and environment (Siripan Suwanmanka et al., 2004).

The development of environmental education for over 30 years with continuous development demonstrates that every part of the world increasingly emphasizes on the environment. Until nowadays, environmental education is given broader definition in which it does not only mention about the environment, but also about social and economic aspects, which are the components of sustainable development. As a result, environmental education is the process that creates knowledge and understanding, perception of values and practice toward mutual living in the community, the society, the country and the world. It is also the foundation of sustainable development by focusing on relationships in environmental, social and economic dimension that affect the development of quality of life and environment as well as having awareness toward the future.

2.1.2 Principle and guideline of environmental education

At the Inter-governmental Conference, the Tbilisi Declaration noted in 1977 identified the principles of environmental education in order to be practice guidelines.

Environmental Education should:

1. consider the environment in its totality-natural and built, technological and social (economic, political, cultural-historical, ethical, esthetic);
2. be a continuous lifelong process, beginning at the preschool level and continuing through all formal and non-formal levels;
3. be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
4. examine major environmental issues from local, national, regional, and international points of view so that learners receive insights into environmental conditions in other geographical areas;
5. focus on current and potential environmental situations while taking into account of the historical perspective;
6. promote the value and necessity of local, national, and international cooperation in the prevention and solution of environmental problems;

7. explicitly consider environmental aspects in planning for development and growth;
8. enable learners to have a role in planning their learning experiences and providing an opportunity for making decisions and accepting their consequences;
9. relate environmental sensitivity, knowledge, problem-solving skills, and values clarification to every age, but with special emphasis on environmental sensitivity to the learners's own community in early years;
10. help learners discover the symptoms and real causes of environmental problems;
11. emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
12. utilize diverse learning environment and a broad array of educational approaches to teaching, learning about and from the environment with due stress on practical activities and first-hand experience (Department of Environment Quality Promotion , 2002: 270)

International educators cooperatively set principles of practice, which comprise of three main components as follows:

1. Learning about the environment: The main points are as follows:
 - 1.1 Promote understanding of the environment, especially ecology and ecosystem.
 - 1.2 Create systematic understanding toward the impacts on the environment as a result of human activities.
 - 1.3 Develop thinking skills and holistic environmental education.
2. Learning in the environment: The main points are as follows:
 - 2.1 Learn actual situation of the environment through direct experience in the field study or natural classroom.
 - 2.2 Develop skills necessary for environmental data collection as well as method of the field study.
 - 2.3 Develop appreciation of values and aesthetics of the nature and the environment.
 - 2.4 Help to create more environmental awareness and consciousness.

3. Learning for the environment: The main points are as follows:

3.1 Focus on creating responsible feeling toward the environment.

3.2 Develop environmental ethic.

3.3 Develop motivation and promote skills to create participation in increasing environmental quality.

3.4 Support the creation of satisfaction to live the life in appropriation to the provision of the natural resources and the environment.

However, approaches to environmental education instruction in the past were not very successful because there was the gap between the concept and the hand-on in which environmental education was not congruent to the ways of life that urged people to have awareness and to change behavior, together with changes of the causes of environmental, social, cultural and technological problems. As a result, Palmer (1998: 272) suggested approaches to environmental education instruction for the 21st century with extensive development from the main components of environmental education by focusing on connection in three dimensions: 1) Components of environmental education (in, about and for); 2) Components of planning tasks (experience, concern and action); and 3) The curriculum's essential 'elements' (empirical, ethical, and esthetic). The most important thing that is the core of the model is "Formative influence" or meaning "significant life experience", by applying real-life experience as a foundation to create knowledge, awareness and action toward the environment as illustrated in Figure 2.

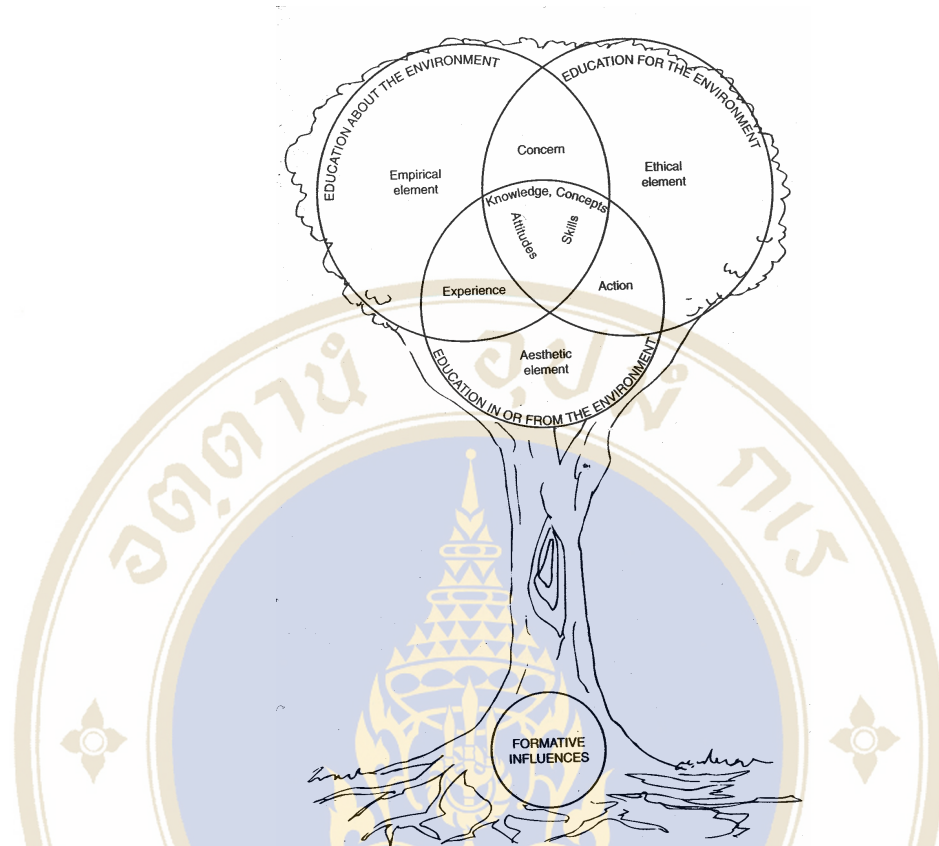


Figure 2 Model for teaching and learning in environmental education: complete planning framework (Palmer., 1998: 272)

Environmental education for the 21st century emphasizes perception of realistic world whereby environmental education does not provide education that aims to save the planet; it is still far from the truth and is, therefore, difficult. As for the present and the future, it should be the provision of education that enables sustainable living among people.

Such principles and approaches are illustrate that environmental education should focus on changing behaviors of learners from direct experience along with hand-on in the current issues that are congruent to the way of life of ones' own or of community. Educational institution is the action model; teachers are supporters of learning along with learners.

2.1.3 Environmental education for secondary schools

School is the organization that has the major responsibility in the operation to create learning for the youths whereby schools with some special characteristics that are different from other social organizations are those that have a great number of young society members in similar age range gathering together, cooperatively undertaking learning activities, spending time in the school system for many consecutive years, and having a certain pattern of learning system, such as, curriculum, instructional system, evaluation and measurement system. Additionally, school is also the social institution that the community gives credibility in education and learning; therefore, it is expected by the society to be responsible for creating learning, preaching of thinking system and value systems as well as skills necessary for sustenance to youths of the society more than other types of social organizations. As a result, environmental education has utilized the school as a prime mover. (Uthai Dulyakasem, 2005)

Structure of Basic Education Curriculum consist of:

1. Interval of grade level provide curriculum as four level depended on learner development.

- Grade level 1 is Pathom 1-3

- Grade level 2 is Pathom 4-6

- Grade level 3 is Mathayom 1-3

- Grade level 4 is Mathayom 4-6

2. Subject area is provided according to curriculum which comprised of knowledge, skill or learning process and characteristic or value, virtue, morality of learner. It is divided into 8 subject areas including Thai Language, Mathematics, Science, Social Studies, Religion and Culture, Physical Education, Art, Vocational and Technology, and Foreign Languages.

“Concerning environmental education, the Basic Education Curriculum identified strand and standards in the subject areas, especially the subject area of science, the subject area of social studies, religion and culture, and the subject area of physical education.”

3. Enabling Activities Self-ability and capacity-based development by emphasizing in addition to activities organized for learners in the 8 subject areas, as shown in table 1

Table 1 Structure of Basic Education Curriculum

Grade level	Grade level 3 (Mathayom 1-3)	Grade level 4 (Mathayom 4-6)
Subject areas		
Thai Language	•	•
Mathematics	•	•
Science	•	•
Social Studies, Religion and Culture	•	•
Physical Education	■	■
Art	■	■
Vocational and Technology	■	■
Foreign Languages	■	■
Enabling Activities	▲	▲

- Subject areas that school has to consider as the principle of learning for creating cognitive basic as well as being the strategy in solving national problem and crisis.

- Subject areas that strengthen human basis and potential in thinking and working creatively

- ▲ Self-ability and capacity-based development by emphasizing in addition to activities organized for learners in the 8 subject areas

Environmental education management for secondary schools is managed in three characteristics as follows:

1. Cross – Curriculum Environmental Education by methods of:

- 1.1 Infusion is the insertion of environmental education throughout the curriculum in every subject areas and all levels.

- 1.2 Integration is putting environmental education into integration with the contents and the process in the subject areas in term of co-subjects. (Department of Environment Quality Promotion, 2002: 9-10)

2. Enabling Activities are extracurricular activities in addition to the 8 subject areas, consisting of guidance activity, boy and girl scouts' activity and club activities.

3. Special project that are various projects relating to the environment in which school or external sectors are the organizer, for examples, environmental camp, provincial environmental education center.

Environmental education emphasizes on the environmental process more than the environmental contents. Integration or infusion into the subject areas has already been identified in the Basic Education Curriculum. Most of the teachers, therefore, organize it this way and also identify framework of the contents whereas project activities that are organized by schools are mostly from school directors or teachers rather than learners. Moreover, activities that are organized in cooperation with other sectors are mostly short-term projects rather than long-term cooperation; as a result, there is the lack of sustainability. When the project ends, environmental education also ends in accordance with the project. In order to be in line with the objective of each project or operating sectors, patterns are different and are chosen only those that are congruent to its own sectors. (Arisara Chuchart, 2004; Monthip Tabuganon, 2004; Orapin Aiemsiri, 2002; Somboon Silphrungham, 2004).

This study was to emphasize on the process of environmental education activities for secondary school through Enabling Activities to enable learners to know themselves and discover their own talents and interests in order to have full-capacity development.

2. 2 Enabling Activities

2.2.1 Importance and definition of enabling activities

The purpose of the Basic Education Curriculum in 2001 aimed to develop Thai people to become complete and good person, smart and happy based on the foundation of Thai-ness in accordance with environmental education management approach of National Education Act B.E. 1999, or it can be said to be a smart, good and happy person. Therefore, Ministry of Education organized Enabling Activities by aiming to promote learners' development in addition to the 8 subject areas to enable learners to know themselves and discover their own ability and talent in order to have full-capacity development, discipline, morality and virtue, and to know their roles and responsibility and to act upon them to create benefits for the community, for the society, for the country, and for blissful sustenance.

Department of Academics (2001: 2) provided the definition of Enabling Activities that are organized in various forms and methods in order to develop learners in terms of physical, mental, intelligent, emotional, and social development, and to promote attitude and value of life, to implant good morals and desired values, to enable learners to understand and know themselves, to build awareness toward the nature and the environmental conservation, and adjust themselves to live happily and act beneficially to the society and the country.

The purpose of the process of Enabling Activities is for learners to have development in three aspects as follows:

1. Integrative development of humanity in all aspects, including physical mental, intelligent, emotional and social development.
2. Self-ability and capacity-based development by emphasizing in addition to activities organized for learners in the 8 subject areas.
3. Participating and conducting activities that are chosen based on self-talent and self-interests.

Enabling activities management based on basic education curriculum is an activity organization based on school's readiness and learner's needs by focusing on variety in forms and methods, and actual practice in group, relationship with learner's

life as well as there is an evaluation in real life situation. Therefore, management consists of three important components as follows.

1. Preparation is the duty of school to plan and prepare for all kinds of activity organizations to achieve its goals. Things that should be prepared include:

1.1 Preparation of personnel concerning Enabling Activities process consists of school council, school director, head of department, club's advisor, and learners who perform activities.

1.2 Preparation of site, materials and equipments, and learning resources must be organized appropriately to characteristic and type of each activity and number of learner groups in order to be able to use resources collectively at a maximum benefit. Sometimes, it may require the use of external learning resources simultaneously in which school must have contact and coordination in advance.

1.3 Learner group management can be organization in many forms by considering based on appropriateness of the number of participants in activities; that is, organizing a group according to class level, knowledge and ability of learners, and by having learners from all levels in the same group.

1.4 Time management can be organized in many characteristics; that is, organizing activity with utilizing time in a curriculum, for instances, in the morning, during lunchtime, and after school, and organizing activity by using time based on appropriateness by organizing as a short project or a continuous project throughout the year.

2. Enabling Activities practice is an activity that enables learners to learn, to have various experiences, and to create positive awareness that is meaningful to learners in a way that responds to their interests, abilities and needs as well as create pride. An activity must encourage learners to take part in planning or in the project related to their interests and be beneficial to their actual lifestyle. It must be an activity that learners can actually practice in group and must be an integrated activity that applies classroom knowledge into practice to discover new knowledge.

3. Evaluation of Enabling Activities process consists of an evaluation by activity and an evaluation by level of passing whereby an evaluation approach is considered from: 1) Evaluation of time of activity participation of learners; 2) evaluation of activity performance of learners according to objective in order to

examine the desired characteristics, evaluated by the club's advisor, self-evaluation, or group evaluation; and 3) evaluation of learner's performance.

2.2.2 Approaches to the organization of Enabling Activities

In the development of environmental education activities model for school, the researcher is interested in the process of Enabling Activities in group's activities based on talent and interests of the learners, or called "Club Activities", which is one of the Enabling Activities according to the Basic Education Curriculum in 2001. It is the activity that aims to fulfill knowledge, expertise and experience of the learners to become more extensive in order to discover self-talent and self-interests and to have self-development at the full capacity. The crucial principles in activity process are as follows:

1. It is an activity that occurs voluntarily from learners by having teacher as an advisor.
2. It is an activity that learners help one another to think, to act and to solve problem.
3. It is an activity that develops learners in addition to Basic education.
4. It is an activity that promotes and develops learners' capacity.
5. It is an activity that is suitable for the condition of educational institution and local.

Approach to management of activity process based on talent and interests of the learners according to the Ministry of Education Curriculum in 2001 concerning rules for club activity. It can be concluded as follows (Department of Academics, 2001)

1. Club establishment: Learners select activities as proposed by schools or learners who have the same interests grouped together to propose club organization from schools, which is called "community or club", which consists of the following steps: 1) members' registration; 2) learners' orientation by advisor; 3) election of club's committee; 4) assigning representative for outlining club organization; 5) asking for approval from school director; and 6) promoting club to entire school.

2. Outline of regulations concerning club in the operation of club organization with formulation of rules and regulations.

3. Club that asks for permission for establishment must have at least one advisor but not more than three advisors, by having the proportion of advisors to club member equivalent to 1:25. If the proportion is greater or less than this, it will be based on consideration of the school director.

4. Related personnel comprise of four groups: 1) Advisor committee, including School Director, Assistant School Director in Academics, Assistant School Director in Administration, Assistant School Director in Services, Head of Enabling Activity; 2) Club's advisor; 3) Club's committee, including Chairman, Vice-chairman, Secretary, Accountant, Receptionist, Public Relations, Editor, Welfare and Registrar; and 4) Club's members.

5. Evaluation of club according to the rules of Ministry of Education for the club's members to obtain "pass" or "not pass" in each academic year.

6. Learners must be the member of only one club and have membership duration of one academic year. If learners wish to change the club, they must submit an application form according to the rules and procedures set by the school.

7. Organizing members' general meeting at least once a semester, by having club chairman as a chairman of the meeting, having members' attendance of more than a quarter of the total members, and having advisor attendance in order to constitute quorum. In every meeting, the chairman must inform meeting agenda to the club's members at least 5 days in advance unless it is an urgent matter.

8. Meeting club, contacts with other external sectors or institutions will require the advisor to submit a letter to the school director.

9. Any activity organization of the club must be proposed to the advisor for approval from the school director.

10. Time allocation for club is done by using time specified in the curriculum of each educational institution, by having one period/week.

11. Income of club from membership fee, budget allocation from school and contribution.

12. Dismissal of club must come from the following reasons: 1) no advisor; 2) having the number of members below the standard and the school director

agrees on such dismissal; 3) no activity operation without appropriate reasoning; and 4) the school director makes a dismissal.

However, the rules of the school concerning club organization allow the educational institution to make an adjustment based on appropriateness.

2.2.3 Desired Characteristics

Activity organization based on talents and interests of the learners aims to promote desired characteristics, which means characteristics or behaviors that the learners should have or practice in sustenance (Department of Academics, 2001: 50).

Desired characteristics are internal characteristics of individual related to the society, emotion and feeling that have an influence on behavioral expression expected by the society. In identifying desired characteristics, the educational institution can specify by itself depending on the conditions of problems and the needs of the educational institution.

The assessment of desired characteristics of learners according to the Basic Education Curriculum was set as follow:

Standard 2 Learners having conscience of mutual benefit, conservation and development of environment. The learners' indicators are as follows:

1. Know value of environment and be aware on impact toward themselves and society resulting from environmental changes
2. Behave themselves benefiting to others and participating in environmental conservation

Standard 6 Learners have their own skill in searching for knowledge, willing to learn and continually in self-development. The learners' indicators are as follows:

1. Enhance them get into the habit of reading, writing, and listening skills. Know how to ask questions for the reasonable answer.
2. Pay attention to search for knowledge from various learning resources or from other educational media both inside and outside school.
3. Know how to learn by themselves, enjoy learning with others and always attend the school.

According to the learners' standards and the learners' indicators the Bureau of Academics and Educational Standard (2005) was set the framework to assess the desired characteristics of learners as well as definitions and indicators of desired characteristics related to learning enthusiasm and conservation of the natural resources and the environment shown in table 2

Table 2 Definitions and indicators of desired characteristics

Definitions	Indicators	Behavior Indicators	Learning Management		
			Subject Areas	Enabling Activities	Special Projects
Learning Enthusiasm refers to a person that has enthusiasm and intention toward learning, and uses free-time beneficially by searching for information from learning resources both inside and outside the school, and having skill of knowledge in summarizing and note-taking.	1. Becoming Enthusiastic and willingness to take part in activities	1. Interested in participating in instructional activities	✓	✓	✓
		2. Not piling up the work and work at full capacity	✓	✓	✓
		3. Search for new knowledge and experience	✓	✓	✓
	2. Utilize free-time through knowledge acquisition	1. Enter a library when having free-time	✓	✓	✓
		2. Search for books and select valuable learning resources	✓	✓	✓
		3. Exchange knowledge with others	✓	✓	✓
	3. Search for information from learning resources both internally and externally	1. Search for information from books, documents, and publications both inside the school and other places	✓	✓	✓
		2. Search for information from news, information technology, technology and others.	✓	✓	✓
		3. Search for information from experts from outside the school and information source in the community.	✓	✓	✓
	4. Note-taking and summarizing knowledge and experience	1. Systematic note-taking	✓	✓	✓
		2. Make notes and report	✓	✓	✓
		3. Record using electronic tool	✓	✓	✓

Table 2 Definitions and indicators of desired characteristics (Cont.)

Definitions	Indicators	Behavior Indicators	Learning Management		
			Subject Areas	Enabling Activities	Special Projects
Conservation of the Natural Resources and the Environment refers to an action that expresses concerns for the nature and the environment as well as conservation of the natural resources and the environment to create sustainability in the world.	1. Participate in activities of natural resources and environmental conservation	1. Be a member of natural resources and environmental conservation club 2. Participate in activities relating to natural resources and environmental conservation 3. Give cooperation in campaigning for natural resources and environmental conservation	✓	✓ ✓ ✓	✓ ✓ ✓
	2. Suggest an approach to natural resources and environmental conservation	1. Propose projects on natural resource and environmental conservation 2. Give opinions toward natural resources and environmental conservation			✓
	3. Practice natural resources and environmental conservation	1. Use natural resources as necessary at optimum benefits 2. Take part in natural resource and environmental conservation	✓	✓ ✓	
	4. Persuade others to take part in natural resources and environmental conservation	1. Take part in campaigning for natural resources and environmental conservation 2. Give thoughts, reasons and warnings to those who violate the natural resources and the environment		✓ ✓	
	5. Support natural resources and environmental conservation	1. Support natural resources and environmental conservation by expressing opinions 2. Support natural resources and environmental conservation by donation		✓	✓

Table 2 Definitions and indicators of desired characteristics (Cont.)

Definitions	Indicators	Behavior Indicators	Learning Management		
			Subject Areas	Enabling Activities	Special Projects
Conservation of the Natural Resources and the Environment	5. Support natural resources and environmental conservation	1. Support natural resources and environmental conservation by expressing opinions		✓	
		2. Support natural resources and environmental conservation by donation			✓
		3. Support natural resources and environmental conservation by physical energy			✓

The organization of Enabling Activities is activity that enables learners to have the real practice by studying, analyzing, planning, working in group and evaluating as well as provides opportunity for learners to select activity based on their own interests, aims to develop learners's capability. Therefore, the development of environmental education activities in this research applied the approach from Department of Academics in accordance with the Basic Education Curriculum in 2001 as the principle in the development and application of indicators based on the framework of Bureau of Academic and Educational Standard.

2.3 Knowledge Management

2.3.1 Definitions of knowledge management

The world of this period is called “knowledge based society and economy” which is the time that every person in every society must acquire the ability of knowledge creation and application as a driving force for the development. That is to say, in the period of “knowledge based society and economy”, we must do what is different from traditional methods or existing familiarity and focus on using knowledge and learning process by emphasizing on values learning and development

capacity as important components for work (Pra Mahasuthit Arpakaro, 2005: 4-6). Currently, all sectors, including governmental, private and civil society sector, apply knowledge management as the tool for driving organization.

The Royal Institute Dictionary B.E. 1999 provided the definition of “Knowledge” as things accumulated from studying, researching or experience as well as practical skills, understanding or information acquired from experience, and things that are received from hearing, listening, thinking and acting.

In the aspect of Nonaka & Takeuchi (1995 cited by Awad & Ghaziri, 2003: 46), knowledge can be divided into two main types as follows:

1. Tacit Knowledge is knowledge embedded in the human mind through experience and jobs. It includes institutes, values, and beliefs that stem from years of experiences.

2. Explicit Knowledge is knowledge codified and digitized in books, documents, reports, white papers, spreadsheets, memos, training courses, and the like.

That know-how includes Explicit and Tacit knowledge. Know-how is used as shorthand for know-how, know-what, know-why, know-when, know-where and know-who.

know-how is the processes, procedures, techniques, and tools you use to get something done.

know-what is the activities required to complete a task .

know-why related to strategic insight – understanding the context of your role, and value of your actions.

know-when is the sense of timing - to know the best time to do something, to make a decision, or to stop something.

know-where is that uncanny ability that some people have for navigating through and finding the right information.

know-who includes knowledge about relationships, contacts, networks, who to call on for help. (Collison & Parcell, 2002 : 21)

In giving the definition of knowledge management, there are many scholars both domestically and internationally who provide the definition of knowledge management as follows:

Vicharn Panich (2005: 3-4) pointed out that knowledge management is the tool for simultaneous achievement of at least four goals: 1) task goal's achievement; 2) human development goal's achievement; 3) organizational learning development's goal achievement; and 4) achievement of community and group with mutual assistance in the workplace. Furthermore, knowledge management also consists of at least six processes as follows:

1. Identify main knowledge that is necessary for or important to work or activity of the group or organization;
2. Search for desired knowledge;
3. Improve, adapt or create some parts of knowledge to be appropriate to individual work;
4. Apply knowledge into one's own work;
5. Apply work experience and knowledge application into exchange of learning and extract "knowledge assets" out for recording;
6. Record "knowledge assets" and "core competence" for implementation and improvement into a set of knowledge that is complete, deep and connected appropriately to utilization.

The integration of all six processes must be blended into homogeneity. Knowledge creation must be explicit knowledge that is in the forms of letters or other codes that are generally understandable, and tacit knowledge that is inherent in humans' mind (beliefs and values) and brain, and in their hands and other physical parts (practical skills).

Pravet Vasri (2005:47) additionally noted that "Knowledge Management" does not involve a person individually, but it is the process of promoting and cooperating to construct the new network. The promotion of collaborative learning enables people whereby it involves individual or people within the same organization or across the organizations to connect together voluntarily. However, the connection is done through collective learning and collaborative activities, leading to the integration of development and capacity utilization of human in four dimensions:

1. physical dimension is a body, health, and relationship with the environment;

2. mental dimension is consciousness, confidence, compassion, and respect for others;
3. social dimension is collaborative action and thinking, principle morals, network, and peaceful mutual living; and
4. intellectual dimension is thinking of others, access to the nature without using power, and integrative thinking.

Boondee Boonyakij et al. (2005: 23) mentioned that knowledge management is the process in applying existing knowledge or learnt knowledge to create optimal organizational benefits through various processes, for instances, knowledge creation, knowledge accumulation, knowledge exchange and knowledge usage.

Knowledge Management Consortium International (2005) stated that new approach of knowledge management is the practice in two patterns.

1. First generation knowledge management is an accumulation into category and sharing knowledge by bringing appropriate information to appropriate persons.
2. Second generation knowledge management is new knowledge acquisition in order to enhance organizational ability in response to new things.

Collison & Parcell (2002: 8) pointed out that knowledge management is knowledge storage, knowledge creation, knowledge extraction, knowledge sharing, and appropriate knowledge application in appropriate condition.

Knowledge management is not just the making of dictionary that accumulates all existing knowledge, but also personnel management to acquire experience on knowledge creation.

Kucza (2001) mentioned that knowledge management is an activity related to process management of knowledge creation, knowledge storage, and knowledge sharing whereby it will also include identification of current condition, specification of needs and improvement of the process that will affect good knowledge management in order to accomplish the needs.

Based on the above definitions, there may be some differences; but if consider overall picture, it is found that “Knowledge Management” has meaning covering main points as follows and as illustrated in Figure 3:

1. Knowledge Management is about human, not knowledge.
2. Knowledge Management is the process of knowledge creation, knowledge accumulation, and knowledge exchange systematically and continuously.
3. Knowledge Management aims to develop human resources , work performance and organization's goal.



Figure 3 Aim of knowledge management

2.3.2 Knowledge management process

From the meaning of knowledge management indicates the process of knowledge management that leads to successful process, which requires different procedures that is knowledge cycle as follows:

According to Boondee Boonyakij et al., (2004: 54-59) the conceptual framework of knowledge management, it can be concluded into the main processes of knowledge process as follows:

1. Knowledge identification: knowledge acquisition is the search for which organization obtains what knowledge, in what form, with whom, and what knowledge necessary for organization to obtain, which enables organization to acknowledge their lack of some types of knowledge. Generally, organization applies the tool called “Knowledge Mapping”.
2. Knowledge creation and acquisition: Organization can create knowledge from tacit knowledge and explicit knowledge. The important thing in this process is determining of knowledge needs and capturing such knowledge.

3. Knowledge organization: This is by organizing the contents and storage of different types of knowledge in order to collect, research, and use more conveniently and rapidly.

4. Knowledge codification and Refinement: It is the codification of knowledge to be in the forms and language that are easy to understand and to use.

5. Knowledge access: Organization must have method of collection and distribution of knowledge that is both tacit and explicit knowledge and have method of knowledge distribution in the form of “Knowledge Push”, which is knowledge input, and “Knowledge Pull”, which is providing an opportunity to choose knowledge usage.

6. Knowledge sharing: This is by organizing documents and database by applying the use of technology, and face-to-face meeting or group meeting.

7. Learning: The most important objective in knowledge management is learning of personnel and the application of knowledge to decision-making, problem-solving and organizational development.

Bordin Wicharn (2004: 45-48) explained about five processes of knowledge management process as follows:

1. Define is identification of the type of intellectual capital or knowledge needed in order to respond to organizational strategy or work performance or the search of organization’s core knowledge, i.e. core competency and is the knowledge that can create distinctiveness when compare to the competitors.

2. Create is the building of intellectual capital or the search for exploitation from existing objects by sending them to further study. Job training within organization or if it is the new knowledge, it may require external sources from consultant, or learning from others’ success and benchmarking.

3. Capture is the search and storage of knowledge in organization to be systematic, including both explicit knowledge and tacit knowledge, in order to use as the knowledge capital of organization, which is ready for faster knowledge enhancement and expansion into the entire organization.

4. Share is sharing, exchanging, disseminating knowledge and transferring knowledge, which are in several forms and channels, for instances, seminar, reciprocal knowledge exchange, job training or in the other forms that have mutual meeting and exchange or knowledge transfer through computer or E-learning.

5. Use is utilization and application to create benefits and achievement as well as knowledge management in action, extension of the level of knowledge, and enhancement of competitive capability.

Komol Deesilphtham (2003) mentioned about components of knowledge management in four processes as follows:

1. Knowledge creation and acquisition is the process that gives importance to long-term innovation in order to create strength to business by emphasizing the implication of knowledge development.

2. Knowledge organization and store is the storage of knowledge in category and then store in the database.

3. Knowledge distribution is the use of knowledge search tool from the stored database and then distribute to different sectors to create usage.

4. Knowledge application is the connection of main activities through workflow system with network system to the other sectors.

Kucza (2001) explained about knowledge management that there are five processes as follows:

1. Identification of need for knowledge is the identification of the need for knowledge that consists of identification of needs and determination of needs.

2. Knowledge sharing is the main objective of knowledge management in which knowledge sharing is divided into two characteristics, including “knowledge pull”, which provision of knowledge to those who need or ask for, and “knowledge push”, which is dissemination or distribution of knowledge to typical people through informing or announcement.

3. Creation of knowledge is the creation of knowledge and has six sub-processes, including identification of new ideas, evaluation of new ideas, gathering of people who obtain new ideas, evaluation of people who have new ideas, selection of people who obtain new ideas and creation of knowledge.

4. Knowledge collection and storage is the collection and storage of knowledge. There are six procedures, including identification of knowledge, evaluation of knowledge, design knowledge storage, categorization of knowledge, knowledge integration and improvement of knowledge mapping.

5. Knowledge update is the improvement of knowledge to be consistent to continuous changing and needs. There are three procedures, indulging identification of changes, evaluation of impacts of changes and knowledge improvement.

Award & Ghaziri (2004: 24-25) explained about knowledge management process in four processes as follows:

1. Capturing is the storage of knowledge consisting of knowledge input, knowledge examination, examination of ideas, revision of information and brainstorming.
2. Organizing is the systematic collection by collecting things that are obtained from knowledge storage, categorization, extraction, connection and data coding.
3. Refining is the extraction of knowledge from systematic collection by applying explicit and tacit knowledge to collect knowledge based on ideas, leading to the making of the project.
4. Transfer is the transfer of data from extraction to application by using it in organization, knowledge sharing, support of data application, careful transfer of data, and promotion of data usage.

Marquardt (1996 cited by Pornthida Wichianpanya, 2004: 43-50) suggested four processes of knowledge management as follows:

1. Knowledge acquisition

1.1. Internal Collecting of Knowledge: The learning ability of most people in organization has become the important factor for value creation. Acquisition of knowledge within organization can be done as follows:

- 1.1.1 Providing knowledge to employees, such as, job teaching, training, meeting and seminar.
- 1.1.2 Learning from direct experience and action.
- 1.1.3 Changing in working processes .

1.2 Internal Collecting of Knowledge: Acquisition of knowledge comes from the following methods:

1.2.1 Benchmarking

1.2.2 Hiring consultant

1.2.3 Receiving news and information from various media, such as, printing documents, television and video

1.2.4 Determining economic, social, political and technological trends

1.2.5 Data collection from customers, competitors and other sources

1.2.6 Hiring new employees

1.2.7 Cooperating with the other organizations to create good alliance and investment partnership

2. Knowledge creation is generative things that are related to push force, deep enlightenment and understanding that occur in each individual in different form of knowledge creation as follows:

2.1 Individual provides tacit knowledge to others, such as, knowledge transfer from working in a team

2.2 Integrating existing organizational knowledge with individual knowledge to create the new knowledge

2.3 Knowledge obtained from collection and synthesis of tacit knowledge

2.4 Internal knowledge creation whereby organizational members discover their own ways and there are several activities that organization operates in order to create knowledge

2.5 Learning by doing

2.6 Systematic problem-solving

2.7 Experimentation

2.8 Learning from past experience

3. Knowledge storage and retrieval relates to technique, for examples, record as the database or in clear writing as well as relates to human process, such as, individual creation and memorization.

4. Knowledge transfer and utilization is about electronics, movement of information and from knowledge from person to another person, either intentionally or unintentionally, with the following methods:

4.1. Intentional transfer of knowledge

4.1.1 Communication in writing (notes, report, letter, news, and announcement)

4.1.2 Training

4.1.3 Internal meeting

4.1.4 Information summary

4.1.5 Internal communication in organization

4.1.6 Work visit organized as necessary

4.1.7 Job rotation/changing

4.1.8 Mentoring

4.2 Unintentional transfer of knowledge

4.2.1 Job rotation

4.2.2 Experience or stories as being told

4.2.3 Working group

4.2.4 Informal network

Knowledge Management is the process about knowledge creation, knowledge acquisition, knowledge storage, knowledge access and knowledge application whereby many scholars have explained about the elements of knowledge management process in the following table (Award & Ghaziri, 2004: 24-25; Boondee Boonyakij et al., 2004: 54-59; Bordin Vicharn, 2004: 45-48; Komol Deesiltham, 2003; Kucza ,2001; Marquardt.,1996 cited by Pornthida Vichernpanya, 2000)

Table 3 Knowledge management process

Process	Boondet et al.	Komol	Bordin	Kucza	Award & Ghaziri	Marquardt
Knowledge Identification/define	/		/	/		
Knowledge Creation	/	/	/	/		/
Knowledge Acquisition	/	/				/
Knowledge Organization	/	/			/	
Knowledge storage& retrieval	/	/		/		/
Knowledge Codification and Refinement	/			/	/	
Knowledge Access	/					
Knowledge Sharing/Transfer	/		/	/	/	
Learning	/					
Knowledge usage/utilization/ application		/	/	/		/
Knowledge Distribution		/		/		
Knowledge Capture			/		/	

From the above table, it can be seen that the cycle of knowledge management has important collective process, including knowledge creation and knowledge sharing; therefore, the researcher applied such process to drive environmental

education activities for schools in appropriation to the context of Thailand. As a result, the cycle consists of knowledge identification, knowledge acquisition, knowledge sharing, knowledge creation and knowledge usage whereby each process has its objective and method as follows:

1. Knowledge identification

Definition: Identification of needs for knowledge and search for the main knowledge that is necessary for or important to work or operation.

Method: defining core process, defining core support, and establishing staffing requirement

2. Knowledge acquisition

Definition: Study, research and acquisition of knowledge from various sources both internally and externally, in the forms of individual, documents and others.

Method: Teaching, meeting, action, searching from various sources, such as, documents, televisions, video, observation, and interview with the well-informed.

3. Knowledge creation

Definition: create new knowledge that is derived from understanding, by applying the data and information obtained from knowledge acquisition and sharing or tacit knowledge into analysis in order to utilize in action or extension of new knowledge.

Method: Integration of tacit knowledge, provision of tacit knowledge to others, hand-on, problem-solving, experience sharing and exchange learning. Therefore, there must be knowledge capture using various methods, such as, record in writing or in the electronic database, drawing or concept mapping.

4. Knowledge sharing

Definition: Share and exchange knowledge and transfer knowledge by face to face, in person or in group.

Method: Internal communication, external communication, group discussion, forum, web board and establishment of cooperation with the other departments or organizations.

5. Knowledge usage

Definition: Utilization and application to create benefits and achievement

Method: Actual knowledge usage in action, decision-making, planning, product development or performance, and trend prediction.

However, knowledge management process has flexibility and is in cycle in which the knowledge cycle can happen repeatedly to enhance the level of knowledge, as illustrated in Figure 4.

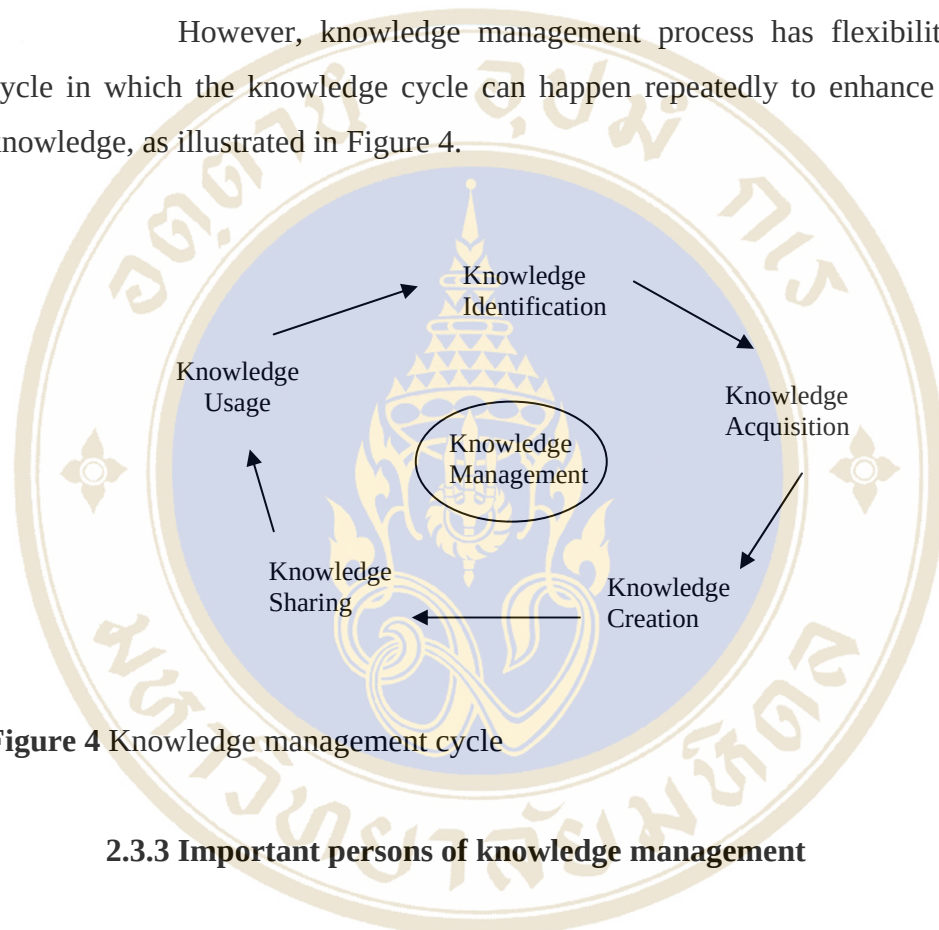


Figure 4 Knowledge management cycle

2.3.3 Important persons of knowledge management

Knowledge management concerns individuals and there are three groups of important individual as follows:

2.3.3.1 Chief Knowledge Officer (CKO)

Chief Knowledge Officer (CKO) is a very meaningful and important person for knowledge management. According to the academic principles and experience of the practitioner/worker, it was found that organizational leader directly influences organizational success.

When compared private business or general agency with educational institute or school, the person who is the CKO is the educational institute administrator. The 2nd National Knowledge Management Meeting Resolution had

suggested the roles of school administrator in knowledge management to be as follows : (Teeradej Cheyarun et al., 2005)

1. CKO performs the major role in authority distribution from the center in order to create learning unit or community of practice from small groups helping each other think or do with full freedom, which is consistent with the mutual goal.

2. CKO performs the role in environmental arrangement to create knowledge sharing. CKO must support the arrangement for stage or meeting for each group to be able to express itself. Additionally, peers need to be given moral support.

3. CKO performs the role in knowledge source examination, such as, how to run the issues or where the obstacle is, etc.

4. CKO performs the role in infrastructure procurement to be used for knowledge management, such as, intranet including outside learning resource in the event that the internal learning resource was not sufficient.

2.3.3.2 Knowledge Facilitator

Knowledge Facilitator or knowledge management facilitator's principle obligation is promoting and facilitating the exchange of knowledge systematically and culturally (Vijarn Panit, 2005:24). Additionally, knowledge facilitator also performs the duty as the connector between the CKO and knowledge practitioner. Pakorn Suwanprapa (2005:52), an expert in facilitator, stated that the facilitator is "the one who extracts human capability" and not the person who provides the answer. Facilitator has the duty to sharply and challengingly and controls the steps turning from difficult issue to easy issue. Therefore, the knowledge facilitator is the manager, coordinator, observer, motivator, atmosphere creator, communication facilitator, performance evaluation promoter and knowledge or problem solving coach that promotes knowledge exploration, promotes learning, and promotes self-satisfaction (Department of Community Development, 2007). Therefore, the definitions of being the facilitator are as follows:

1. Coach that asks questions along with providing advice, but not a teacher.

2. Learning process organizer by emphasizing on knowledge exchange, but not the providing or transferring knowledge.
3. Having the goal for creating new knowledge, but not for the people to believe what is presented
4. The participant is the center of learning activities, but not the lecturer.
5. Facilitator is only a mirror for the participant to change themselves, but not the decision maker for such change.
6. There must be two-way communication, but not just one-way communication.
7. Possessing the interdisciplinary knowledge, but not the expert in a certain subject.
8. Paying more attention to the mutual learning process, but no need to answer to every question.
9. Interested in the learning process resulting in synergy and self-reliance, but not depending on the lecture.
10. Paying greater attention to the interaction and knowledge creation, but not focusing on the content.

2.3.3.3 Knowledge Worker

Knowledge Worker is the person who operates knowledge management activity, contributing to 90 percent of the total; therefore, it could be said that knowledge worker is the truly knowledge management. Knowledge worker participates in group achievement designation and then proceeds with knowledge finding internally and externally and using knowledge to reach mutually set goal. In knowledge implementation, there is also knowledge exchange and mutual interpretation of experience into knowledge creation. New knowledge must also be recorded and reused. It is a never-ending process (Vijarn Panit, 2005: 39). Additionally, Miller stated that knowledge workers use their intellect to convert their ideas into products, services, or processes. It can be said that knowledge workers are important in knowledge development and usage and neither using labor nor is the knowledge receiver.

This research comprised of important individual, such as, school administrators who act as the Chief Knowledge Officer, the researcher who acts as the Knowledge Facilitator and the learners who act as the Knowledge Workers.

2.4 Concept of Participatory Action Research: PAR

2.4.1 Participatory action research definition

Participatory action research means research done by the researcher and group of individual that perform duties in agency, organization or community with the principle objective being to implement the research result found or created for the improvement of solution for work performance quality to be consistent with the current situation and the administration structure along with social, cultural context and other aspects (Ongart Naiyapatana, 2005:338). The participatory action research emphasizes on systematic and participatory learning and finding solution guideline that would lead to long term improvement. Participatory action research also focuses on the knowledge and skill to be practiced on and beneficial to the agency, organization or community. It could be said that participatory action research is a bridge connecting between theory and practice by holding on the principle of “learning by doing” (Brien, 2006; Koranissanun Wilawan & Napat Prapasuchart, 2005: 4-5). The form of participatory action research depends on the emphasis such as participatory action research, critical action research, action learning, community action research, etc.

Participatory action research is the research according to ordinary scientific research only its objective is to focus on developmental solution and involves participation from community in both the research process and the benefit that would be gained from the research (Kamon Sutprasert, 1994: 8).

Participatory action research is a democratic process that put forth both academic knowledge and practice to improve, correct or change the society (Pantip Ramasoot, 1997: 31).

Thus, participatory action research is a form of research that involves participation from those whom have been researched and such participation must be for the whole research process.

2.4.2 Participatory action research principles and characteristics

The followings are the participatory action research principles and characteristics: (Guerrero, 1995 cited by Pantip Ramasoot, 1997: 35-39; Kamon Sutprasert, 1994: 9; Kemmis & Wilkinson, 1998, cited by Pongpan Trimongkolkul & Suparp Chatraphorn, 2002: 207-208)

1. Participatory action research process is a community process because it is based on the belief that individual development process and community change process must be consistent no matter how much it would benefit the individual.
2. The research may be started or motivated by outside researcher but the research process emphasizes on the participation from everyone in the group as joint research owners and not just information providers or the one who would benefit from the research but everyone would be able to participate in the analysis or one's own capability and quality, in the management of one's ideas including reflecting the criticism toward the joint activities.
3. Participatory action research focuses on practice especially any practice that involves interaction in the society by understanding the existing method and the performance result, studying that way to make the performance better and learning from the practice and the performance results.
4. Participatory action research creates freedom for the individual in order to learn and share the knowledge and jointly create fairer and more peaceful society.
5. Participatory action research focuses on self-reflection in all research processes both prior to and after the research.
6. The core concept of participatory action research must reflect the learning of revision process and revision that would facilitate learning further for the research to be participatory action research.

7. Participatory action research produce knowledge by combining knowledge from scholar and the local knowledge which similar to two rivers coming together and at the connection, there are bubbles of new knowledge. It is co-generative learning process that starts with part of the participation to the full participation between the locals and the researcher in order to create shared experience by combining academic knowledge with experience.

8. Knowledge from participatory action research is in the form of interactive and interdisciplinary, which is the lifestyle, the demand for self-learning by new methodology, the determination for finding new things. It means finding new routes, interdisciplinary, not from education but from experience, which result from continuous practice and performing with others.

9. When participatory action research is correctly implemented, there will be at least three achievements: the population would gain more knowledge; the population would have more participation; and the population would gain more power to share knowledge.

10. Participatory action research looks at the world optimistically based on the belief that everyone has the ability to manage the issues in their own community, which would strengthen individual's aspect.

2.4.3 Participatory action research phases

There are five participatory action research phases (Parichart Walaisatean et al.,2000: 111-112):

1. Prior to the research phase, such as, selecting the community and accessing the community, integrating the researcher in the community, surveying the primary community information, and distributing participatory action research to the community.

2. During the research phase, such as, jointly solving problems with the community, selecting and training local research team, designing the research form and data collection, data analysis, and data presentation.

3. Planning phase, such as, project or activities designation

4. Plan implementation phase

5. Evaluation and follow up phase, such as, participatory evaluation, which comprises of quantitative and qualitative data collection, field data collection, documentary information utility, conversation group arrangement, and discussion.

Concerning participatory evaluation, Jackson (1981 cited by Parichart Valaisateing et al., 2000: 111-112) has suggested numerous participatory evaluation techniques;

1. General techniques such as interviewing the administrator, information providers, and interviewing by using open ended questions, and arranging for meeting.
2. Meeting technique is a method to enhance participatory atmosphere and it is suitable for the attendants from various sectors.
3. Field techniques can be used in various forms of meeting and there is also participatory observation technique and the important technique is small group discussion.
4. Self-evaluation technique can be used in various forms of meeting and Participatory Action Research focuses on community development.
5. Cultural technique may consider the original form of communication, culture and tradition.

In this research, the researcher selected participatory action research along with knowledge management because the research creates knowledge for researcher, teachers and learners. The researcher is not only the passive observer, but also plays proactive role as the practitioner/worker. Participatory action research is a method that is used for lesson learnt.

2.5 Related research

The followings are related researches on environmental education for schools and knowledge management as follows:

Udomsit Jitwijarn (2002) studied Scenarios of Basic Education Management for Sustainable Environment in the Next Decade (2012) in the aspects of environment, process factor and educational management result and the research was done by using

Ethnographic Delphi Futures Research. By interviewing 19 educational and environmental management experts and 97 administrators and teachers, it was found that educational management for sustainable environment in the next century would be in the form of learners development on smartness, knowledge and understanding, intention, and skills necessary to be used for their own life for mankind and natural world in a peaceful society. Environmental education curriculum is a local curriculum integrating Basic Education Curriculum and integrated environmental process. The learners are the local researchers and the teacher is the management supporter and learns along with the learners. The educational institute is a model of the society and environment. It is complete and administrated with the focus being on learners's achievement and environmental quality. The created future image comprises of four consistent images: 1) environmental education curriculum is the educational institute curriculum, 2) environmental study from lifestyle integration, 3) perfect educational institute, and 4) be knowledgeable clever learners that are able to live happily in the society.

Somboon Silrungham (2004) studied the scenarios of environmental education curriculum in Basic Education Level in the next decade (during 2004-2014) by interviewing 22 curriculum development experts who teach environmental education in the Basic Education Level. From the research result, it was found that the curriculum design is in the form of integrated environmental education in the Curriculum as the foundation course and elective course and Enabling Activities so all learners would be able to select such course. The management of environmental study must be consistent with sustainable developmental. Enabling Activities (supplement) for 7th – 9th graders would focus on guidance activities, boy and girl scouts' activity and environment related clubs, which are connected to the courses offered in the classroom. Enabling Activities (supplement) for 10th – 12th graders would focus on environment related structure i.e. activities that the learners are the thinkers and planners. They would be activities that promote solving school environmental problems and enhancing consciousness for others.

Ranida Pingmeung et al. (2007) studied environmental education that is suitable for the context of Thai schools in Chiang Rai province and Phayao province for 29 schools by using qualitative research. From the research result, it was found

that most of environmental education activities occur in school, that is, Enabling Activities both inside and outside the school e.g. environmental camps and activity arrangements, school environmental activity arrangements (physically and biologically), and landscape and building arrangements. The internal factors that facilitate success are the school having clear policy and goal as appear in school's vision and mission, the administrators possess vision and deemed environmental education important, teachers participate, support and are involved in the activities, the learners are interested and constantly involved in the activities, and the community are continuously involved concerning labor and finance. The problems and obstacles were found that there is insufficient number of teachers who are knowledgeable in environmental education but those who have the knowledge are busy, lack of environmental education lecturer, connection and integration of environmental education teacher is not continuous, lack of solid curriculum in the school, environmental education management appear only in some curriculum e.g. science and physical education, and administrators have different policies.

Prasarn Tunsikabut, Piboon Upunno & Rutchukarn Tongtarworn (2007) studied the development of environmental education process that is appropriate for Thai school context in the upper northern region (Chiang Mai province, Lamphoon province, Lampang province) for thirty-three schools by applying qualitative research. From the research result, it was found that the environmental education policy only emphasizes on the beauty of the landscape in the school. Environmental education development is still in the subject areas of science and ecology, the school only integrated the environmental education in science, social studies, and vocational and technology subject areas. There is no integration with other courses and not teaching learners to see the environment in the macro level, the school's schedule only allow two periods per week for environmental education. There are numerous ways to arrange for teaching i.e. classroom, club, field studies, camping, boy and girl scouts' activities, and the assessment focuses on memory concerning which far away from environment with the assessment being only on the answer sheet. Problems and obstacles are lack of support from agencies e.g. Office of the Basic Education Commission because the Ministry of Education lack of solid policy to be implemented, lack of financial support from local administration entities, teaching

management period is insufficient because it is only deemed supplemental; therefore, there is no designation of class hours, there is no personnel that graduate from the major of environmental education, lack of environmental management IT to support teaching.

Tanongsak Kumkainam & Suksiri Nuntasuk (2007) studied the environmental education process development that is appropriate for Thai school context (Chaiyaphum province, Nakhon Ratchasima province, Phetchabun province, Lop Buri province) for twenty schools. From the research result, it was found that 1) Teaching process arrangement focuses on the learners being able to gain real experience locally, there is environmental education integrated into the courses, there are numerous activities for the learners' development e.g. community resource survey, local intellect search, establishment of group or clubs, arrange of camp and establishment of assigned activities structure. The learners participate in the school performances i.e. eliminating garbage, growing trees and bettering the soil. The important learning media is the community actual condition. The assessment is done by the behavioral changes; 2) Related factors that influence environmental education success are the school's administrators and school's policies and the support from local community both in public and private sectors; 3) The main problems and obstacles are the parents and the community are still unaware of the importance of environmental education; and 4) Concerning the affects from environmental education process for the school, it was found that the learners, teachers, schools, and the population are affected e.g. the learners behaviors change toward increasing resource preservation and the knowledge is transferred to the parents, the environment in the school is improved, the teacher are motivated to increase their knowledge in the field of environmental education, and the population is more conscientious of the environment.

Kongsak Tardtong & Ngamnit Tardtong (2007) studied the developmental process of environmental education that is appropriate for Thai school context (Khon Kaen province, Maha Sarakham province, Roi Et province and Kalasin province) for 20 schools. From the research result, it was found that 1) Environmental education already exists in integration within courses; 2) The learners and community environmental education knowledge and understanding level is still low, while the

teachers think that they possess high environmental education knowledge and understanding level; 3) The environmental conscientious of teacher is quite good, whereas the learners and community environmental conscientious is mediocre; 4) The participation between the teachers and learners is in the low level; 5) Most of environmental projects are initiated by the teachers not by the learners; 6) The schools mostly arrange environmental activities in various forms of projects; and 7) The important problems for environmental operation process are the related individual lack of the knowledge, understanding, conscientious and participation along with lacking necessary financial and material support for the environmental education operation.

Nuntawan Laorit (2007) studied the environmental education process development that is appropriate for Thai schools context for 34,026 schools, both private and public, countrywide that are under the governance of Ministry of Education. From the interviews with school directors and teachers performing academic duties, it was found that the environmental education arrangement for school is in the form of integration within subjects, which is found mostly in science, next down being sociology. Most of the content concerns forestry resource, water resource, plantation and herbal, garbage and waste material. Most of the learners developmental activities are within the school and activities that have been arranged through boy and girl scouts' activity. Most of other special activities are camping and activities that are arranged with the community and local administrations' organization. The main problems are lack of clear environmental education's policy; and the teachers' lack of knowledge, understanding and skill in activity arrangement and lack of teaching media. The factors that influence success are administrator's policies, teacher participation which possess knowledge and understanding.

Stevenson (2007) studied the Schooling and Environmental Education: Contradictions in Purpose and Practice. Content analyses have revealed that curriculum materials commonly used for environmental education in Australia and the United States of America deviate from the rhetoric in a similar way. It was found that this rhetoric-reality gap is to be expected given the traditional purpose and structure of schooling. A discussion of its historical development sets the contemporary concept of environmental education in the context of the political activism of the environmental movement. The socially critical and political action goals of environmental education

are contrasted, first, with nature study and conservation education, and then with the uncritical role of schooling in maintaining the present social order. The need for students to engage in ideological and critical inquiry is indicated by an examination of the different ideologies which underlie proposals for environmental reform. However, conflict with the dominant practices for schools, which emphasise the passive assimilation and reproduction of simplistic factual knowledge and an unproblematic "truth". These practices are then explained by examining the structural organisation of schools, the primacy of demands on teachers to maintain order and control, and teachers' presuppositions about knowledge and teaching.

Adepoju (2007) studied the correlates of environmental conservation habit of members of a school-based environmental education programme. The focus of the study was on empirically providing a composite picture of the relationship of some representatives of school, student and teacher factors on students' environmental conservation habit of a school-based environmental education programme. The study sample comprised 584 members of the Nigerian Conservation Foundation (NCF) School Conservation Club Programme. The sample was drawn from 25 schools having the Club using stratified random sampling technique. Data collection was through the use of an instrument developed by the researcher. The instrument was named Environmental Conservation Habit Inventory (ECHI) and it yielded a Cronbach alpha reliability coefficient of 0.88. Results of the study indicated that the fourteen independent variables investigated accounted for 12.12% of the variability of students' conservation habit. Four of the variables made significant contributions to the explanations of the variability in students' environmental conservation habit, these were: school ownership status, school Club activity status, students' class level and students' level of activity in Club. Based on the results, the study then surmised that the best attainment of environmental conservation habit can only be achieved by active members of the Club who are in senior secondary classes of private schools having the Club active in them.

Pirat Thidpard (2002) studied the development of self evaluation model for secondary school environmental education by using participatory action research in the construction and design process. There were 4 targeted schools with the sample group. It was found that the participatory activities in developing the model, each

school had to use specific strategies based on their real condition, together with the employment of the strategic approach, and PAR process as the framework for development.

From the following related reviews above, it can be summarized the organizing of environmental club activities for school as follow.

1. The scenarios of environmental education are integrated environmental process in all subject areas which consist of the foundation course, the elective course and Enabling Activities. The environmental process which integrated from learners' way of life. The learners as the local researchers. Teacher as the managing supporter who also learn with learners. School as a perfect model from social and surrounding environment which aims to learners' achievement and also to environmental quality. In the future, it would be in the form of learners' development on smartness, be knowledgeable learners, and skills necessary to be used for their own life, for mankind and for natural world in order to be able to live happily in the society

2. The environmental education for school is integrated environmental process in subject areas which emphasis only on science and social. But in case of Enabling Activities, most of activities are with for school like, club organization boy and girl's scout activity. However, other activities or projects such as field-trip, camping, renovate the beauty of the landscape, buildings and also cooperating with community in other activities. The providing period for the activity still follow the curriculum. Besides, the assessment emphasizes recognition and learners' behavior by both testing and behavioral observation.

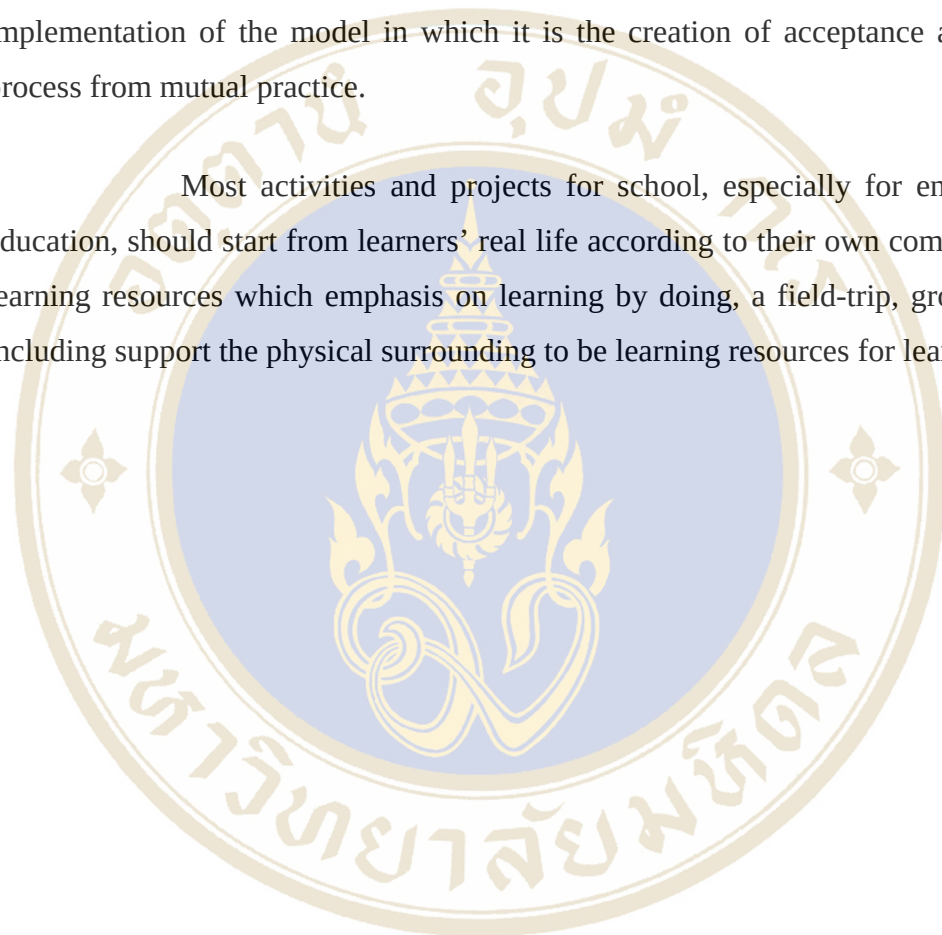
3. The factors which bring success to school's activities such as the clearness of school policy which stated in school's vision, mission, the administrators emphasis on school vision, all teachers have gained more knowledge and participated in supporting with local both government and private sectors.

4. The main problems/obstacles are the organization of environmental education occurred only in some subject areas. Besides, the unclear policy still never pushes into practice. The lack of supporting in budgets and in all equipments and also the lack of knowledge, understanding and conscientious are the main problems. While the lack of participation in community both government and private sectors are also the main problems.

5. The results from environmental education affected both people and organization, i.e. learners, teacher and school. That is learners relayed their knowledge of environmental conservation to their parents. School was developed and teachers were more enthusiastic in learning about environmental education.

6. PAR is an appropriate method for the development and implementation of the model in which it is the creation of acceptance and learning process from mutual practice.

Most activities and projects for school, especially for environmental education, should start from learners' real life according to their own community, as a learning resources which emphasis on learning by doing, a field-trip, group process, including support the physical surrounding to be learning resources for learners.



CHAPTER III

RESEARCH METHODOLOGY

The purpose of the research on the development of environmental education activities model for schools through knowledge management is to develop effective model of environmental education activities under environmental education, knowledge management and Enabling Activities principles by means of participatory action research whereby the researcher plays the role in developing environmental education activities model in all research processes together with schools.

3.1 Study area

This research selected study areas by means of purposive sampling by selecting Banglen district, Nakornpathom province because it was the area where there was the need to solve pollution and environmental problems. The district identified that there are crucial problems that was ranked in the top 5 of the district (Office of Banglen Amphoe, 2001). In addition, the environmental quality report by Regional Environmental Office 5, who was responsible for Nakornpathom, Suphanburi, Chainat and Samutsakorn provinces, found that Nakornpathom province was the province that had the most complaints concerning environmental problems in 2006-2007. When studied particularly in Banglen district, it was found that water quality at Thachine River was in the very low level and there were also problem of bad smell from alcohol manufacturing factory and plastic factory, problem of chemical usage, and problem of soot from casting factory. Moreover, it was also the area of the research project on participatory development of learners, schools and communities through the process of environmental education and budget support from Mahidol University.

The researcher, therefore, selected this area as the study area, which consisted of four schools in secondary level: Banglen Vitthaya School, Buapaktha Vitthaya School, Sathaporn Vitthaya School and Bangluang Vitthaya School whereby

these four schools were under the supervision of Office of the Basic Education Area 2, Nakornpathom province. For the selection of schools in this study, there were two schools, including Banglen Vitthaya School and Bangluang Vitthaya School. The researcher selected Banglen Vitthaya School as the initial study area as it is selected because it was selected as an ideal school in Banglen district. The school also received Enabling Activities Award from Office of the Basic Education Area 2, Nakornpathom province and organized Enabling Activities in the form of club activity relating to the environment.

3.2 Study design

The development of environmental education activities model for school through knowledge management was designed by participatory action research whereby the researcher plays the role in developing environmental education activities model in all research processes together with schools. The study was divided into two phases as follows:

Phase 1: The construction of environmental education activities model for school through knowledge management.

Phase 2: The implementation of environmental education activities model for school through knowledge management.

3.3 Study process

3.3.1 Phase 1: The construction of environmental education activities model for school through knowledge management.

The study during this phase aimed to conduct contextual study and to construct environmental education activities model by studying in Banglen Vitthaya School during Academic Year 2/2006.

Study sampling: Participants of Banglen Vitthaya School in phase 1 consisted of school director, environmental club's advisor and learners in environmental club, totally 23 people.

Stage 1: Contextual study of general conditions of the schools consisted of location, personnel, resources, management, internal and external both school environment, and learning resources.

1. Study important documents related to schools, including Self Assessment Report (SAR) in 2006, Report on external institution evaluation in Basic Education Level, action plan in 2007 and Student Handbook.

2. Interview the school director about vision of the school, educational management policy, and environmental education instruction for school.

3. Conduct a field survey around school area by surveying and taking pictures of surroundings and buildings both inside and outside school.

Tools and Data Collection

1. Basic data collection about school from documents by coordinating to request for documents from school and Office of the Basic Education Area 2, Nakornpathom province as well as search for data from the Internet.

2. Coordinate with school by sending a letter from Faculty of Graduate Studies to ask for an approval for the study area to the school director as well as ask for an approval in conduct interview the school director with structured interview form constructed by the researcher and to record the interview in which the researcher self-conducted the interview.

3. Survey both inside and outside school surroundings based on observation, recording data and taking photos in which the researcher and research assistant collected the data.

Output

Basic information about school, inside and outside surroundings of the school, vision of the school and environmental education activities for school.

Stage 2: The study of state of environmental education activities for school, characteristics of club activity organization related to activity process, related persons, learning resources and limitations.

1. Coordinate with school to ask for an approval for the interview with environmental club's advisor and two learners' representatives in environmental club.

2. Interview club's advisor and learners' representative in environmental club according to the appointed time and date.

3. Study related documents on operation of environmental club activity process, such as, activity report form and list of learners.

Tools and Data Collection

1. Interview environmental club's advisor by structured interview that was constructed by the researcher based on the concept of activity process of Department of Academics (2001), which consisted of important questions, including 1) Background of club activity; 2) persons related to activity process; 3) activity process; 4) learning resources including budget, time, place, technological/learning resources; and 5) problems/constraints in which the researcher conducted the interview as well as recorded it and collected various documents related to activity process.

2. Interview two learners' representatives in environmental club in which learners gave the reasons for joining environmental club, past activities satisfaction and problems and constraints. The researcher conducted the interview as well as recorded them.

Output

Data of environmental education activities for schools

Stage 3: Planning

1. Study documents and related research about environmental education, knowledge management and Enabling Activities principle in order to clearly understand the concept of environmental education process for schools, knowledge management process and approach to Enabling Activities.

2. Analysis of data in Stage 1 and 2 to use for planning the model of environmental education activities for school through knowledge management.

3. Organize the workshop among the director, club's advisor and the researcher in order to plan the environmental education activities for school by synthesis the draft of model which consisting of concept, objective, process and guideline to practice.

Tools and Data Collection

1. Data collection from documents and related research from various information sources, including articles and research results in academic periodicals, research report, academic conference documents and thesis at both doctoral and master degree level as well as, annual report and information obtained from analysis results of contextual study of school and the state of environmental education management for school.

2. Data collection from group's meeting summary.

Output

The draft of model of environmental education activities for school through knowledge management.

Stage 4: Implementation plan and evaluation

1. Operation of environmental education activities model according to synthesized model among the researcher, club's advisor and learners in Academic Year 2/2006. Starting with the stage of member's registration from learners who were interested in environmental club. During following the stage of activity based learning, club's advisor, the researcher and the learners took part in observation and reflection of the output in each stage.

2. Organize meeting summary on activities based learning in order to improve into practical model among the school director, club's advisor and the researcher.

Tools and Data Collection

1. Tools used in the study of basic information of target group were learners' basic information survey form, by asking about name, class level, gender, G.P.A., and reasons for joining club activity in order to create basic

understanding towards learners and prepare for activity process. The data was collected in the first period environmental club's orientation in which learners filled out information and returned to the researcher.

2. Tools used in evaluation of model efficiency were as follows:

2.1 Measurement form of desired characteristics was adapted from the framework of evaluation of desired characteristics of learners of Bureau of Academic and Educational Standard and Office of the Basic Education Commission in 2005. It consisted of two sections: section 1 related to learning enthusiasm, which consisted of 11 questions; section 2 related to participation in environmental conservation, which included 11 questions, equivalent to the total of 22 questions. Questions were in five-rating scales as follows:

- 1 = the lowest level of practice or never practice
- 2 = a low level of practice
- 3 = a moderate level of practice
- 4 = a high level of practice
- 5 = the highest level of practice

Reliability assessment of the research tools was done by try-out with 30 learners who were not included in the sampling group, and then analyzed by Cronbach's Alpha Correlation Coefficient in which reliability value was equivalent to .924. The data was collected by asking learners to fill out measurement form of desired characteristics during pretest and posttest of environmental education activities model.

2.2 Learners' behavioral observation form, by dividing into learning enthusiasm and participation in environmental conservation in 9 items, which were adapted from the framework of the evaluation of desired characteristics of learners of Bureau of Academic and Educational Standard and Office of the Basic Education Commission in 2005. The data was collected from club's advisor and the researcher was the person who observed and recorded during learners' activities in order to examine the data obtained from learners.

2.3 Knowledge note-taking was the questions about conducted activities, acquired knowledge and feelings toward activity conduct, by collecting data from having learners record performed activities and acquired knowledge as well as

reflection of feeling satisfaction or dissatisfaction toward each activity whereby learners must record every time there was activity process. The researcher collected the data and gathered the records.

3. Tools used for reflection of action results were as follows:

3.1 Post-activity record was the record about process, climate, problems and constraints occurred throughout the trial process of model whereby the researcher and club's advisor recorded from observation together in every process.

3.2 Questions for activity summary were the questions for evaluating activity outcomes by asking about all activities performed, things learnt, feelings or problems occurred. The data was collected from learners' group meeting organization in the last activity in order to reflect knowledge and satisfaction toward the model.

Output

Result of testing model of environmental education activities for school through knowledge management.

3.3.2 Phase 2: The implementation of environmental education activities model for school through knowledge management.

The study during this phase aimed to the implement of model of environmental education activities through knowledge management by studying Bangluang Vitthaya School during Semester 1/2007.

Study sampling: Participants of Bangluang Vitthaya School in phase 2 consisted of school director, environmental club's advisor and learners in environmental club, totally 22 people.

Stage 1: Study the school context from related documents, field survey and interview with the school director.

Stage 2: Implementation of environmental education activities by organizing the activities among club's advisor, the researcher and learners who were target group during Semester 1/2007

1. Indicate the study's objective and the environmental education activities model for school to club's advisor and the learners who were target group.

2. Organize the activities according to the develop model which was organized by the researcher, club's advisor and learners.

3. Summarize the results of the implementation of environmental education activities model for school through knowledge management.

Tools and data collection

Tools and data collection used in the study during this phase was the same method applied in Phase 1, including learners' basic information survey form, knowledge note-taking, measurement form of desired characteristics, learners' behavioral observation form, and questions for activities summary.

Output

The environmental education activities model for school through knowledge management.

3.4 Data analysis

3.4.1 Quantitative data obtained from survey of learners' basic information and measurement of desired characteristics, which were learning enthusiasm and participation in environmental conservation were analyzed by means of percentage, arithmetic mean, standard deviation and comparison of the mean prior to and after performing activity of desired characteristics by Willcoxon test.

3.4.2 Qualitative data obtained from interview about the state of environmental education activities process for school were analyzed base on the activity process framework of Department of Academics (2003), data from various records, learners' behavioral observation and meeting, and content analysis and environmental knowledge were analyzed based on the framework of Collison & Parcell (2002:21). The researcher examined accuracy of the data by conducting triangular analysis and using various data collection methods.

CHAPTER IV

RESULTS

This research is the development of environmental education activities model for school through knowledge management in the study area of Banglen district, Nakornpathom province.

In this chapter, the researcher presents research results according to the research process by dividing into two phases. Phase 1: The construction of environmental education activities model for school through knowledge management Phase 2: The implementation of environmental education activities model for school through knowledge management and the environmental education activities model for school through knowledge management. Details are as follows.

4.1 The construction of environmental education activities model for school through knowledge management

4.2 The implementation of environmental education activities model for school through knowledge management.

4.3 The environmental education activities model for school through knowledge management

4.1 The construction of environmental education activities model for school through knowledge management

The study during this phase aimed to conduct the contextual study, to study the state of environmental education activities process for school, and to construct and testing model of environmental education activities by studying in Banglen Witthaya School during Semester 2/2006.

4.1.1 Contextual of Banglen Vitthaya School

The contextual data of Banglen Vitthaya School was obtained from Self Assessment Report (SAR) in 2006, Report on external institution evaluation in Basic Education Level, Action plan in 2007, Student Handbook and from interview with school director together with field survey. Data was summarized in the following details.

School Type: It is the medium-sized secondary school of the district, from Matthayom 1-6.

Site: Banglen Vitthaya School is situated on 81 Moo 6, Banglen sub-district, Banglen district, Nakornpathom province under the supervision of Office of the Basic Education Area 2, Nakornpathom province. The school was established on 15th May, 1959. The school is situated in the municipality, which is not far from Banglen Market and Bus Station. Transportation is convenient; most learners come to school by bus. Located places next to the school are the hospital of the district, groceries and gas station. Behind the school is community area where people are working in agricultural field and as general employees.

Personel information: Learners data was collected during the 2nd semester of Academic Year 2006, there were 1,016 students, which were divided into Matthayom 1-3 (708 students) with 18 classrooms; Matthayom 4-6(308 students) with 12 classrooms. Regarding teachers' and personnel's data, there was the total of 52 personnel, contributed to 4 administrators, 38 full-time teachers, 7 part-time teachers, 2 janitors, 1 driver. The ratio of teacher to learners was 1:22.

Learning resources: The school has the area of 32 Rai 1 Ngan 60 Sq.Wah. There are 3 study buildings, 6 sub-buildings, and 16 laboratories, for examples, library, math laboratory, Thai language lab, computer lab, cooking room, Buddhism room and Audio Visual Room. Moreover, there are also areas for practical and recreational activities, including football field, volleyball court, ta-kraw court and

basketball court. The school also organizes internal learning resources, such as, waste bank, grease trap, bio-fertilizer factory, and external learning resources, such as, Thai Songdam Cultural Learning resources, Banglen City Public Library, Banglen Temple and Orchid Garden.

School Administration: Concerning the operation of the school, the school mutually identified the vision that, “Banglen Vitthaya School, Good Academics, Outstanding Environment, Morality Emphasis, Technological Advancement, and Accepted by Community” by holding on to the principles of school development; that is, participative working, thinking, planning and mutual implementation by personnel at all levels and all parties, following the stages of: planning, following the plan, examining and improving. The important thing is to start by building awareness. In term of educational institution administration, it can be separated into three working groups, including group of directors, academics and student affairs. In each group, duties are specified under each group by letting responsible personnel working cooperatively.

Instructional management: Instructional management based on Basic Education Curriculum in 2001; there were 53 clubs during 2nd Semester of Academic Year 2006. Most of them were the clubs promoting Math, Science and Sports. As for club promotion, learners have an opportunity to choose based on their interests by having one club’s advisor. School director provides supports to the clubs. The school also allocates budget and tools and equipments based on appropriateness of activities under the consideration from the club’s advisor, head of Enabling Activities, and Deputy Director of Academics. In term of environmental education process in the school, there are many characteristics, including process of integration and addition into various subject areas, focusing on Science, Social Studies, boy and girl scouts’ activities, camping, environmental club and activities undertaken together with external organizations, for examples, canal digging, and “We Love Thachine” environmental conservation campaign.

Internal and External environment: Internal environment of the school are delightfully arranged by planting trees, and small parks, and around building area there are the bush and marble tables for learners to relax as well as refreshment stall. There is also an arrangement for designated waste disposal area. In front of the school and behind the school is close to the roads, sometimes there is noise disturbed by vehicles and tremendous amount of dust particles into the school. Someday, bad smell from alcohol manufacturing factory will occur, which is not quite far from the school.

Relationship with Community: Regarding the relationship between the school and the community, the relationship is good as can be seen from mutual organization of activities between the school and the community in many important occasions, for instances, Candles Festival, Royal Family's Birthday, and Canal Digging activity. Furthermore, the school also conducted data survey on the learners' parents and found that the majority of the parents work as employees, followed by agriculture and merchant, respectively. The majority obtain income below 150,000 baht per year, followed by 150,000-300,000 baht per year. As for religious belief, the majority are Buddhists, followed by Christians and Muslims, respectively.

It can be concluded that Banglen Vitthaya School was the secondary school based on coeducation. The school had the vision toward environmental development and instructional management based on the Basic Education Curriculum in 2001, and had environmental education process in the form of integration into subject areas Enabling Activities and special project in cooperation with external sectors as well as readiness in terms of buildings and organization of surroundings that were supportive to learning and had learning resources both within and outside the school.

4.1.2 State of Environmental Education Activities for School

From the interviews conducted with one club's advisor and two learners's representatives from environmental club, including a chairman and a club's member, together with documentary data, study results can be summarized as follows.

Background: The club organization of the school consists of two characteristics: 1) the school is an organizer of the clubs; 2) interested learners who wish to establish the club makes a proposal to the school. As for the environmental club, it is categorized as the first characteristic. The school gives an opportunity for learners to register for the club. The head of enabling activities submits the list of 53 school's clubs and approval documents to establish environmental club at the school. The environmental advisor gives a reason for organizing this club that "it is my own preference and interests. As a social studies teacher and a teacher, who participated in "Rao Rak Thachine Project" of the Regional Environmental Office, also want learners to do activities" while the club's chairman gives a reason for taking part in this club that "I'm fond of and interested in environment, and I would like to develop better environment in my school". The club's member representative mentioned that "My friends applied for it, and I just followed them".

Process of activities: After the school director approved for club establishment, the advisor and learners' representatives identically mentioned about the important processes as follows: 1) Orientation to introduce all club's members; 2) Selection of club's committee, including a chairman and a vice-chairman who are responsible for coordinating and looking after club's members to do activities in accordance with identified rules; 3) Conducting activities as assigned by the club's advisor, for examples, collecting trash around the buildings, sweeping gutter in the canteen, Plants survey in the school (recording names of the trees), and drawing poster on the topic "We Love Thachine" whereby the club's advisor brought the paperwork the names of trees record within the school and posters created by learners as a support; 4) Assessment by the club's advisor, which is considered from activity participation, work performance and number of activity participation. The club's evaluation result is "pass" or "not pass" without identifying grade.

In term of learners' satisfaction toward environmental activities conduct, they have satisfaction toward environmental activities by providing that, "It's fun and relaxing and we don't have to be so concerned like other subjects (Math and Science) and we also get to know the names of trees; our school also becomes cleaner" while the club's advisor also has satisfaction in similar to learners by praising learners'

works that were previously submitted, especially the posters, “Look at these works of my learners; the drawings are very beautiful. Wherever they are displayed, people admired them. If there is any contest, I’ll send them to the contest.”

Related persons: From the interviews with the club’s advisor, learners’ representatives and list of learners in the clubs, it was found that important persons consisted of: 1) school director: having the roles in introducing, approving, establishing or dismissing the clubs; 2) club’s advisor: having the roles in providing consultation, assigning tasks, evaluating and coordinating with academic administration group of the school; 3) learners: having the roles in participating in doing activities throughout the entire semester. The total number of learners was 21, who taking part in environmental club, were studying in the range of the third level (Matthayom 1-3) with one club’s advisor.

Duration: Based on school’s timetable, it was found that in organizing club activities of the school, it was set by one period per week by arranging it in the 5th period of Monday. The total duration was equivalent to 18 periods per semester, which was consistent to the data obtained from the interviews with the club’s advisor and learners’ representatives.

Place: According to the study timetable, the room allocated for the club is at the 2nd Building, Room 202 while the actual practice does not utilize such room; instead the marble tables around the building are used as the place for calling for a club’s meeting and doing activities together. The place of environmental activities is internal school

Media/learning resources: Based on conducted activities, including garbage collection, plant species survey, and drawing pictures, it was found that the club’s advisor utilized learning resources within the school.

Problems/obstacles: It was found that the problems of the club’s advisor was that some learners who are in the club do not have interest in the environment and

do not pay attention to the club activities because no grade is granted. The period of the club is on Monday afternoon after lunch, which makes learners come to class late and sometimes the school organizes the meeting; therefore, there is no club's activity. Together with loaded teaching responsibility, the club's advisor is unable to follow-up and look after learners continuously. There is also the lack of modern teaching materials. However, the club's advisor still has the desire to develop better activities for the learners while learners had the desire to have field trip or external activities and enhancement of environmental knowledge through various media, such as, VDO and Internet.

In conclusion, the state of environmental education process in school based on the framework of Enabling Activities that had 3 components of: 1) Preparation; it was found that important personnel consisted of school director who had the role of presentation, approval for establishment or dismissal of activities, club's advisor had the role of advice giving, assignment of task, evaluation and coordination, learners had the role of activity participation and accepting evaluation results. In terms of site, materials and learning resources, it was a utilization of place within school, including classroom and school's surrounding areas. On the other hand, learner group management was an organization of a group by having learners from all levels in the same group. Time management was time utilization in a curriculum; 2) Activity conduct based on club's approach was an activity that was organized based on learners' interests and can be collectively performed. The process began from an admission of learners who were interested in club participation, orientation, selection of club committee, activity performance such as cleaning school by collecting garbage, sweeping gutter, and surveying plants in the school; 3) Evaluation is an individual assessment concerning interests in activity participation by considering from observation of activity participation, work performance, and evaluating of time activities participation. In terms of problems occurred based on analysis from the concept of environmental education, it can be categorized into 3 issues consisting of the followings: problem of teacher in which teacher had too much teaching burden and lacked understanding toward environmental education process; a problem of activity process in which the method of activity process was an organization of activity where

a teacher was the center and evaluation was an assessment of outputs without an emphasis on outcomes occurred with learners.

4.1.3 The draft of model

From synthesis of documents and related research as well as results of data analysis obtained from the study of the state of environmental education activities process based on the context of the study area, data was used to identify the draft of model. Organize the workshop among the director, club's advisor and the researcher in order to plan the environmental education activities for school by synthesis the draft of model which consisting of concept, objective, process and guideline to practice. Details were as follows.

4.1.3.1 Concept of the draft of model

The model was capacity development of human by collective learning or team learning, action learning, activity based learning, direct experience and hand-on that were integrated into or consistent to the way of life and the residence context with good mental health and happiness.

4.1.3.2 Objective of the draft of model

The objective was to develop learners to have desired characteristics, including ability to create environmental knowledge, awareness and skill toward environmental conservation as well as being a person who had learning enthusiasm, by focusing on activity process that enabled learners to have learning from hand-on in group or team, which was consistent to the context of learners and school.

4.1.3.3 Process of the draft of model

The design of the process of the model was based on the concept of environmental education and knowledge management was applied as a tool together with participation by identifying structure of the process based on principles of Enabling Activities in order to be consistent with the context of the study area and basic education curriculum.

This was in order to be consistent to actual practice that was congruent with the school's approach, which can be concluded as the process of environmental education activities process in three main stages in the follow details.

Stage I: Preparation consisted of club establishment; orientation and selection of club's committee

Stage II: Action activities consisted of identification of environmental issues, perform activities through knowledge management cycle under environmental issues which consisting of knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing, and knowledge usage.

Stage III: Activities Assessment

4.1.3.4 Guidelines to practice

From analysis of the components of learner development process, it was found that there must be preparation of personnel, site, learning resources, learners' group, and time.

1) Personnel involved identification of roles of three important related persons as follows:

(1) The role of school director: the school director acted as the Chief Knowledge Officer (CKO) who approved for club establishment, supported exchange of learning both internally and externally, facilitated in finding external learning resources, allocated budget, tools that necessary for activity conduct.

(2) The role of club's advisor: Advisor acted as knowledge facilitator who organized learning process by stimulating learners to have curiosity and raise questions, connected learning resources both internally and externally, coordinated with the school director and learners, created friendly atmosphere and connected knowledge that was occurred as well as learnt and evaluated along with learners.

(3) The roles of the learners: The learners acted as knowledge worker who created knowledge by participating in activity by planning, operating and reflecting the occurred results as well as evaluating together with club's advisor.

2) Site and learning resources by using site for activity process and learning resources both within and outside school.

3) Learners' group was an organization of the group that opened an opportunity for learners from all levels who had interests in activity participation regardless of gender, level and ability.

4) Time was specified by using the club period in the curriculum, which was the 5th period on Monday and outside the curriculum during lunch break.

From synthesis of the draft model leading to planning for action by mutually identified method of practice in which the model was used to testing with learners in environmental club in the second semester by organizing environmental activity, by using school based. Characteristics of activities were that learners were divided into subgroups based on their willingness by emphasizing teamwork. The evaluation was activities assessment by mutually conducting assessment between learners and club's advisor.

4.1.4 Results of testing model

From synthesis of environmental education activities model for school through knowledge management, it was used to testing with participant who were learners in environmental club of the school for one semester, which was operated by the learners, club's advisor, and the researcher. The researcher would like to present overall picture of the operation of the club before presenting the output of activity conduct in each stage. The results are presented as follows:

4.1.4.1 General information

Club's advisor information: female, 52 years old, from the subject areas of social studies, religion and culture, teaching in Matthayom 4 and used to be the club's advisor of environmental club for 1 year, having environmental work experience in working with the Regional Environmental Office 5 in "We Love Thachine Project" with 30 years of experience as a teacher.

Learners' information: Learners in the club were females more than males; it indicated that learners were males (23.80 percent) and female (76.20

percent). The maximum age was 15 years old and the minimum was 14 years old, studying in Matthayom 3 the most, contributing to 95.23 percent with grade point average of 2.20.(Table 4). Reasons for joining showed that learners selected the environmental club mostly because they were interested in doing environmental activities, interested in environment, friends' persuasion, contributing to 42.85, 33.34, and 14.29 percent, respectively.(Table 5).

Table 4 Characteristics of Environmental Club's Learners of Banglen Vitthaya School

Characteristics	Number (n=21)	Percentage
Gender		
Male	5	23.80
Female	16	76.20
Age	Min. 14 years old; Max. 15 years old; Age Mean 14.76 years old.	
Educational level		
Matthayom 1	1	4.77
Matthayom 3	20	95.23
GPA	Min. 1.21; Max. 2.85; GPA 2.20	

Table 5 Reasons for Selecting Environmental Club of Banglen Vitthaya School

Items	Number (n=21)	Percentage
1. Interested in doing environmental activities	9	42.85
2. Interested in environment	7	33.34
3. Friends' persuasion	3	14.29
4. Desire to make contribution to the society	1	4.76
5. Desire to pass the club's activity	1	4.76

Environmental club information: Environmental club was organized in the 5th period of Monday, having one club's advisor and 21 members. The club was organized in two sub-groups; each group consisted of 10 members and 11 members based on willingness of learners. There was an appointed of the three club's

committees who were mainly responsible for coordination, including one club's chairman and two sub-group representatives (one from each sub-group). Interesting environmental issue was related to waste, by having the goal to develop cleaner school's surrounding; something that learners can actually do by themselves, starting from dropping litters in the right place and separating waste.

4.1.4.2 Output of activity conduct in each stage

Output of activity process in each stage was the presentation of the method, results of each stage and observation from the researcher, club's advisor and learners by collecting from the note-taking and observation form.

Stage I: Preparation consisted of club establishment, orientation and selection of club's committee.

Club establishment; the application was available for any learners who were interested in environment and would like to join the club. Then, the club's advisor asked for permission to establish a club from the school director through the head of enabling activities and deputy director of academics department. Finally, the school director signed for approval. It was found that most of the learners who were interested were in Matthayom 3, but came from different classrooms, while learners from Matthayom 1 were learners whose teacher taught Social subject in this semester.

Orientation; the method was about the club's advisor and the researcher orientation the learners who learnt in the environmental club in order to make them know to one another and familiar among the learners by doing the activity of relations group that was playing game called "Who am I ?" by having all of the learners write their own information into the introduction form then put them in the box, after that let their friends random and read the information which was written about oneself and finally try to guess who was that person mentioned from the information in the introduction form.

It was found that the learners were interested in this game very much, they felt it was strange and new activity towards them then they had good attitudes to one another because this was the first time they began the activity and the

first time to meet one another among the learners who came from different classrooms, therefore the atmosphere was full of enjoyment.

Selection of club's committee; the method was about letting everybody in the club offered their representative who would do the duty of club's chairman then voted, after that dividing the learners into sub-groups according to their voluntary together with offered their representative by one person per group in order to be the vice-chairman who would do the main duty in terms of coordination. It was found that for the name offer, the learners likely selected the person they were familiar with and from the same class of them more than their friends from other classes. For the sub-group division by voluntary.

It was found that most of the learners in the same group were from the same class and it made the group had the big size, that was dividing into two groups and each group had 10 and 11 members. The suggestion in this stage was that for the chairman selection, it should be from the voluntary of the learners first, if no one volunteered to be then the chairman then selected them. For the group division, it should be divided by random made the learners come from different classrooms and the size should be about 5-8 members per each group. However, the learners reflected the result that the group division and the selection of administrative committee was reasonably that was the coordination and appointment for doing the activity was comfortable and it didn't make contrary because the learners were familiar to one another before which was shown in Figure 5



Figure 5 Learners Selection of Club's Committee

Stage II: Action Activities consisted of

Identification of environmental issues; the method was to apply the school's vision concerning the environment into practice whereby club's advisor encouraged learners to brainstorm in finding the method of school's environmental development, and then presented the result of brainstorming with

discussion and selection of the issues that learners could do by themselves. Club's advisor and learners cooperatively summarized the issues and planned the method of practice as well as the desired goal.

It was found interesting environmental issue related to waste in which the goal was to develop the school environment to be clean. What learners perceived to be actual practice by themselves was dropping letters in the right place and segregate waste. It is noticeable that both groups had the same issue, which was about waste and planning to begin from what could be done by oneself, not focusing on campaign or information board, but rather on practice. In term of the method, it was found that some learners did not propose ideas, club's advisor had to look after them and during brainstorming there was noisy conversation; some learners sat on the floor; some lay down, making friendly atmosphere, as illustrated in Figure 6.



Figure 6 Learners brainstorming environmental issue

Perform activities through knowledge management cycle; The process was in a cycle or what was called “Knowledge Management Cycle”; each process was not absolutely separated from one another and there was flexibility within the process as follows

1) Knowledge identification; the learners were identification of need and determining of need that were necessary for goal achievement. Club's advisor set questions for members to reciprocally find an answer to which from the identified environmental issues, “What are knowledge requirement?” “What knowledge is needed to enhance?” “What is known and what is not?” What should be done in order to know what is not known?”

It was found that knowledge identifying occurred in two phases. The first phase was identification of need in the topic related to waste that were found mostly for school and method of waste management of the school. Then,

learners had more determining of needs in the topic related to the Waste Bank, invention of left-over materials and production of bio-fertilizer. In term of background knowledge, it was the meaning and types of waste. From an observation, it can be seen that background knowledge of learners was the knowledge acquired from classroom learning and textbooks, which was theoretical knowledge concerning the meaning of waste and method of waste segregation, as in the following examples.

“There are four types of waste and method of segregation was done by dumping into the bin; 1) the green bin was for decomposable waste like food scraps, vegetables and fruits; 2) the yellow bin was for recyclable waste such as papers and bottles; 3) the blue bin was for general waste like plastic bags; and 4) the gray bin was for battery and insecticide can.”

In the real practice, learners had already dropped litters into the bins at the school. While learners had knowledge about waste segregation, the school only had two colors of the bins, which were green and yellow. Most of them were the green bins and learners also dropped everything into the green bins.

In term of atmosphere of the conversation, it was friendly and informal. Sometimes, learners talked loudly and out of the points because most learners were in the same level, which was Matthayom 3. Even though they were from different classrooms, learners had well familiarity.

2) Knowledge acquisition; the method was searching for knowledge and researching from various learning resources with different methods both inside and outside the school, individual or documents, and both tacit knowledge and explicit knowledge. Club's advisor suggested different learning resources and methods of knowledge acquisition, for examples: interview, observation, library search, and practice. Moreover, learners should be encouraged to tell about what they knew to the group and recorded information that was obtained every time.

It was found that the knowledge acquisition started from the tacit knowledge by discussion to one another in the club then extended the knowledge increasingly from knowledge acquisition from outside or explicit knowledge. The learning resources that the learners were seeking for were from both inside and outside their school. For inside school was including library, garbage bank building around the school and for outside their school was including Watkonglad School by

interview the persons/groups of janitors, observation the environment which were lots of garbage quantity, practice by doing, walking by observing around the school, field trip visit the invention facilities from remains, video watching about garbage bank. For the observing reflection, the learners had the method of knowledge acquisition by the interview. The persons whom they interviewed were janitors of the school and agricultural teachers that the learners thought both of the groups knew about this matter the most. For the knowledge acquisition from the library was likely the final choice, when asking the reason about this case, it was found that the all learners didn't have library card and didn't like reading.

Moreover, it was found that lots of limitation were the library was open only the day time because there was only one librarian and she also had to teach the method of library use, books in the library were out of date and had only a few which mostly came from the text books sent from Office of the Basic Education Area 2, Nakornpathom province, and at that time the school was in the phase of building the new library so it was during the time of movement preparation. For the field trip visit both in and out of the school, it was found the problem of coordination because it had to coordinate and asked for the allowance from teachers in other subjects and students' parents as well as the organization outside, these procedures took time a lot. However the atmosphere of doing the activity made the learners feel appreciated and fun with various activities that could be found from the example of the saying of learners's opinion and the sample pictures of knowledge acquisition in Figure 7 ;

“Appreciated a lot and gain knowledge a lot”

“I like it very much. If I have an opportunity to come here again, I will come otherwise I would like my juniors to have a chance to see it as well”.



Figure 7 Learners acquire knowledge from various learning resource

3) Knowledge creation: the learners were building new knowledge that was derived from an understanding by applying information technology obtained from searching or sharing or tacit knowledge into analysis while club's advisor organized a meeting to conclude knowledge together, explicit knowledge, background knowledge of learners as well as knowledge acquired from practice, collection and record of knowledge in the form of documents.

It was found that for knowledge creation of the learners, it came from their knowledge and experience discussion and exchange within the club, making a questions and trying to find the answers and from these answers it led to further questions. These methods could make knowledge creation happen in every period of activity in order to extend the former knowledge of the learners. Therefore the knowledge capture was very important in this procedure. Every time the learners participate the activities, they noted their knowledge into the knowledge record form then they brought their knowledge to conclude and analyze that whether the knowledge they got was covered the things they wanted or not. Therefore the knowledge creation made them have more knowledge. From the observation, it was found that the knowledge of the point the learners created was applicable their daily

life such as bio fertilizer which the learners could apply in their house because most of their parents were doing agriculture. For the learners' collection or note were still in the form of documents. However for the terms of knowledge note, the learners rather didn't like it. Every time after doing the activities, the learners had to jot down their knowledge they got but their club's advisor had to warn them and suggest how to note-taking the knowledge. Moreover at the first time of making a note by individual, it was found that the learners copied to one another therefore the club's advisor had to adjust to do note-taking in group and this way was better. For the meeting of knowledge summary, it had to do by informal type in order to make the atmosphere not too serious which was shown in Figure 8, the sample of knowledge note-taking.

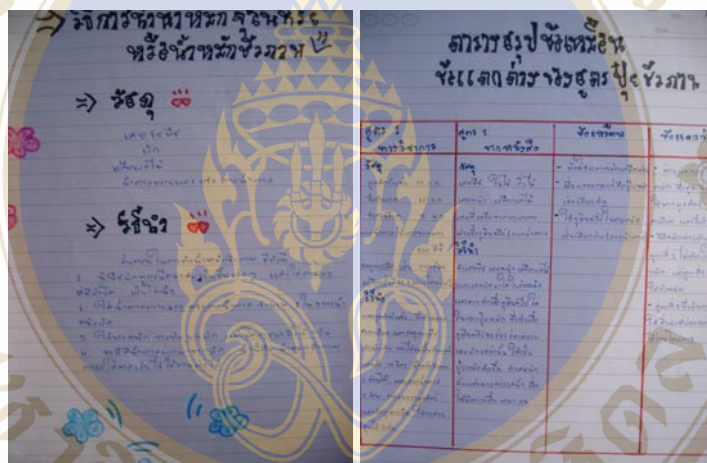


Figure 8 Learners jot down knowledge note-taking

4) Knowledge sharing; the learners were, sharing and transferring knowledge by face-to-face or in group whereby club's advisor organized a stage for learners to sharing within the club or across the clubs both within and outside schools, or sharing with an expert in that topic.

It was found that from the stage setting, it made the sharing to one another within the group in terms of the method of garbage remove. For the exchange to one another cross the group with the club of garbage bank in terms of garbage bank performance for school and the sharing with the professionals outside school which was the experts from the Land Development Department, Nakornprathom province in terms of the bio fertilizer. From the sharing knowledge, the learners not only had more knowledge but also developed their potentials, made

good relationship among friends and enjoyed with being the giver and receiver at the same time as well as gave the new meaning of the garbage from the view of the learners that the garbage had ever been the worthless things to become valuable resource. From the observation, it was reflected that the learning cross the club was such a new thing never been performed before. For the knowledge exchange with the professionals outside or the lecturers from the Land Development Department, the lecturers reflected their opinions that

“Today I am very happy that I came to give the knowledge to the students, normally I teach folklores but today I have an opportunity to come to Banglen Vittaya School. When I realize that the students are interested in this matter, I feel glad and the student can take this knowledge to tell their parents and apply it at their school as well. Moreover it reduces the fertilize use, reserves environment and saved money”.

At the same time, learners also reflected impression through the note-taking as follows:

“In this learning, we’re very glad to have the speaker, from Land Development Regional Office, comes to teach us the method of producing fertilizer in order to make us to do it ourselves at home”.

“What I like is an opportunity to ask and to obtain knowledge from the speaker and what I am impressed is that everyone has acquired knowledge from the speaker together. It is very enjoyable and friendly”.

It can be noted from the method in this stage that sharing of learning between learners in the same age could lead to argument because they held their own opinion while in sharing with adults, learners tended to listen. In term of atmosphere, it was found that learners were happy to learn about things close to them that can be put into practice, for examples, production of bio-fertilizer in which learners paid great interests because their families were producing and some learner would like to produce it at home, as shown in Figure 9 below.



Figure 9 Learners share knowledge across group and with expert

5) Knowledge usage; the method was the implementation of knowledge that would lead to success by means of application into actual practice, planning, decision-making, development into performance or forecast whereby learners utilized the knowledge acquired in different characteristics, for examples, producing as the group performance, extension of knowledge by applying knowledge into further practice or planning for future activities.

It was found that learners were the persons who acquired the knowledge by themselves and used the knowledge at the same time. The garbage knowledge of the club from the acquisition, sharing and knowledge creation was applied in accordance with the daily life both at school and home. The knowledge application started from the learners themselves which adjusted their ideas of worthless garbage into valuable resource from the saying of the students; “garbage is valuable resource”, from the observation of the learners’ behavior which they gave the plastic bottles to their friends in garbage bank club or from their idea that they thought to develop garbage bank of their school, bio fertilizer to waste the vegetables they planted, invention creation, saving box in a house shaped and picture frame from ice-cream wooden sticks which were found a lot at school and it could not be sold at the garbage bank. Moreover, the students also applied their knowledge at their own home by separating garbage and recommended the family members to keep garbage for sale as shown in Figure10



Figure 10 Learners produce various kind of creative product from waste

Stage III: Assessment of the method of meeting organization to lessons summary and obtained knowledge, revision of activity that was mutually conducted as well as satisfaction toward activity performance, and then allowing learners to present group's work performance.

It was found that learners concluded knowledge obtained from activities that were conducted throughout the semester involving waste management in school or what learners named as "Trailing the waste route", activities that were performed together such as waste survey in school, study visit, and video viewing, and feeling toward activity conduct. It was found that learners liked and were happy, as mentioned by learners in examples as follows:

"I really like it. I can see new things that the other schools do and know how they do it, which enables us to have the model for the development of our school in the future"

"I feel that learning is fun this time"

"It's enjoyable and we can also go out of the school"

"I feel enjoyed and the atmosphere is friendly, not boring"

"I feel good to get to know new friends"

For presentation of group's work performance which was a report of each group on recycled waste and decomposable waste, and invention of learners which were bio-fertilizer, photo frame and money tin.

It can be noted in term of the process that club's advisor must be the person who recorded and observed behaviors of learners continuously. In the organization of meeting to conclude lessons, club's advisor must hold fair thought and evaluate mutually with learners. What should be aware of was letting learners gathered

performance and knowledge record; some groups might not completely collect or lose them. Therefore, club's advisor should be the one to collect and store them.

In conclusion, activity performance in each stage had created the group with mutual interests in the environment called “environmental club”. Interesting environmental issue was waste management in school. The issue used as a drive was waste segregation, recyclable waste management through deposit with the waste bank and invention, decomposable waste management through production of bio-fertilizer, which created an activity driven by knowledge management cycle including actual practice, walking survey of waste in school, interview with a knowledgeable person, observation, study visit at the waste bank and Wat Kong Lard School, searching library, video viewing, and sharing with the waste bank club and land development officer. This led learners to have learning by doing and have knowledge consistent to the actual context. With various methods, learners would therefore enjoy more than learning only in a classroom. However, the process still encountered some limitations such as learner's preparation which required an adjustment from passive learners to active learners, provision of audio visuals and equipments including textbooks, video projector, and computers, and coordination with other related persons as well as constraint of the study time that would affect learning in other subjects in which learners had to go out for field trip.

4.1.4.3 Outcome of testing model

Efficiency of the testing model was the study of learning outcomes occurred with learners by considering from environmental knowledge, participation in environmental conservation, and learning enthusiasm.

1) Environmental knowledge

The environmental issues of the waste in which they cooperatively named the topic as “Trailing the waste route”, which had the main points as follows:

Definition: The waste did not need to always be invaluable things; they could turn into valuable resources. Some types of the waste like recyclable

waste can be sold and those who work in collecting the waste also had income from the waste.

Types of the waste: The wastes that were mostly found in the school can be divided into three types as follows:

1. General waste was indecomposable waste, not toxic and not worth to reuse, for examples, food, plastic bags, noodle packages and candy packages, which were the trashes found the most in the school.

2. Recyclable waste was the waste that can be reused and sold, such as, papers, plastic bottles and glasses. This type of waste can be deposited in the waste bank.

3. Decomposable waste was the waste that can be decomposed itself naturally and can be used in fermentation to produce fertilizer, such as, vegetables, fruits, food scraps and leaves. These types of waste were often found in the school canteen. The mongers usually used them to feed the fish, but did not use them to produce bio-fertilizer.

Other places for school which found the waste the most were around the marble tables in front of the co-operative, next to the male restroom, behind the 3rd Building and the canteen.

Disposal methods: The easiest way that everyone in the school could do was to drop litters into the right place and separate waste whereby the school had placed the bins around the school area and also in the classrooms. Before dumping, the waste must be separated. Waste management of these three types of waste was as follows:

1. General waste like candy packages, snack packages, and ice-cream sticks must be thrown away in the green bins located around the school, and then the janitor would collect them and keep them in the waste collection center of the school before the trash-collection truck of the municipality came to collect them.

2. Recyclable waste consisted of papers, water bottles and plastic glasses must be thrown away in the yellow bin that was placed at the waste collection center of the school or deposited at the waste bank.

The school's waste bank was located next to the petanque court and was a single-floor building, looking after by the waste bank club. Opening and

closing hours were on Monday, Wednesday and Friday from 12.30-13.00 pm. The waste that could also be sold apart from papers, water bottles and plastic glasses were aluminum and iron. To become the membership, the person must contact the waste bank during opening hours with five processes as follows: 1) fill out an application form 2) open money savings account 3) fill out deposit form 4) deposit the waste; the first deposit must not be less than two kilograms 5) the waste bank officer makes a record. Conditions of the waste bank as follows: 1) in the first account opening, the waste must be deposited not less than two kilograms 2) the next deposit must not be less than one kilogram 3) withdrawal of the money can be done only once a day 4) within 20 days, if the account does not have any deposit transaction, the waste bank will close the account and confiscate the money to the bank 4) the price of the waste must be in accordance with the announcement of the waste bank only

However, in opening for the new membership, it can be done in a group, but if individual liked invention, they can also use the left-over used materials to make something. The researcher would like to present learners' work as follows:

Method of making "money savings box" from ice-cream wooden sticks

Equipments were 1) 120 ice-cream wooden sticks; 2) poster colors based on preference; 3) glue; and 4) scissors or knife.

Making process: 1) wash the collected ice-cream wooden sticks and leave until dry; 2) paint colors on the ice-cream wooden sticks; 3) make a house-shaped structure by placing the ice-cream wooden sticks alternately in a square shape and glue them tightly, and then arrange the ice-cream wooden sticks to fill the square area until finish; 4) make the wall by arranging the ice-cream wooden sticks alternately in the layer until it reaches the desired height. Don't forget to glue them tightly; 5) make the roof by using the ice-cream wooden sticks to make isosceles triangle on both sides, and then connect them by covering the roof with the arranged sticks in horizontal line, and glue them; 6) connect the finished roof with the house; and 7) make the door by dividing the sticks into half and attach them to the house wall.

3. Decomposable waste consisted of, for examples, food scraps, vegetables, fruit shells and leaves. In addition to the mongers using food scraps to feed the fish, vegetable scraps and fruit shells could also be used to produce bio-fertilizer in

which bio-fertilizer had many benefits, including helping the plants grow, saving money from buying chemical fertilizer, environmental degradable, and not deteriorating self-health.

Mixture of bio-fertilizer production were as follows: 1) plant materials (grasses, leaves, straws, vegetable scraps, and fruits) 4 kilograms 2) molasses 1 kilogram 3) water 1 liter 4) bucket 5 liters with complete closure 5) bio-organic substance 2

The production processes were as follows: 1) dissolve bio-organic substance 2 into 1 liter of water and mix them well for 5 minutes 2) mix plant material scraps and molasses into the 5-liter fermented bucket, and then pour the mixed bio-organic substance 2 into the fermented bucket. 3) stir well and then close the closure, and leave it for 7 days.

Note: Bio-organic substance 2 was catalyst of organic decomposition produced by Land Development Department. Learners can be obtained knowledge from agricultural subject or the soil expert of the sub-district or Nakornpathom Land Development Station.

Recommendation: 1) If there are the fish or golden apple snail, they can be fermented, but the time requirement would be 21 days in the proportion of 3: 1: 1, which is equivalent to 30 kilograms of the fish or golden apple snail: 10 kilograms of molasses: and 10 liters of water, but the plants should not be fermented together with the fish or golden apple snail. 2) Method of usage: Mix with water in the proportion of 1:20 and spray on vegetables or plants once a week. What should be highly cautious is that should not excessively mix bio-fertilizer or directly watering it onto the trees because this microorganism is highly acidic. If use it to water the tree, the trees would die. If it touch the leaves, they would be burnt. It must be mix in the specified proportion or simply use 1 tablespoon of bio-fertilizer with 5 liters of water 3) If the family grows rice, it can be used since the beginning of rice plantation and injected every 7 days until the rice is 100 days old until harvest. When finish harvesting, do not burn rice straw; use this bio-fertilizer in the proportion of 10-20 per Rai, and release the water into the rice field for approximately 3 inches. To decompose rice stubble into the fertilizer, it takes about 15 days to increase nutrients in the soil. Do not use in combination with chemicals 4) If the house has orchid garden, yellow

color fruits should be used, such as, banana or pumpkin, to ferment because there are more nutrients for blossom acceleration. Utilization in orchid does not require special caution. It must be used in the light proportion of 1 spoon per 7 liters of water because the orchid has soft characteristic and 5) If the family has the fish pond, it must be used approximately 5 liters per Rai per month to help adjust the gas from fish foods and fish emulsion .

It can be seen that knowledge created by learners began from doing something that were close to them and simple, and can be practiced in real life situations. This knowledge depended crucially on learners' needs and context of the school.

Analysis results of knowledge toward the topic "trailing the waste route". As stated by Collison & Parcell (2002: 21) that knowledge must cover the following aspects: know-how, know-what, know-why, know-when, know-where and know-who. Therefore, there must be an analysis of knowledge created by learners to be able to cover the following issues:

Know-how involved the processes, procedures, techniques and tools that use to get something done. It was found that the strategy used by learners was "trailing the waste route", which began by setting questions and searching for knowledge, and then turning back to set further questions and search for answers whereby learners imitated the TV program called "Kob Nork Kala".

As a consequence, learners had various methods of knowledge acquisition, such as, interview, field trip, book exchange, and actual practice.

Know-what concerned the activities required to complete a task. It was found that learners must do something to their school environment. Based on the search for environmental issues, learners mutually identified the topic relating the waste because the school had a lot of waste and learners perceived the method of achievement, which was by beginning from themselves, such as, dropping litters into the right place and separate the waste.

Know-why related to strategic insight – understanding the context of their roles, and value of their actions. It was found that learners would research on the waste with the purpose to develop their school to have a clean environment.

Know-when was the sense of timing - to know the best time to do something, to make a decision, or to stop something. It was found that learners specified appropriate time in doing activity. According to the example, it was acknowledged that the waste bank opened during lunch time on Monday, Wednesday and Friday; therefore, the field trip was organized on Monday because it was in the club period. During lunch time, all learners can visit school's waste bank with friends in the waste bank club without the need to be hurried to go to other classes.

Know-where was that uncanny ability that some people have for navigating through and finding the right information. It was found that learners identified the place for knowledge acquisition, including school library, school surroundings, waste collection center, the waste bank and Wat Konglard School.

However, as for the field trip to see the inventions at Wat Konglard School, it was suggested by the club's advisor because the club's advisor participated in "We Love Thachine" Project. As a result, the club's advisor had a connection and knew about schools in Nakhonpathom province in which the club's advisor had an opinion that this school was famous for used materials invention and knew the club's advisor well, which was convenient to have a visit. Such school was opportunity extended school and had the invention club as well as received the School Award in 1996.

Know-who included knowledge about relationships, connections and networks, who to call on for help. It was found that the acquired knowledge was knowledge acquisition from the well-informed whereby learners had searched for from several people, including the school janitor, the environmental advisor and the waste bank club's advisor, the librarian, the agriculture teacher, club's advisor of the invention club of Wat Konglard School, Nakhonpathom Land Development officer, friends from the waste bank club as well as friends from the invention club of Wat Konglard School.

It can be concluded that learners had environmental knowledge that was derived from knowledge creation under interests in waste that was mutually identified in which such knowledge were both the content and the method.

2) Participation in environmental conservation

Results of comparison of the desired characteristics in environmental conservation participation before and after testing of the model were shown in table 6

Table 6 Scores of pretest and posttest in environmental conservation of Banglen Vitthaya School

Item	Pretest		Posttest		p-value
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	
Environmental conservation	3.20	0.34	4.70	0.23	-4.02*

P = .05

From Table 6, it indicated that the mean score of environmental conservation of learners in the posttest was higher than the pretest at statistically significance level of .05

Based on the observation of learners' behavior by the club's advisor in term of environmental conservation, it was found that learners participated in the activities of the environmental club since the 1st semester, without the need to change to the other clubs, and consistently participated in the activities. In term of action, learners played an important role in developing better environment of their school and learners also separated the waste, used the waste to create new products and to produce bio-fertilizer as well as reused them within the learners' families who separated them, sold them, and wanted to use bio-fertilizer in the agriculture. Furthermore, the researcher noticed that some learners brought plastic bottles to their friends who were in the waste bank club as warned their friends to drop litters into the bin as well as suggested ways in developing the school's waste.

3) Learning enthusiasm

Results of comparison of the desired characteristics in learning enthusiasm before and after testing of the model were shown table 7

Table 7 Scores of pretest and posttest in learning enthusiasm of Banglen Vitthaya School

Item	Pretest		Posttest		p-value
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	
Learning enthusiasm	3.15	0.44	3.80	0.32	-3.71*
P = .05					

From Table 7, it indicated that the mean score of learning enthusiasm of learners in the posttest was higher than the pretest at statistically significance level of .05

Based on the observation of learners' behavior by the club's advisor in term of learning enthusiasm, it was found that learners were very enthusiastic in doing activities whereby they did not usually attended the class of the other subjects, but they completely attended the club activity. The researcher noticed that in the early periods of activity, some learners were absent or late because they had to re-exam on the compulsory subjects, such as, Science and Math. Later, learners had the full attendance and were very interested in, especially, the field trip outside the school; learners would arrive on time. In term of information search and note-taking, according to the activity conduction, both the club's advisor and the researcher agreed that learners obtained self-development by which there was knowledge acquisition from various sources, including the library, the field survey, knowledge sharing with the speaker, the field trip, and having note-taking even though the club's advisor had to keep reminding them; later, they could do it by themselves.

It can be concluded that environmental education activities model for school enabled learners to have environmental knowledge, participation in environmental conservation as well as learning enthusiasm.

4.1.4.4 The improvement of model

Results from the meeting on testing model, the administrations, club's advisor and the researcher gave recommendation toward the model could be concluded as follows

1) The developed model of environmental education activities, as a process, was not emphasized on environmental contents. The process was to emphasize on student-centered activities which learners gained direct experience through their real life situation in their own context. Club's advisor also learnt together with the learners to develop their skills on environmental activities. The school had developed more on school's surrounding and also on learning resources. Moreover, the developed model brought the school's vision into practice as the following opinions from both school director and club's advisor.

The school director provided an opinion that environmental education through knowledge management was interesting and efficient, enabling teachers and learners to learn simultaneously and truly have knowledge creation and participation. In addition, new methods that were useful to the school were obtained in order to use together with the acquired skills of learners and driving force the school's vision.

The school director mentioned that,
“I came down to see what they are doing and how they are doing from time to time, especially when letting learners from the two clubs do activity together It's never happened before at the school as each club usually operates separately.”

“The identification of vision of the school comes from the teachers, but the action to be conducted in order to achieve such vision requires cooperation from all parties, especially learners who are the main force of our school”

While the club's advisor gave opinion toward environmental education activities through knowledge management that it enabled learners to learn from various sources and have awareness toward the environment. There were clear and evaluation in which teachers can also learn along with learners, enabling teachers to have better understand environmental education process, to have connection and relationship with the other sectors or organizations that were beneficial to the

instruction and also consistent to the Basic Education Standard. The club's advisor pointed out that:

“It's good to have this kind of activity organization. Learners like it and enjoy it as they can learn from different sources that do not bore them and encourage them to come to class and also have more friends. They can do something that is beneficial to our school. They are now Matthayom 3 learner and they will be gone next year”

“I can also learn about bio-organic substance.² in which I can also use it at home”

“The Office for National Education Standards and Quality Assessment (Public Organization) will come to conduct the 2nd external audit assurance. If we organize the activity like this, it will exactly meet the standard indicators”

“Right! Processing environmental education will create awareness among learners. It's good to organize like this. It's very understandable and better. Those who come to talk and then just go; it's better to make it happen for real”

2) There were some problem and restriction during testing this model such as it consisted of several stages which made it hard to follow. Moreover, the objective emphasized only on learners. The coordination both inside and outside school along with the learning resources and the budget also need to be solved as the following mentions from club's advisor.

“There are too many stages, nearly 7-8 stages, which had more details in each stage made me confused. I think that these stages can be grouped or named and made it easily to follow.”

“We have to spend a lot of money and learners also have to study compulsory subjects. The Math teacher would complain about this”

“When coordinating, it must be contacted early and inviting them as the guest speaker. Our process is very complex before it reaches the school director; we have to make a call for coordination first”

“When you go somewhere, you must have 5 letters in asking for permission from the school director in a field trip, asking for permission in other

subjects that the learner have to take leave, asking for permission to use the school bus, asking for permission from the parents, and asking for financial support. When writing it, it should be done at the same time in order to make it more convenient. Even though the school director gives permission, we still have to follow the procedures”

3) Suggestions for model improvement.

The school director, club’s advisor and researcher gave recommendations for improvement of the model as follows:

(1) The objective of the model should be presented in each item by concluding to be important points.

(2) The concept of model should be presented in each item by concluding to be important points.

(3) The procedure in stage I from the practice, it was found that in terms of the orientation with the selection of the committee was in the same study period. Therefore it was combined together to be the same stage and placed the stage of environmental issues in the stage I in order to realize that the cycle of knowledge management was created the knowledge under the environment issues determined.

(4) The name definition should be easy for practice and communication.

(5) The learners’ group should divide in to small group about 5-8 persons

(6) Knowledge note-taking should do in small group rather than individual.

4) The improvement of model

(1) Concepts and theories used to identify the model that was obtained from synthesis of documents and actual practice, which resulted in 3 important keywords including learning together, learning through activities, and learning in real life (3L), which meant learning together by conducting through environmental activities in accordance with real life situations.

Learning together – Activity process in the form of environmental club with mutual thinking, mutual action, mutual problem solving, mutual decision-making and mutual responsibility in creating mutual awareness and intelligence.

Learning through activities – Learning derived from activities based learning in environmental club every process.

Learning in real life – Organization of activity that is congruent with the context of learners and schools, which can be applied into daily lives.

2) Objective of model was identified from assessment of outcomes of the model that emphasized learning establishment in learners.

(1) To develop learners to have environmental knowledge.

(2) To develop learners to have participation in environmental conservation.

(3) To develop learners to have learning enthusiasm.

3) Process of the model was adapted to be consistent with effective implementation based on suggestions of the club's advisor who was familiar with normal instruction that had teaching steps of introduction into the lesson, teaching and conclusion that can be divided into 3 stages, including Preparation, Practice, and Production (3P).

Stage I: Preparation consisted of club establishment selection of club's committee, and identification of environmental issue

Stage II: Practice consisted of knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing, and knowledge usage

Stage III: Production

4.2 The implementation of environmental education activities model for school through knowledge management

In this phase of the study, it aimed to implementation of environmental education model for school through knowledge management, which was the developed environmental education model in the secondary school that was the study

area, including Bangluang Vitthaya School, Banglen District, Nakornprathom Province and to conclude the outcomes of applied type as above.

The researcher presents general context of Bangluang Vitthaya School in order to see the overall of the school then following with the implementation of developed model.

4.2.1 Contextual school

The contextual data of Bangluang Vitthaya School was obtained from Self Assessment Report (SAR) in 2006, Report on external institution evaluation in Basic Education Level, action plan in 2007, Student Handbook and from interview with school director together with field survey. Data was summarized in the following details.

School Type: It is the medium-sized secondary school of the sub-district, from Matthayom 1-6.

Site: Bangluang Vitthaya School is situated on 170 Moo 6, Bangluang sub-district, Banglen district, Nakornpathom province under the supervision of Office of the Basic Education Area 2, Nakornpathom province. The school was established on 10th October, 1960. The school is situated in the municipality, which is not far from Bangluang Market and Bus Station. Due to the fact that the location is close to the bus terminal, commuting is convenient. For the majority of the students, they commute to school alone by public transportation. As for the remaining students, the parents send them to school by motorcycle. In terms of the surrounding areas of the school, they are designated areas for agriculture and street vendors.

Personnel information: In semester of learners' data during the 2nd of Academic Year 2006, there were 305 students, which were divided into Matthayom 1-3 (218 students) with 6 classrooms; Matthayom 4-6(87 students) with 3 classrooms. Regarding teachers' and personnel's data, there was the total of 21 personnel,

contributed to 2 administrators, 12 full-time teachers, 5 part-time teachers, 1 janitors, 1 driver. The ratio of teacher to learners was 1:19.

Learning Resources: The school has the area of 22 Rai. There are 2 study buildings, 6 sub-buildings, and 10 laboratories, for examples, library, math lab, Thai language lab, computer lab, science lab. Moreover, there are also areas for practical and recreational activities, including football field, volleyball court, ta-kraw court and basketball court. The school also organizes internal learning resources, such as, library, computer laboratory, musical room and external learning resources, such as, old Bangluang Market, Thachine River, and Bangluang Temple.

School Administration: Concerning the operation of the school, the school mutually identified the vision that, “Bangluang Vittaya School emphasizes education to instill in the students the desire to increase their own knowledge, to have virtue, healthy body and to preserve the environment and Thai arts & culture. Students should be in the forefront of technology and retain a method of managing all things ethical. Also, the school community and members of the public should establish a unity effort in maintaining the education system”. By working cooperatively and sticking to the principles to improve the education system would require thinking, planning, and working together for all sectors in all levels. Managing work by PDCA (Plan, Do, Check, Act) which entailed a process in which work was done and assessed periodically.

Instructional management: Basic method of instruction of the year 2001 was as follows. First semester of the year 2007 would include 16 groups of open activities. For the majority, the groups would be comprised of music, sports, arts and drama. To promote each category, there was a counselor or club’s advisor for the students interested in that field. The school set the budgeting and materials for each category after considerations and input from club’s advisor and the school director. For the arrangement of the venues, it was provided through various categories of the following: integration management and interpolating groups of knowledge by emphasizing the science and social studies, Enabling activities, the environmental

camping, joining the activities with other sections such as , Rao Rak Thachine Project, the conversation of century old market, etc.

Internal and External Environment: The instruction building was separated into lower class secondary school, upper class secondary school, library, and dancing room. The center area consisted of the school sports field and the multi-purpose building which included the indoor gym. There was an open-air area under the instruction building which was built for students to participate in activities and also a location for studying. The backside of the building contained the natural pool and the cement pool. In regards to the school, they had planned to improve the landscape by proposing the botanical garden as an educational site to the science department in charge of seedling control. The front of the school was close to the main street which did not have a lot of vehicles.

Relationship with community: according to the outsourced evaluation reports, the relationship between the community and school was strong. In addition, Bangluang Vitthaya School had gathered information from the survey of guardians which concluded that most of them had primary education and worked in either the agriculture (farming) industry or were some form of an employee. Average income of each family was 60,000 baht per year and the majority was Buddhists.

In conclusion, Bangluang Vitthaya School was a secondary school based on a co-education structure. There was a vision to improve the environment, prepare the basic curriculum founded in the year 2001 and provided surrounding education in the form of a main integration group. They were also arranging activities for learners to improve themselves and special activities to coordinate with outsourced institutions. The school building, structure and location were currently being prepared. The surrounding environment would be a source of supporting knowledge to students which put Bangluang Vitthaya School in similarity to Banglen Vitthaya School.

4.2.2 Results of implementation model

In order to describe the researcher's participation in activities together with the club's advisor and learners in the club in the 1st semester of academic year 2007, the researcher would like to present general information of activity process, outcomes occurred from model implementation as well as opinions and suggestions on the model.

4.2.2.1 General information

Club's advisor information: The club's advisor was male, 35 years old, teaching, physics, in science subject areas for the Matthayom 4 and 5, also teaching boy and girl scouts' activity for Matthayom 2, and ethics subject. He had 13 years of teaching experience. At that time he was studying for Master Degree in Educational Administration at the Rajabhat Institute, Nakornpathom. He just moved to Bangluang School since 3 months ago and was demanded from the school director to be responsible for the club's advisor instead of the former teacher. He was also interested in environment and ever be an environmental club's advisor before. He required the learner to feel conscious of environment.

Learners' information: Learners in this club were male more than female, it indicated that learners were males (55 percent) and female (45 percent). The maximum age was 16 years old and the minimum was 13 years old, most of them were studying in the Matthayom 2 and Matthayom 3 respectively. Having the average grade at 2.30 (Table 8). Most of the reasons for this club participation were requiring pleasant and shady school, interesting in environmental activities, planting fondness and requiring to have environmental knowledge, contributing to 40, 25, 20 and 10 percent, respectively. (Table 9)

Table 8 Characteristics of Environmental Club's learners of Bangluang Vitthaya School

Characteristics	Number (n=20)	Percentage
Gender		
Male	11	55
Female	9	45
Age	Min. 13 years old; Max. 16 years old; Mean age 13.8 years old	
Educational Level		
Matthayom 1	2	10
Matthayom 2	9	45
Matthayom 3	5	25
Matthayom 4	4	20
Grade Average	Min. 1.66; Max. 3.36; Average 2.30	

Table 9 Reasons for selecting environmental club of Bangluang Vitthaya School

Items	Number (n=20)	Percentage
1. Require pleasant and shady school.	8	40
2. Interested in the environmental activities.	5	25
3. Fond of planting	4	20
4. Require to have environmental knowledge	2	10
5. Fond of environment	1	5

General information of the Environmental Club: Environmental Club was in the 7th period on Thursdays. There was one club's advisor with 20 club's members. For the club administrative structure, it was divided into four small groups, 5 members in each group according to the willingness of the members. There was an appointment of club's committee who had the main duty in coordinating, including five persons; a group leader and a representative of member from each small group. The interesting environmental issue was about tree planting in which the desired goal was to make the school more shady and beautiful.

4.2.2.2 Outcomes of implementation model

1) Environmental knowledge

The body of knowledge by learners about planting in which learners named it “Only One Tree”; this was from the learners’ ability to learn about the value of trees that were not only for pleasures and beauty, but also served as food, herbs, fertilizer, absorbing carbon dioxide and reflecting the belief about culture. The important contents of this issue were as follow;

Planting was useful in terms of making the school more beautiful and pleasurable place, and relaxing for learners, and decreasing global warming, absorbing carbon dioxide, giving oxygen to human, learning about the species of various trees. Additionally some trees were also used as food and herbs.

The school areas for planting were around the ponds, near the shelter of riverside and at the side of the school. These areas there were 3 cement wells which such wells were connected with the ponds therefore, there were swamps all years and these were suitable for planting aquatic plants such as lotus, etc. The school had a project about creating the botanical garden in order to be the learning resources. The trees planted were including Wishing Tree (Ton-Coon), Lxira Tree (Ton-Khem), Chinese Rose (Ton-Chaba) and mango trees. Furthermore, there were herbal plants that had been known and easy to find in the local areas which were lemon grass, red-hot basil, chili, Alpinia galangal, Banyan Tree such plants many people had known them well and for several times we had walked pass the various trees we were familiar with or even planted them at home, we never knew that they were the herbs and could heal diseases, for example,

Lemon grass is a perennial plant, long life, growing to 0.75-1.2 m. height, spreading by clusters with finger root, specific smell, short stemmed, off-white spathe or light violet spathe covering its segment tightly, alternate unifoliate and rough leaf and sharp edge. There is aroma in its fresh leaf and dry stem which is used as a carminative in Thai traditional medicine. It is used to cure flatulence by smashing fresh aged stem and boiling in water or pour hot water in and drink 3 times before meals. Besides, it can be used as urinate medicine for people who have suppression of urine.

Aloe vera is a perennial plant, short stemmed, succulent, growing to 0.5-1m. height, spreading by offsets and root sprouts. The leaves are light green or dark green with a serrated margin. There is clear latex inside the leaves and yellow substance. The flowers are produced on a spike in the middle of the tree. Each flower is pendulous with an orange tubular corolla. The plant is used for burns and affected area of skin. It is also used in skin cosmetics and treatment. The gel can be boiled and used as a carminative aid and cure constipation.

Gotu Kola is a perennial plant, spreading by root sprouts. The leaves look like kidneys. It is used to cure asthma, bronchitis, measles, constipation, infected skin, dysmenorrhea, hemorrhoid, high blood pressure, fever and help circulatory system and brain.

Roselle is a perennial plant and straight stem. The flowers are bright red with a dark red spot at the base of each petal and have a stout fleshy calyx at the base. The leaves are succulent with rough hair cover oval fruit inside. It is used to cure urine suppression, kidney stone and high cholesterol.

Saapsuea is a perennial plant with straight stem. It can grow up to 1.5 m. When it is young, every single part of the stem has hair. The leaves are unifoliate in opposite line. There is hair on the leaves. The flowers are at the end of the branch and they are white or violet white. The fruit is dry and lean. The leaves are used to cure bleeding and the stem is used as an herbicide.

Besides the medicinal and edible properties, there are beliefs about plants such as sesame plant. In the funeral ceremony, Isaan people use sesame to spread over dead body because they believe that if sesame grows the spirit of the dead body will grow in peace too. They also bring sesame plant to grow in the central area. Sesame is a perennial plant. The stem is square with a long crack and covered with hair. The leaves are unifoliate, alternate or opposite, oval or spear shape. The flowers are white or pink. The fruit is dry and cracked, oval shape, brown or white. The oil from the seed is used to cure wounds and rub to cure pain. Northern people always bring umbilical cord of newborn to tie with the plant as a personal tree of that baby.

It was shown that the knowledge in planting did not emphasize on growing but showing the knowledge that learners were seeking for it from various

places by trying to reflect the value and benefits from those plants and giving the importance to the things near them which they might look over.

From the knowledge base the learners together created, it was analyzed into the knowledge according to Collison & Parcell (2002: 21) as followed;

Know-how is the processes, procedures, techniques and tools which use to get something done. It was found that the strategies that the learners used were starting from the things that they were interested, simple but practical. After they had learnt and realized the value of plants, they extended their knowledge in various ways, for example, researching from the libraries, encyclopedia of youngsters, planting manuals, leaves in Thailand, field trip at the Sireeruckachati Garden at Mahidol University, Sufficient Economy Learning Resources and Sathaporn Vitthaya School by actual practice with the planting the trees they brought from their own home such as lemon grass, Srail-ong, Chinese rose, exchanging knowledge with the other groups and clubs including friends in Staporn School and interview from the expert of herbal gardens.

Know-what is the activity required to complete a task, it was found that the learners required to plant in order to make their school pleasant and beautiful. Therefore the learners discussed to one another that what kinds of trees that make their school beautiful and pleasant then they met the conclusion that they had to grow the plants, therefore the learners brought the Golden Shower, West Indian Jasmine, and Chinese rose to plant as the example below

“Plant the Golden Shower because it is the perennials, give shady and its yellow color of flowers are beautiful”

Furthermore, when the learners had the field trip at the Sireeruckachati Garden, they found several kinds of strange seedlings, so they had the idea to plant them by themselves. They screened their knowledge that could apply appropriately with their areas by starting with planting easy herbals by starting growing the herbs which were easy to find such as lemon grass, hot basil, whereas the herbs at Mahidol were difficult to find so they brought the herbs from their house to grow at school that was the beginning.

Know-why related to strategic insight - understanding the context of their roles, and value of their actions. It was found that learners understand their roles for school and they think growing plants can make their school beautiful. Besides, they value the trees and regard them as more than just beautiful and green but help develop their minds too. Like the saying as:

“Without soil, water, fertilizer, trees cannot grow. But without people, trees die”

“Teacher, could you tell the school director to assign every new student to grow a tree and they have to take care of it until they finish school.”

Know-when is the sense of timing - to know the best time to do something, to make a decision, or to stop something. The club’s advisor observed that during planting activity, learners did not water the trees in the morning only; they trimmed the trees in the lunchtime also.

Know-where is that uncanny ability that some people have for navigating through and finding the right information. It was found that learners could specify places where they could gain knowledge inside school as school surroundings, library and computer room. However, for outside learning resources, they were recommended by the club’s advisor to go to Sathaporn Vittaya School which is another high school in Banglen district and it is not far from their school. There is a self-sufficiency center there and learners could learn new theory of agriculture and exchange opinion with their peer. The researcher also recommended Sireerukkachart Herbal Garden at Mahidol University for learners who would like to learn about herbs.

Know-who includes knowledge about relationships, connections, and networks, who to call on for help. It was found that most of their knowledge was from their own acquisition of close people like friends, the club’s advisor, the researcher, parents, experts and friends at Sathaporn Vittaya School.

One learner said that “My father told me that Srai-ngor could be used to cure sore throat. When I was ill and had a sore throat, my father boiled a shoot of Srai-ngor and let me drink it. Finally, I was recovered. And when anybody had a sore throat, my father always did that.”

Results of qualitative data analysis concluded that learners had environmental knowledge which came from knowledge creation under interests in planting that was mutually identified, which created learning among learners in the contents or knowledge and learning as the method.

2) Participation in environmental conservation

Results of comparison of the desired characteristics in environmental conservation participation before and after implementation of the model were shown in table 10

Table 10 Scores of pretest and posttest in environmental conservation of Banglung Vitthaya School

Item	Pretest		Posttest		p-value
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	
Environmental conservation	3.25	0.45	3.81	0.52	-2.15*
P= .05					

From Table 10, it indicated that the mean score of environmental conservation of learners in the posttest was higher than the pretest at statistically significance level of .05

From observation of learning enthusiasm of learners, the club's advisor found that learners were not only enthusiastic, but they asked their friends from another clubs to join the environmental club also. They proposed many activities, expressed their opinions and showed their planting activity. Learners participated in environmental conservation by gardening herbal gardens for school. The researcher also observed that learners loosen the soil, watered and planted by themselves. They did not complain or express their tiredness or boredom. The most important thing was that the policy of a school which declared that every student had their own tree and they had value of living things depended on one another.

3) Learning enthusiasm

Results of comparison of the desired characteristics in learning enthusiasm before and after testing of the model were shown table 11

Table 11 Scores of pretest and posttest in learning enthusiasm of Banglung Vitthaya School

Items	Pretest		Posttest		p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	
Learning enthusiasm	3.31	0.51	3.75	0.31	-3.11*
P= .05					

From Table 11, it indicated that the mean score of learning enthusiasm of learners in the posttest was higher than the pretest at statistically significance level of .05

From observation of learning enthusiasm of learners, it was found that learners were enthusiastic in learning and would like to participate in every activity. Although school could not offer enough information technology equipment for them, they still attempted to learn from outside sources such as library, internet café, herbal garden and self-sufficiency center. Whenever they went for a field trip, they made a note-taking which was in consistent with an observation of the researcher who found that they paid attention to club's activity.

4) Results of satisfaction toward the model implemental of learners

From the meeting of lesson summary it was found that environmental education activities model through knowledge management enabling learners to feel fun and happy, have new friends, be proud of the developed work, work in a team, and receive various knowledge that helped develop school's surroundings as shown in the follow examples.

"We felt good to do activities and we gained knowledge and could work as a team. We had harmony."

“I felt good to do things I had never done before. I had new friends and finally I did it with all my heart and I learnt about kindness.”

“We enjoyed working together. We gained knowledge. We were happy and proud of our work. We knew new friends and We had fun in learning.”

“We learnt that growing plants could reduce global warming. It made our school has better environment.”

“We felt good with friends and seniors for our school.”

“We had harmony among each other.”

“We had new friends from a field trip.”

In conclusion, the result of implementation on environmental education for school through knowledge management enabled learners to gain environmental knowledge, to participate in environmental conservation and to become enthusiastic learners. In addition, it was also found that learners enjoyed and were happy in doing activities together in a team and making new friends, and were proud of the group's work performance as well as helped developing the school environment.

5) Opinions and suggestions on implemental model of club's advisor

From the reflection of club's advisor, it was found that the model of the environmental education activities for school through knowledge management made the club's advisor gain knowledge and understanding as well as skills in organizing environmental education activities increasingly because the club's advisor graduated from scientific field but at that time they teach physics, therefore they thought at the former time that environmental education was learning about the environment roundabout both living things and non-living things. However when the model was used, the club's advisor realized that the environmental education was the process in terms of development at the learners not emphasized on the environment, and from the setting activities together with the learners and researcher, it could develop the skills in terms of environmental education setting as well. Moreover it reflected that the results of using the model made the club's advisor see the way and method for learners development, as example below;

“Setting the activity like this is quite good, it can be seen clearly that the children can touch the real environment, they like it and the club’s advisor as well get knowledge together with their children and also see the way and methods to develop and manage the teaching and learning, have the wider point of views, open the vision to ourselves, know people more, increase the network and experiences to myself. The most important is to know and understand what the environmental education is”

“From this activity, it was obvious that learners could sense the real environment. They enjoyed it and they had fun and it made me enjoy too. I knew the methods to develop learners. I broadened my own vision. I knew more people and had more networks. I gained more experience. I knew how to do an action research. It was not clear at first but it was clearer now. Then, I exchanged ideas with my friends and would like to do a research and it was drafting at the moment.”

It could be seen that learners started from small and simple things and it spread to more success with adding more value to garbage or making a herbal garden. It was noticeable that learners did everything with their heart and they smiled with happiness. The environmental activities should be done with liveliness and good feeling. It was noted that sometimes learners were bored with taking notes, tired with planting tree in a hot and sunny day, exhausted with walking around school but they were also happy to do activities with friends and meeting new friends. Among those feelings, there were smiles and they knew that what they did was valuable.

Moreover, the club’s advisor said that the area that learners planting trees would be used as a learning resources, herb garden which was a good beginning.

From the lesson learnt, it was found that the outcomes occurred from the model were the learners planted the trees for school as well as decorated the gardens and viewed to be beautiful, created the atmosphere which supported the learning of the learners. At the same time, it was in accordance in the vision of the school which was said that “Bangluang Wittaya School emphasizes education to instill in the learners the desire to increase their own knowledge, to have virtue, healthy body and to preserve the environment and Thai arts & culture. Learners should be in the forefront of technology and retain a method of managing all things ethical”.

Also, the school community and members of the public should establish a unified effort in maintaining the education system and the school policy that aimed to create learning resources in terms of herbal gardens.

In conclusion, the result of implementation on environmental education for school through knowledge management enabled the club's advisor to obtain greater knowledge and more understanding and skills in environmental education activities and the school had the better surrounding of environmental development.

4.3 The environmental education activities model for school through knowledge management

The model of environmental education activities for school through knowledge management that was developed as the process in which each step had continuously relationship, which was used for processing learners development activities in the form of club activity for secondary school based on theory that was used to design by environmental education concept, which was used as a fundamental construction of the model and identified environmental issues as well as the goal of development to enable learners to achieve environmental education objectives. The concept of Enabling Activities was used to identify as the main process and component of the model in order to be consistent to basic education curriculum and the area context, and then apply knowledge management as a tool in accompany with participatory action research for learning creation and model development.

The model focused mainly on learners as the person who identified environmental issues with a group consensus that was derived from learners' interests and can be put into practice according to the context of the area. The model of environmental education activities for school through knowledge management consisted of essential components as follows.

4.3.1 Concept of the model (3L)

Learning together, Learning through activities, and Learning in real life which meant learning together by conducting through environmental activities in accordance with real life situations.

Learning together – Activity process in the form of environmental club with mutual thinking, mutual action, mutual problem solving, mutual decision-making and mutual responsibility in creating mutual awareness and intelligence.

Learning through activities – Learning derived from activities based learning in environmental club every process.

Learning in real life – Organization of activity that is congruent with the context of learners and schools, which can be applied into daily lives.

4.3.2 Objectives of the model

To develop learners to have environmental knowledge

To develop learners to have participation in environmental conservation

To develop learners to have learning enthusiasm.

4.3.3 Process of the model (3P)

Stage I Preparation: The purpose of this stage was to establish the club by gathering groups of learners who were interested in and willing to do environmental activities, selected the club's committee and mutually identified environmental issues. The consisted of :

Club establishment; which had the method where club's advisor proposed to open the club to the head of Enabling Activities through deputy director of academics of the school. Then the school director would sign for approval and then the school opened for registration of learners who were interested in environmental aspects and had the desire to participate in club's activity.

Selection of club's committee; the club's advisor was the organization of orientation of club members in order to get to know one another and

familiarity by organized group relationship activity, and then proposed the name of learners' representative who should become the chairman and then made a consensus, or learners could volunteer to be the club's chairman. Club's advisor divided groups of learners into subgroups based on their willingness; each group consisted of 5-8 members as well as selected the representative of each group to act as the committee, including chairman, vice chairman and secretary.

Identification of environmental issues; the method was to apply the school's vision concerning the environment into practice whereby club's advisor encouraged learners to brainstormed in finding the method of school's environmental development, and then presented the result of brainstorming with discussion and selection of the issues that learners could do by themselves. Club's advisor and learners cooperatively summarized the issues and planned the method of practice as well as the desired goal.

● **Stage II Practice:** The purpose of this stage was for learners to perform activities through knowledge management cycle under environmental issue that was mutually identified. The main activities in this stage consisted of :

Knowledge identification; the learners were identification of need and determining of need that were necessary for goal achievement. Club's advisor set questions for members to reciprocally find an answer to which from the identified environmental issue, "What are knowledge requirement?" "What knowledge is needed to enhance?" "What is known and what is not?" What should be done in order to know what is not known?"

Knowledge acquisition; the learners searched for knowledge from various learning resources by interviewing with a knowledgeable person, practice, observation, data search from a library, external field trip and telling story with a group and taking notes with different methods both inside and outside the school, individual or documents, and both tacit knowledge and explicit knowledge. Club's advisor suggested methods of knowledge acquisition, on interview, library search and learning resources. Moreover, learners should be encouraged to tell about what they knew to the group and took note about information that was obtained every time.

Knowledge creation; the learners created new knowledge that was derived from an understanding by applying obtained from searching or sharing their

own background knowledge into analysis while club's advisor organized a meeting to conclude knowledge together with explicit knowledge as well as knowledge acquired from practice, collection and record of knowledge in the form of documents.

Knowledge sharing; the learners shared and transferred knowledge by face-to-face or in group whereby club's advisor organized a stage for learners to exchange within the club or across the clubs both within and outside schools, or share with experts in each topic.

Knowledge usage; the learners implemented or applied of knowledge that would lead to success by means of application into actual practice, planning, decision-making, development into performance or forecast whereby learners utilized the knowledge acquisition in different characteristics, for examples, producing as the group performance, extension of environmental knowledge by applying knowledge into further practice or planning for future activities.

Stage III Production: The purpose of this stage was to assess the results of activity process by learners and club's advisor through an assessment of procedures, outputs and outcomes, by having a meeting to lesson summary, revision of activities that was mutual activity performance as well as satisfaction toward activity conduct. Learners presented the group's work performance and were allowed to evaluate themselves in their participation in environmental conservation and learning enthusiasm.

4.3.4 Strategy for successful model implementation (3S)

Simple, small, and smile, meaning that learners start doing simple things and small things around them with smile and heart.

Simple – learners started the task that can be put into actual practice that was simple close to them not beyond ability in order to be successful.

Small – learners performed successful activity which started with a small task and expanded to further task.

Smile – learners came from willingness and participation that they expressed happiness toward activity based learning.

4.3.5 Guideline for model implementation

Personnel: There was the identification of the roles of 3 important related persons 1) school director, who approved for club establishment, supported exchange of learning both internally and externally, facilitated in finding external learning resources, and necessary equipments for activity conduct 2) club's advisor, who organized learning process by stimulating learners to have curiosity and raising questions, connecting learning resources both internally and externally, coordinating with the school director and learners, creating friendly climate and connecting knowledge that was occurred as well as learnt and evaluated along with learners. 3) learners, who created environmental knowledge from participation in doing activities with the group by following knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing, and knowledge usage from different learning resources both internally and externally as well as the learners' reflection of results occurred during activity conduct, self-evaluation and co-evaluation with club's advisor.

Learners' group management: it was to open an opportunity to learners at all levels that had interests in participating in environmental activities regardless of gender, class levels and ability. There were number of club's members around 20-25 persons and number of sub-group members around 5-8 persons according to their own willingness.

In terms of site and learning resources: the activity organization could be both inside and outside a classroom. Learning resources both internally and externally depended on environmental issue that was identified.

Time management: Study period in the curriculum which was the period of club activity was 1 period/week, and study period outside the curriculum was in the morning or during lunch break, and there was a special time for external field trip.

It can be showed that the test of model in Banglen Vitthaya School and an actual implementation in Bangluang Vitthaya School had created results on learners, the club's advisors and the schools in which learners acquired environmental knowledge through knowledge creation from an actual practice in environmental

issues that were mutually identified by learners. The club's advisors were able to obtain greater knowledge and more understanding and skills in environmental education activities whereas schools had the better surrounding of environmental development.



CHAPTER V

DISCUSSION

The presentation in this chapter is divided into discussion topics as follows:

- 5.1 The environmental education activities model for school through knowledge management
- 5.2 The result of implementation of environmental education activities model for school through knowledge management
- 5.3 The process of developed model

5.1 The environmental education activities model for school through knowledge management

The model of environmental education activities for school through knowledge management that was developed as the process that was used for club activity for secondary school. Research findings showed that activity process consisted of 3 processes (3P) as follows.

Stage I Preparation consisted of club establishment, selection of club's committee, and identification of environmental issues.

Stage II Practice consisted of knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing, and knowledge usage

Stage III Production

The club process was mainly based on 3 processes, including preparation, practice and production, which were consistent to the concept of Enabling Activities (Department of Academics, 2001) that was divided into preparation, action activity, assessment.

Knowledge management was the concept of learning that focused on learning by doing to create experience. It was learning with work that could be affiliated into real life (Wicharn Panich, 2004) by involving knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing and knowledge usage (Boondee Boonyakij et al., 2004: 54-59; Bordin Vicharn, 2004: 45-48; Komol Deesiltham, 2003; Kucza, 2001; Award & Ghaziri, 2004: 24-25; Marquardt, 1996 quoted in Pornthida Vichernpanya, 2000). Such processes were flexible and occurred in dynamics. From the study, it was found that everyone in the club took action in every process under the school context from the work of environmental development in their own school, including waste segregation, bio-fertilizer production, tree plantation, and arrangement of herbs garden. Such activities were driven by knowledge management cycle that flew naturally. It had flexibility that was adjusted according to the area context and needs of the club. From these processes, observations can be seen as follows.

1. Knowledge identification initiated the beginning of thinking and asking oneself before taking action concerning what topics they do need to know and whether they have known any of them.

2. The method of knowledge acquisition of learners was mostly asking questions. The first person to ask was friend, followed by a teacher who was in the club, and then other knowledgeable persons, which reflected learning style of learners which tended to rely on others. Moreover, field trip outside school was important method that learners were highly interested in. They were able to see a good model and apply it into their school. However, learners' self-acquisition skill of knowledge was the construction of a tool that would remain with learners for a lifetime.

3. Knowledge creation was a record of data that was obtained from external knowledge acquisition through various methods and then arranged into categories of information. It was mostly came from understanding of learners themselves.

4. Knowledge sharing was considered a very good method that stimulated learners' thoughts, created new knowledge, and gave a chance to meet different people as well as obtain good advices that were useful for effective activity conduct in the future. From the study, it was found that there was sharing between

environmental club and Waste Bank club in the school. Moreover, there was on so sharing between the clubs outside school which was environmental club of Bangluang Vitthaya School and agriculture for life club of Sataporn Vitthaya School, which was an innovation of activity process in the area.

5. Knowledge usage was found that there was the utilization for environmental development in school. Furthermore, knowledge was also applied at home, which reflected that knowledge could be applied into the real life and it was the knowledge that was appropriate for learners. Building curiosity in learners would require the topics that learners could actually experience and practice in their real lives, not only knowledge from books.

In conclusion, the implementation of knowledge management process enabled each school to have the method of activities of its own under different contexts of the area and environmental issues.

However, to make this model simple and convenient for implementation there was an adjustment of names to be congruent with familiarity of participants; as a result, an abbreviation was 3P which came from Preparation, Practice and Production.

If considering in overall picture, it can be seen that the developed model had many advantages in which it was the model that could be applied into other schools that had similar context while environmental issues were not previously specified concerning what topics they should be. Instead, it was mutual identification of everyone in the club whereby a person who had the most important role was learners, who identified environmental issue under the real situations occurred within school and had the role in identifying the method of self-conduct. Therefore, it was the process that focused on learners-centered as the center, which was consistent to basic education curriculum. Furthermore, it was also a connection of learning from within a classroom into the practice that was congruent with the actual way of life. This form of the process created variety in the dimension of learners' groups from all levels; the dimension of the process methods that were practice, interviewing, and sharing; the dimension of place, learning resources both inside and outside school that was not only limited within the classroom; and the time dimension that was not only limited within the study period, but also the extra time outside curriculum which was in the

morning or during lunch break. However, the model still had some limitations in learning resources in school and could not respond to learners' needs. According to an approach of the club process, learners had to be the club member throughout an academic year. However, due to time constraint it was unable to proceed continuously throughout the academic year and unable to organized a club exhibition.

It can be concluded that a starting point came from mutual environmental interests of related persons who were teachers and learners and then formed the group that had the desire to think and act together with school's support that would lead to collective learning as a result of environmental development work in school.

5.2 The result of implementation of environmental education activities model for school through knowledge management

5.2.1 The result from the learners

The result of implementation of environmental education activities model indicated that learners had environmental knowledge in the issue that was mutually identified by learners, and participated in environmental conservation through suggestion of opinion and approach, and then taking action by themselves. In addition, learners also had learning enthusiasm. It can be discussed as follows.

1. The beginning of learning came from group integration of learners who had interests to do environmental activity with willingness of learners themselves without being forced to study. From research findings, it was found that learners came from different classrooms and levels, which contained secondary level and high school level, both male and female, both intelligent and unintelligent students (considered from G.P.A.), but what alike was their age and interests in the same topic. Although most learners integrated based on their interests, it was found that some learners participated in activities without genuine interests but because of persuasion from friends. Furthermore, size of the community was not very large with members around 20 persons. As a result, it was more convenient for activity organization, behavioral observation, meeting, coordination and traveling outside the area.

2. Identification of environmental issue was based on the concept of school based because school was the place that had group integration of youths in the same age to conduct learning activity together systematically and in a certain pattern. Moreover, it was an organization that the society gave reliability in preaching skills necessary for life subsistence. As a result, school had to be the social model and environmental model. In the real situation that learners had to spend their lives in relations to school at least 1-3 years, and spend their time at school 5 days per week, at an average of 8 hours each day (8.00-16.00), school was, therefore, the place that had meaning and function, which enabled learners to understand various phenomenon. From researching findings that indicated environmental issues to be waste management and tree plantation, it reflected that the school context still had problems concerning these issues and learners wanted to solve problems or have better development. It can be seen that such issues were things closed to what learners were encountering and they could lead to actual practice, which was in accordance with environmental education principle that focused on learners to learn and connect to their real life practice, and was consistent to the principle of learners development process in which activity must be organized suitably to the condition of school in community. It was, therefore, the condition in which the identified issued could be put into practice and learners had an intention to mutually develop the environment in their school.

3. Concerning the concepts of knowledge management, environmental education and Enabling Activities, these three concepts emphasized learning by doing and from a group process in order to enable learners to have direct experience. Therefore, learners took action in activities in every process by thinking together, doing together and solving problem together, beginning from being the persons who identified the issues by themselves, providing opinions and suggesting approach and method that would lead to practice, and then driving the issues through knowledge management cycle that was flexible and a repeated cycle that led to enhancement of knowledge from easy to difficult.

4. The concept of environmental education that learning about the environment, learning in the environment and learning for the environment integrated with knowledge management process caused various learning methods,

such as observation, acquisition, sharing, field trip both inside and outside school. The most important thing was that learners could do it through their six senses, i.e. touching, feeling, seeing, hearing, smelling, and tasting

5. Knowledge management was to manage human to have experience of knowledge creation and knowledge usage to be useful for work, people and organization. When considering knowledge that learners helped creating, it was extended from background knowledge and mixed with their knowledge acquisition from outside area. The knowledge was from actual practice and it was appropriate with the area and could be used in real life.

6. Knowledge creation was not confined in just classroom method nor did not depend on grade point average, but everybody could create knowledge. This reflected to the process because knowledge could change but knowledge acquisition was instilled skill. The knowledge as a method was Know – what, Know – where, Know –how, Know – who, Know – when and Know – why. Therefore, what happened along with knowledge was the content or understanding of knowledge and knowledge method.

7. When comparing the roles of important people according to the concept of knowledge management and actual practice, it was found that the role of school director who acted like a chief knowledge officer (CKO) was in consistent with that concept. The school director approved club establishment, promoted knowledge exchange for both inside and outside school and facilitated budget and tools for activities. Therefore, it was an important condition that the school director should be CKO and regarded the importance of environmental education activities. The role of club's advisor was changed from the one, who ordered learners to follow and evaluated on the result not on learners, to become knowledge facilitator, who encouraged learners to inquire and connect knowledge of both inside and outside school, and also coordinated with the school director and learners. Learners were the most important people to create knowledge like knowledge practitioners/workers. Learners also had a chance to identify environmental issues, acquisition method and evaluate by themselves.

8. Development in learning enthusiasm was an expression of ability to search for information, and skill of knowledge acquisition from learning sources and

knowledge record both inside and outside school. It was found that learners had developed these skills as a result from knowledge management process that enabled learners to exchange learning with friends both internally and externally as well as with a knowledgeable person in that particular aspect or interview about the topic they wanted to know. However, it was also found that learning resources in school had many limitations including number of books that was so little and did not respond to the needs.

9. Activity process in the form of club according to basic education curriculum was the organization of activity by academic year and there was an evaluation of pass/not pass without grading, which made the atmosphere of activity process to be friendly and not stressful. There was no examination to collect score or no competition in the classroom. It focused on discussion and practice outside the classroom; as a result, learners were happy and fun and had new friends.

10. When considering knowledge, it was found that knowledge was extended from background knowledge from learning in the classroom or at home. Together with external knowledge acquisition. It was knowledge that learners wanted for actual implementation to be appropriate to the area context that came from understanding of learners as well as knowledge that reflected the method of thinking and perspective toward the value system of the relationship of sustainable mutual livings of human and the environment.

5.2.2 The result from the club's advisors

Results of the implementation of the developed model showed that club's advisor were able to obtain greater knowledge and more understanding and skills in environmental education activities because club's advisors were the person who organized activities and previously had interests in the environment that motivated to become environmental club's advisors. One of the most important things was the heart of being a teacher who had the desire to develop learners. Therefore, the teacher was always ready for learning and self-development in combination with teaching experience, understanding toward learners as well as familiarity with the area condition.

5.2.3 The result from the schools

Results of implementation of the model showed that school had developed the school environment as a result of their vision toward the environment and school director's perception of importance concerning this issue. Identification of environmental issue had brought school's vision as the problem and principle of the model that aimed at learning that was congruent with the context and could be put into practice. Therefore, schools were used as the action based, which made learners' performance that was occurred from doing activities to be environmental development in school and help driving the school's vision.

5.3 The process of developed model

From the conceptual review of environmental education, knowledge management and Enabling Activities, it was found that every concept had the belief toward the development that centered on human being, which emphasized human as both the goal and the process of the development. Under this concept, the researcher selected participatory action research instead of experimental research that was widely used. Participatory action research has the concept that was consistent to the above mentioned concept in which the researcher perceived to be suitable for the model development in the secondary school as follows:

1. Participatory action research believed that every human being had the potential for development and could learn. Also, it was the nature of human being to continue learning all the time. Participatory action research was the method for development of human potential that would lead to acceptable and sustainable development.

2. In this research, questions/issues of research problems had interesting point beginning from the researcher; therefore, the researcher needed to evaluate the conditions of problems and needs of school concerning whether it had interests in the issues that were of the researcher's interests talking about objectives of the research. However, the research opened an opportunity for school to make a decision on whether to participate in the process in which the research process focused

on participation from all related persons as the co-owners of the mutually developed model; not just an informant to the researcher, but to take part in opinion expression toward what was done together.

3. Participatory action research led to co-generative learning of club's advisor and the researcher in which the researcher had environmental education knowledge while club's advisor had teaching experience, understanding toward learners and familiarity with school, which was a combination of theoretical and practical knowledge, leading to the create the new knowledge of environmental education activities.

4. Participatory action research emphasized on thinking together, making a decision together and acting together of all related persons, which offered recommendations that were useful for model improvement as well as effective implementation approach.

However, participatory action research that was applied in the secondary school context was found to have some limitations in which participatory action research required participatory process from many parties. However, in this research personnel who participated in the research were only limited within school. Furthermore, it was found that the developed model was limited within the study area that had similar context, and there was no model testing with different area contexts. As a result, it was unable to explain the occurred results in different contexts.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The purpose of the model development of environmental education activities for school through knowledge management was to develop the model of environmental education activities for school through knowledge management and to study results of the implementation of the constructed model. The study area consisted of two secondary schools in Banglen district, Nakornprathom province, including Banglen Vitthaya School and Bangluang Vitthaya School whereby Banglen Vitthaya School was the area used for the initial study in constructing and testing the model, and Bangluang Vitthaya School was the school that had model implementation.

This research was a participatory action research in which the study process was divided into two phases, including Phase 1: The construction of the environmental education activities model for school through knowledge management, and Phase 2: The implementation of the environmental education activities model for school through knowledge management. Participants consisted of school director, club's advisor, and learners in environmental club. Conclusions and recommendations from the study were as follows.

6.1 Conclusions

6.1.1 The environmental education activities model for school through knowledge management

The environmental education activities model for school through knowledge management that was constructed was the process model in which each stage had a continuous relationship, which was used for Enabling Activities in the form of the club for secondary school. The concept of theoretical base was used in designing with

environmental education that was used as a fundamental construction of the model and was an identifier of the environmental issues as well as the goal of development to enable learners to achieve environmental education objectives. The concept of Enabling Activities was used to identify as the main process and component of the model in order to be consistent to basic education curriculum and the area context, and then apply knowledge management as a tool in accompany with participation in learning creation and developing the process method in order to use in driving environmental issues.

It can be concluded that concepts and components of the environmental education activities model for school through knowledge management were:

- 1) Concept of the model (3L): Learning together, Learning through activities, and Learning in real life which meant learning together by conducting through environmental activities in accordance with real life situations. It was the principle that was used to identify the process method that was the organization of activity based on learners' ability and environmental interests. The activity was organized in a group process by thinking together, acting together, solving problem together, making a decision together as well as being responsible together, which focused on everyone's action in every stage based on the real condition that was occurred in the learner and the school context in order to enable learners to have learning by doing activities and them apply into the real life.

- 2) Objectives of the model emphasized learners to have knowledge and participation in taking action toward environmental conservation as well as to become a person with learning enthusiasm.

- 3) The process of the activity was divided into 3 stages (3P), including preparation, practice and production. Details were shown as follows.

Stage I Preparation: The purpose of this stage was to prepare learners and to identify environmental issues needed for environmental development in school. It consisted of Club establishment: it was an admission of learners who were interested in doing environmental activities; Selection of club's committee: club's advisor was an organization of orientation and selection of learners' representative to work as club's committee according to a group's agreement; and identification of environmental issues; learners brainstorm on the topic of environment according to

school's vision in order to find out environmental issues needed for developing the school environment whereby the identified issue must be able to put into practice.

Stage II Practice: The purpose of this stage was for learners to perform activities through knowledge management cycle under environmental issues that were mutually identified. It consisted of: Knowledge identification was learners' cooperation in identifying necessary knowledge, search for background knowledge as well as knowledge that did not exist to develop the school environment from the issues that were mutually identified. Knowledge acquisition was learning's acquisition of knowledge through interview with a knowledgeable person, practice, observation, data search from a library, external field trip and telling story with a group and taking notes. Knowledge creation was a process that allowed learners to collect the data and information obtained from knowledge acquisition and background knowledge inherent in themselves and then analyze and conclude as a new knowledge, and record knowledge in the form of documents. Knowledge sharing was a sharing of learners' knowledge with friends in the club and between the clubs within and outside school as well as sharing with experts in each topic. Knowledge usage was an application of learners' knowledge into practice through production as a group work and deciding to conduct activities continuously in order to develop the school environment.

Stage III Production: The purpose of this stage was to assess the results of activity process by learners and club's advisor through an evaluation of procedures, outputs and outcomes, by having a meeting to lesson summary, revision of activities that was mutual activity performance as well as satisfaction toward activity conduct.

4) Strategy for successful model implementation (3S) simple, small, and smile in which learners started doing simple things and small things around them with smile and heart. It was the design of activities by allowing learners to do activity on the topic they could actually practice, which was not so difficult and was a small task that led to achievement, by emphasizing every activity that came from interests and intention of learners who mutually conducted activity with happiness.

6.1.2 The results of model implementation

6.1.2.1 Learners had environmental knowledge through knowledge creation from practice in environmental issues that were mutually identified by learners. Learners took part in taking action in environmental conservation through consistent participation in activities, suggestion of an approach and a method, and expression of opinions that were useful for environment development in school. What important was the change in thinking method and behavioral expression toward environmental conservation as well as having learning enthusiasm in which learners could search for information from learning resources both internally and externally, having knowledge acquisition skill in searching for books, interview, conversation exchange with friends from different clubs or schools, and with a knowledgeable person, having courage of expression, and knowledge note-taking into a knowledge record form and then writing a report. Moreover, it was also found that this model also satisfied learners in doing activities that made learners happy and enjoy to have new friends, know how to work in a group, have harmony and mutual sympathy, and proud of group's work performance.

6.1.2.2 Club's advisors were able to obtain greater knowledge and more understanding and skills in environmental education activities. Club's advisors were the person who organized activities and previously had interests in the environment that motivated to become environmental club's advisors. The role of club's advisors as a knowledge facilitator in every process, leading to learning creation. The club's advisors realized that the environmental education was the process in terms of development at the learners not emphasized on the environment, and from the setting activities together with the learners, it could develop the skills in terms of environmental education setting as well.

6.1.2.3 The schools had the better surrounding of environmental development, which was resulted from the club's performance in doing environmental development activities in school. The schools had vision toward the environment and school director's perception of importance concerning this issue. Identification of environmental issue had brought school's vision as the problem and principle of the model that aimed at learning that was congruent with the context and could be put into

practice. Therefore, school was used as the action based, which made learners' performance that was occurred from doing activities to be environmental development in school.

6.1.3 The process of developed model

The process development of the model showed that the development of the model of environmental education activities for school through knowledge management by means of participatory action research was divided into 2 phases, including the construction of environmental education activities model for school through knowledge management, and the implementation of model. The study area was a secondary school. It can be concluded to be an appropriate method to create collective learning between the researcher and the participants in the area, and recommendations that were useful for model improvement as well as approach for model implementation were obtained.

6.2 Recommendations

6.2.1 Recommendations for utilization of research results

6.2.1.1 For school in study area

1) School should have development of learning resources both inside and outside school. It should create the database of both internal and external learning resources systematically, and connect them in order to establish the network for sharing between schools. It is also important for school to promote learners to have learning and skills to organize the exhibition of the club's performance, and promote environmental education activities to be well known and accepted by the entire school as well as promote learners who are members of the environmental club of school to become a leader in doing environmental activities in the future.

2) Teaching personnel are considered to be human capital that is highly important in school. School should, therefore, promote action research together with environmental education process, which is the development routine to research

which is one way to develop ability of teachers. It also enables teachers to get to know one another and to share knowledge that will be beneficial to environmental education activities process in the future.

3) School should organize activities to develop learners in the form of the environmental club. It enables learners to get to know one another, to become friends, and to have a chance for sharing with friends at the same age. The process should organize throughout an academic year and has follow-up evaluation in terms of process, product and progress in every semester that is occurred with the whole school system.

6.2.2 For schools that want to utilize the model

6.2.2.1 The constructed model could develop learners to have environmental knowledge by creating knowledge from environmental issues that are mutually identified by learners from the real context under the vision or policy of school. Therefore, school should clearly identify vision, policy and action plan related to the environment that can be put into practice. This is because to support learners to take part in driving the policy as well as in developing the school environment.

6.2.2.2 The implementation of the environmental education activities model through knowledge management can develop learners in terms of knowledge and action toward environmental conservation as well as to become a person with learning enthusiasm, and to develop school and skills of activity process of the teachers, it is one of the choices that school can apply in appropriation to the condition of learners and school.

6.2.2.3 The method of environmental education activities for school has variety in the group of learners who come from all levels, in learning sources both internally and externally, and in the process of doing activities. Therefore, school should have more flexibility in timetable and place for activity organization and should facilitate in terms of external field trip, tools and equipments, learning resources and budget as well as coordinate with various departments both inside and outside school.

6.2.2.4 There should be the implementation of the model in activity process continuously. For examples, the organization of activity requires the time duration of 2 semesters whereby the first semester is the organization of activity according to the developed model and then evaluating output and outcome, and the second semester should organize this form of activity again, but there should be an enhancement of environmental knowledge or additional identification of the issues as well as the organization of activity together with other clubs in school that are related to the environment in order to create the integration of the group of learners, the contents and the process.

6.2.3 For policy implications

6.2.3.1 The school is a unit that is important to the creation of desired characteristics in learners and is also an organization that is a model of community. School should, therefore, include the model of environmental education activities in the school's curriculum and promote participatory action research together with knowledge management to develop personnel and school in terms of instruction of environmental education in school.

6.2.3.2 The Office of Educational Area is the organization which has the main responsible in each area so they should provide and support all secondary schools to have their own learning resources both inside and outside school. Besides, they should promote the environmental education activities through knowledge management model to other schools and need to create more networks to join the activities among the schools.

6.2.3.3 The government and private sectors which related to the environmental education development should bring the model of environmental education activities for school through knowledge management using as a data to improve and as a plan to work in cooperative with other sectors for further environmental development.

6.2.3 Recommendations for future research

6.2.3.1 The development of environmental education activities model for school through knowledge management involves the study of school in Banglen district, which is a rural area. In the next study, there should be a comparative study in different contexts, such as, schools in urban area, semi-urban area, and rural area.

6.2.3.2 This study is the development of environmental education activities model by applying the concept and the process of knowledge management as the tool, which enables learners to create environmental knowledge, participate in environmental conservation and have learning enthusiasm. In the next study, other alternative tools should be used in order to reinforce knowledge for more efficient model.

6.2.3.3 Participatory action research can be applied into the model development, which results in collective learning and participation between the researcher and the participants. This study only focuses on related persons in school. In the next study, it should include external related people to participate in the research process, including school's committee, community leader, and other related departments within the area, both public and private sectors.

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APPENDIX A
Interview form
Contextual school

1. How was the school's history?

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2. What are the learning resources of school?

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3. How did the administration manage the school ?

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4. Whether the school had a vision or policy on the environmental development?
 What are they?

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5. What are the characteristics of school's environmental education activities?

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Interview form
State of environmental education for school

1. How was the steps of club established ?

.....

.....

2. How did the environmental activities process develop ?

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.....

3. Who take part in the activities?

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.....

4. Where is the budget come from?

.....

.....

5. When did the activities take place?

.....

.....

6. Where is the place to do activities?

.....

.....

7. What are the media/technology or learning resources ?

.....

.....

8. What are the problem of activities ?

.....

.....

9. Recommendations

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.....

APPENDIX B

Knowledge note - taking

Group name

Period **Date** **Time**

Place

1. What did we do today?

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2. What can you learn from this activity?

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3. The things we like/dislike or the things we impress.

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Measurement form of desired characteristics

Directions

1. Measurement form of desired characteristics consisted of 2 sections: section 1 related to learning enthusiasm, which consisted of 11 questions; section 2 related to participation in environmental conservation, which included 11 questions, equivalent to the total of 22 questions.

2. Please consider behavioral lists in each item, by checking according to your own practice. There are consist 5 levels of practice as follow.

- | | | |
|---|---|--|
| 1 | = | the lowest level of practice or never practice |
| 2 | = | a low level of practice |
| 3 | = | a moderate level of practice |
| 4 | = | a high level of practice |
| 5 | = | the highest level of practice |

No.	Behavioral lists	Levels of practice				
		5	4	3	2	1
● Becoming Enthusiastic and willingness to take part in activities						
1.	Interested in participating in instructional activities					
2.	Not piling up the work and work at full capacity					
3.	Search for new knowledge and experience					
● Utilize free-time through knowledge acquisition						
4.	Enter the library when having free-time					
5.	Search for books and select valuable resources					
6.	Exchange knowledge with others					
● Search for information from learning sources both internally and externally						
7.	Search for information from books, documents, and publications both inside the school and other places					
8.	Search for information from news, information technology, media, and others					
9.	Search for information from speakers outside the school and from other resources in the community.					

No.	Behavioral lists	Levels of practice				
		5	4	3	2	1
• Note-taking and summarizing knowledge and experience						
10.	Systematic note-taking					
11.	Make notes and report					
• Participate in activities of natural resource and environmental conservation						
12.	Be a member of natural resource and environmental conservation club					
13.	Participate in activities relating to natural resource and environmental conservation					
14.	Give cooperation in campaigning for natural resource and environmental conservation					
• Suggest an approach to natural resource and environmental conservation						
15.	Propose projects on natural resource and environmental conservation					
16.	Give opinions toward natural resource and environmental conservation					
17.	Use natural resources as necessary at optimum benefits					
18.	Take part in natural resource and environmental conservation					
• Persuade others to take part in natural resource and environmental conservation						
19.	Take part in campaigning for natural resource and environmental conservation					
20.	Give thoughts, reasons and warnings to those who violate the natural resources and the environment					
• Support natural resource and environmental conservation						
21.	Support natural resource and environmental conservation by expressing opinions					
22.	Support natural resource and environmental conservation by doing physical energy					

Learners' behavior observation form

Items	Note
1. Becoming Enthusiastic and willingness to take part in activities	
<u>Behavioral Indicator</u> Learners were interestd in taking part in doing activities through semester.They intend to do the assignment with their own capacity and searched for knowledge including gain new experience.	
2. Utilize free-time through knowledge acquisition	
<u>Behavioral Indicator</u> Learners searched according to their own interest or their assignment from library, internet or other resources. They learnt to exchange knowledge with others and knew how to select value books and media.	
3. Search for information from learning resources both internally and externally	
<u>Behavioral Indicator</u> Learners searched from various learning resources among books, documents, printed media and technology including learning from community and from external experts.	
4. Note-taking and summarizing knowledge and experience	
<u>Behavioral Indicator</u> Learners had a systematic note-taking. They made notes and reported in lesson learnt or recorded in electronics tool.	

Items	Note
5. Participate in activities of natural resource and environmental conservation	
<u>Behavioral Indicator</u> Learners, as a number, took part in natural resource and environmental conservation and participated in activities regularly	
6. Suggest an approach to natural resource and environmental conservation	
<u>Behavioral Indicator</u> Learners submitted projects or activities including express their opinions toward natural resource and environmental conservation.	
7. Practice natural resource and environmental conservation	
<u>Behavioral Indicator</u> Learners took part in natural resource and environmental conservation and used resources as necessary at optimum benefits.	
8. Persuade others to take part in natural resource and environmental conservation	
<u>Behavioral Indicator</u> Learners persuade there friends, family, and others to take part in natural resource and environmental conservation in order to give thoughts reasons and warning.	

Items	Note
9. Support natural resource and environmental conservation	
<u>Behavioral Indicator</u> Learners supported natural resource and environmental conservation including express their opinions and do physical energy.	



APPENDIX C

Post-activities record

Name

Period.....**Date**.....**Time**.....

1. The activities that we did today.

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2. The learning environment and the participation of learners activities in doing activities.

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3. problems and constraints occurred

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4. Recommendations

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Questions for activities summary

1. What did we do from the beginning?

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2. What did we learn from those activities?

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3. How do we feel after take part in those activities?

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.....

4. Are there any good things happen during we take part in this club through this semester?

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Learner's information survey form

Name

School.....

Student code.....

Sex ☐ Male ☐ Female

Age

Class Grade average

Address.....

.....

.....

.....

Telephone(Home)..... Mobile.....

E-mail

Why did the learners choose the environmental club?

.....

.....

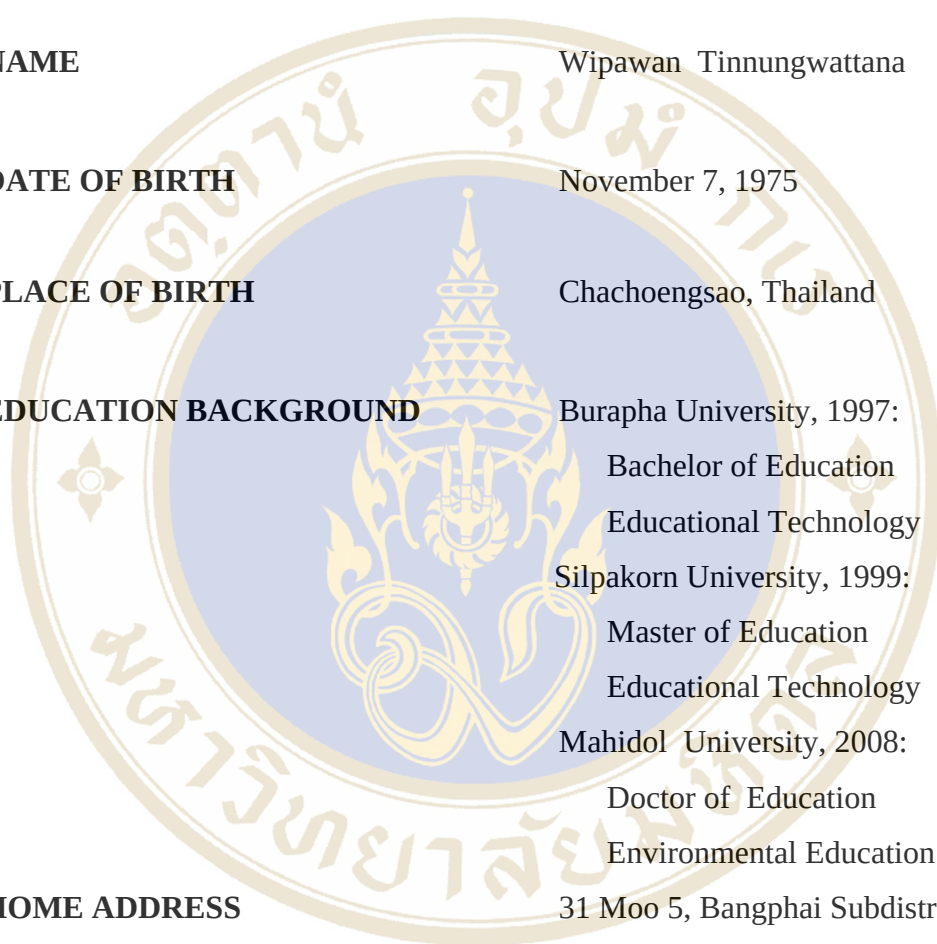
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BIOGRAPHY



NAME	Wipawan Tinnungwattana
DATE OF BIRTH	November 7, 1975
PLACE OF BIRTH	Chachoengsao, Thailand
EDUCATION BACKGROUND	Burapha University, 1997: Bachelor of Education Educational Technology Silpakorn University, 1999: Master of Education Educational Technology Mahidol University, 2008: Doctor of Education Environmental Education
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SCHOLARSHIP	TA Grant, Faculty of Graduate Studies, Mahidol University. Banglen Project, Department of Education, Faculty of social science and humanity , Mahidol University.