CHAPTER II

REVIEW OF LITERATURE

For this study, the researcher has reviewed the literature along the following topics: (1) Curriculum Development, (2) Environment, (3) Awareness to the Local Environment, (4) Learning Management, (5) Learning in Mixed Class Group, (6) Cooperative Behavior in Learning, and (7) Advanced Thinking Skills.

Curriculum Development

Curriculum development is a process in planning and developing learning experiences that are creating or changing the learners. This undertaking is composed of deciding the objectives for the newly created curriculum, choosing and arranging the learning experiences for learning, picking the teaching media, arranging the methods to implement the curriculum, and harnessing the methods to achieve the targets and to evaluate the results of such curriculum.

The guiding concept for development of a curriculum is basically based on answering four problems, which are the educational targets for learners to achieve, the experiences required to reach such targets, efficient arrangement of experiences, and efficient evaluation to measure learners' achievement (Tyler, 1949). Therefore the development of a curriculum should involve the following important steps. First, the curriculum developers analyze the needs and demands of learners, and survey the conditions and the necessities of learners and their societies. Second the developers identify the clear objectives of the planned curriculum. Third, they select the contents of the curriculum. Fourth, they arrange the contents according to the known capabilities and interests of learners. Fifth, the curriculum builders select the appropriate learning experiences. Sixth, the curriculum developers arrange learning experiences and seventh, they identify educational aspects to be evaluated and the evaluation methods (Taba, 1962 : 12-13). In this study, the researcher develops an environmental-related curriculum by using Taba's procedures. The researcher begins by analysis of the basic data and the needs and demands of Regina Coeli College and identification of the objectives of the course/subject including its contents on the local environment deemed useful for the learners' learning and daily living. The products of these processes should attract learners' interests and should be in accordance with acceptable targets of education in the society. After identifying the learning experience by integrating the process-oriented teaching methods, the curriculum will promote the kinds of learning for the learners that enable them to achieve the learning targets. The evaluation methods for the developed curriculum will be manufactured during and after the curriculum implementation with the cooperation of the Science teachers in the school where the curriculum is applied.

Environment

Definition of Environment

Environment means things around human beings composing of living things, or the bio-environmental factors, and of non-living or the physical environment (Kasem Chankaew, 2001: 1; Department of Environmental Quality Promotion, 1997 : 13).

Natural environment is divided further into two, which are the living or biological elements such as plants, animals, and human beings, and the non-living or physical environment such as weather, geographic conditions, fire, etc (Prakong Lerkwanpen, 2002: 2; Laddawan Kanhasuwan, 1992 : 1; Kaserm Chankaew, 2001 : 4; Niwat Ruangpanich, 2003 : 7). The living beings rely on soil, water and air as parts of their habitat as the whole system. Normally the environmental system in nature is called ecological system (Niwat Ruangpanich, 2003 : 8).

The environmental elements that human beings have created are divided into two types which are the material or physical elements (i.e., house, buildings, monuments, etc) that human beings build for their convenience or other objectives, and cultural or societal elements (i.e., religion, culture, traditions, beliefs, including other knowledge that human beings have built to coexist in society peacefully (Prakong Lerkwanpen, 1982: 2). Most parts of the environmental elements that human beings have created already become norms or ways of life in the human society (Niwat Ruangpanich, 2003: 7).

It can be said that both natural environment and cultural environment human beings have created are inter-correlated with each other and have influenced one another, either in constructive or destructive ways. They are connected into a dynamic cycle within the whole system. Environment and human beings are influential to each other and have close relationship with each other. Human beings are influential as they inflict changes in their environment. When the environment is changed, in return it affects human lives. Therefore human beings should study and understand the environment, be aware, and then begin responsible practices to the environment so that they can live in balanced ways.

In studying the environment it is very constructive to understand the characteristics of the environment and the human perceptions or aspects of these characteristics as the targets related to education attempts. Prakong Lerkwanpen (2002 : 2) and Kasem Chankaew (2001 : 8-16) have identified that the unique environment of the world has four dimensions as the followings. The first dimension is the resource dimension or the structure of the environment in terms of natural and socio-culturally-related resources. The second dimension is the technological dimension, which has roles and importance to bring human-invented scientific knowledge into use for environmental management. The third dimension is the human-affecting waste dimension, or the outcomes of utilization of resources through technologies. The fourth dimension is the human socio-economic dimension where human beings are performers of behaviors that affect environmental conditions. This is the outcome of the size and quality of human population, levels of education, levels of economic development, politics in practice, governance system, etc. This study therefore proposes the resource dimensions and the human-affecting waste dimensions as the issues to study in order to create a proper environmental-friendly curriculum.

The environment has unique characteristics. Prakong Lerkwanpen (2002 : 3) has proposed that each type of environment is unique, although each is not isolated in the whole natural system and is always a part of the larger environmental system. Each type of environment is called ecological or environmental system. The ecological system, however, is rather confusing for beginners interested in the environmental knowledge. In order to understand the ecological system, Precha Suwanpinit (2001 : 9) emphasizes that ecology is a statement about living things and their physical environment beginning from micro-organisms, the smallest living beings, to the biggest ones or the world level (or biosphere). The study of living things in an ecological system is not the study of certain species at the population level but the study of many groups of species that live together in certain place. Neither it is about the size of the habitat. Beside the study of the groups of living beings, it is also a study about physical and biological environments around these groups of living beings. This unity is called ecological system. In addition, the ecological system requires the substance cycle and energy-transformation cycle as parts of the whole ecological system however small (i.e., in decaying logs) or large (i.e., pine forests or Biome like "Marine Biome" composed of sand, coral reefs, etc). Therefore, the researcher summarily concludes that the study of ecological system is a holistic study on both biological and physical factors in certain area as inter-connected building blocks of the whole ecological system**.**

Local Environment

Chiang Mai National Statistics Office (http://chiangmai.nso.go.th/aboutpro.htm) has presented the data of Chiang Mai, which can be summarized as the followings.

Chiang Mai area covers an area of 20,107,057 sq. km with the majority (82.74 percent) of the area is the mountainous and mountain slope areas. About 12.80 percent of Chiang Mai total size is farming lands and 4.46 percent of it is residential areas or others.

Chiang Mai Province is passed through by many waterways such as Ping River, Mae Chaem River, Mae Taeng River, Fang River, Mae Klang River, Mae Ngad River and Mae Khan River.

Mae Ping River passes the plains along Chiang Dao District, Mae Taeng District, Muang District, Saraphi District, and Doi Tao District. Mae Ping River also passes Mae Kok plains that cover some areas of Fang District and Mae Ai District.

The important mountain range in Chiang Mai Province is Den Lao mountain range that covers the important mountains such as Doi Pha Hom Pok, Doi Ang Khang (in Fang District), and Doi Luang mountains (in Chiang Dao District). Thong Chai mountain range has the important mountains like Doi Inthanon (in Chom Thong District, with height of 2,575m or the highest peak in Thailand), Doi Phui, and Doi Suthep mountains (in Muang District). Phi Pan Nam mountain range has the important mountains, which are Doi Khun Than and Doi Chang, both of which cover the areas of Phrao District, Doi Saket District, and San Kam Phaeng District.

The most important waterways functioning as sources of water for Chiang Mai province are Kok River, Fang River, Mae Tha River, Mae Ngad River, Mae Taeng River, Mae Kwang River, Mae Chaem River, and Mae Teun River. The source of Ping River, the longest (600 km) and the biggest river as the water source in Chiang Mai, is Doi Thuei in Chiang Dao District, Chiang Mai Province. Ping River passes through Chiang Mai's many districts, i.e., Chiang Dao District, Mae Taeng

District, San Sae District, Mae Rim District, Muang District, Saraphi District, Hang Dong District, San Pa Thong District, and Chom Thong District and it also traverses through Lamphun Province in its Muang District and Pha Sang District before passing through Pak Nam Pho sub-district, Nakon Sawan Province. It converges with Nan River in Khwae Yai sub-district of Nakhon Sawan Province and both become the distinctive Chao Praya River.

The kinds of forest areas in Chiang Mai Province are belonging to the groups of Mixed Deciduous Forest, Hill Evergreen Forest, and Deciduous Dipterocarp Forest. The important trees are teak and many kinds of hardwood trees.

Chiang Mai Province has 25 national conservation forests with the total area of 19,555.83 sq. km or 12,222,395.87 rai such as Lum Nam Phang, Mae Lak Meun, Mae Soon, Chiang Dao, Inthanin, Mae Taeng, Mae Kachan, Mae Ngad, Khun Mae Kwang, San Sai, Mae On, Khun Mae Tha, Sameung, Mae Rim, Doi Suthep, Mae Tha Chang – Mae Kha Nin, Mae Khan-Mae Wang, Chom Thong, THa Than, Mae Chaem-Mae Teun, Khun Mae Rai, Mae Than-Mae Yuy, Mae Had, Mae Chaem, and Om Koy Forests.

There are seven national parks covering the area of 4,054.90 sq. km or 2,537,512.50 rai such as Doi Inthanon, Doi Suthep-Pui, Sri Lanna, Op Luang, Huay Nam Dang, Mae Ping, and Pha Daeng (Chiang Dao) National Parks and some 6 areas are being prepared to be announced as National Parks such as Mae Tho, Mae Fang, Mae Tha Klai, Doi Wiang Pha, Doi Khan, and Khun Khan parks.

There are three places known as wildlife sanctuaries in Chiang Mai Province, which are Doi Chiang Dao Forest, Pra Om Koy, Mae Lao-Mae Sae Forest (the one prepared to be a conservation area is Sameung Forest).

Doi Suthep Forest (17.50 sq. km or 10,937 rai) is already declared as the area prohibited for wildlife hunting and poaching.

There are also 6 national parks which are Fang Hot Spring, Op Luang, Mae Sa Waterfall, Pong Deurd, Thad Mok Waterfall-Wang Hang and Mon Hin Lai.

From the past until the present, most of the forests have been denuded through illegal logging, forest clearance for agriculture, and forest fires. Like the decreasing values of forests, water in rivers, canals, or other waterways similarly have been polluted by domestic sewage from households and pollutants from industries. The example for the polluted waterways is Mae Kha Canal, which has low level of organic compounds (COD Test), foul odor, and floating garbage along it. Ping River, another example, has become shallow (less than 1 m in depth) and its water has become muddy from sedimentation and water erosion. Running from the upstream (Bumibhol Dam at Doi Thao District) up to the waterways along Chiang Dao District, Vieng Haeng District, Chiang Mai Province, Ping River was recorded as having the COD (Chemical Oxygen Demand or the amount of organic pollutants in water) at the level of 6.00 to 7.00 mg/liter (fair to good) in 2003. Although this indicator of water quality is satisfactory, the Department of Toxic Control has estimated that the increasingly amount of organic pollutants (based on BOD values or Biochemical Oxygen Demand, the speed of oxygen consumption by organisms) in Ping River is coming from the domestic sewage. The contamination by *Fecal Coliform Bacteria* (FCB) is becoming the main problem for the water quality in Ping River. The main debacle to water quality in Ping River is the moderate to low level contamination of *Fecal Coliform Bacteria*. The levels of contamination by *Coliform Bacteria* range from 9,000 to 160,000 MPN per 100 ml and the levels of *Fecal Coliform Bacteria*

(FCB) contamination stand from 1,100 to 11,000 MPN per 100 ml. It is obvious that the rivers as sources of fresh water have growingly become the vectors for diseases related to food digestions. The bacteria contamination comes from domestic sewage from communities and the waste discharge in Ping River, and the crowded communities of Muang District with large amounts of domestic sewage and garbage released directly to the river have become the area with the highest contamination level of *Fecal Coliform Bacteria*. In summary, the water quality in Ping River is no longer appropriate for its utilization as the source of fresh water consumption or fishery (although still acceptable for farming and industrial purposes). If the water is meant for home consumption, it must purified with highly special treatments to eliminate bacteria.(http://www.prachatai.com/05web/th/home/page2.php?mod=mod_ptcms&ID=7533&Key=HilightNews ; Thai Environment Consultation Association : 2004: 41-42)

The discussion about the recorded floods in downtown Chiang Main (August to October 2005) as appear in documented opinions among the private, public, and government sectors as well as village levels has indicated the following causes for the floods. The disruption in river flow and irrigation system is caused by prolonged high levels of rainfall, the higher density of man-made constructions in the plains of the northern side of Chiang Mai, massive deforestation along the waterways, and the ubiquity of mono-crop farming system. These causes dramatically disturb the levels of air humidity and natural ability of the landscape to accommodate the increasing speed and volume of flowing water. In addition, the tampered geographic features along the Ping River failed to allow quicker flow of water. The availability of water reservoir systems and water conservation systems (dams) before the water reaches downtown areas is not sufficient to control the faster flow of the water. Rapid development and urban or community expansion have brought larger residential areas, buildings, and other use the land along the slope of Ping River. Construction projects reduce the capacity of Ping River to accommodate the amount of water at its peak season. With decreasing size of slope and sedimentation of the river, Ping River has become a part of shallow irrigation system and waterway. Water flow was hampered and the excessive water deluged the residential downtown areas (Somneuk Chatchawan, 2005).

Duangchan Aphawatcharoot surveys the randomly chosen cars (4,649 cars) and measures that from the total air pollution level in Chiang Mai, car exhaust systems contributed around 82.77 percent (http://www.fm100cmu.com/programs_detail.php?id_sub_group=39&id=2337).The next sources of air pollution were listed as the cooking, burning of leaves, garages or car painter, cremation processes, and constructions. The weather is therefore in a state of crisis because both summer and cold seasons expose people to numerous sources of health hazard. People of Thailand are frequently reporting health problems in respiratory and lung problems. And these problems would lead to other diseases and therefore the problems must be solved for their ill effects on tourism-based economy.

After a series of meeting among the citizens of Haiya sub-district, Muang District Chiang Mai Province, they decided to obstruct forcibly the use of a garbage-transfer building that was operating since 2004. Belonging to Chiang Mai municipality Office, the building is located in Haiya Gate Cemetery Area. This building, radiating foul odor to the area in the radius of 1 km from it, is claimed to

affect the health of surrounding communities. Some citizens have reported symptoms of illness such as dizziness, headaches, wet eyes, and breathing difficulties. This garbage transfer building receives around 300 tons of garbage per day from Chiang Mai Municipality and around 350 tons per day during the tourism festive seasons. Although Chiang Mai Municipality Office has hired an auction-winning private company to manage the garbage of Chiang Mai municipality, some parts of garbage in Chiang Mai are reportedly dumped in landfills in outskirt districts or nearby provinces (http://www.thaico.net/b_pnews/49032900.htm). Obviously garbage is one of the main problems and has increasingly become the most annoying trouble for the environment. Garbage has been an accelerating problem that needs solutions at once.

In a public hearing for local sectors on management plan on urban-setting environment and integrated rural communities in Chiang Mai (held in Chiang Mai Hill 2000 Hotel in Chiang Mai Province on July 6, 2004), Parinya Panthong, Deputy Governor of Chiang Mai stated that Chiang Mai was facing four main environmental challenges. The revised report on the environmental problem in the urban communities and rural communities in Chiang Mai claimed that these are human invasion over natural resources, polluted water sources and air, congested human environment especially traffic, and haphazard natural resource management (i.e., inefficient law reinforcement, lack of support from local administration offices environmental planning, and little popular awareness for environmental conservation).

The situation depicted by the information above indicates that now is the right time for launching the solutions for the environment problems in Chiang Mai Province. Human beings who base their livelihood on the nature should reconsider the balance of the resource management in their surrounding ecological system. It is thus necessary to build a curriculum related to conservation of the environment because it affects well being of human beings other living beings. In arranging the curriculum for the study on the environment, its developer should prioritize the followings. First, the curriculum must encourage the learners to be aware of the importance of the environment. Second, it must build positive attitudes toward the environment and good responses to the environmental problems. Third, the guideline to build such a curriculum should focus on the local environment of the learners. Accordingly, for the development of a curriculum related to the local environment, this study defines the environment as an entity with natural physical and biological characteristics. Human behaviors including those of the students of Chiang Mai Province are deemed influential to the environmental conditions and problems in local environment surrounding Chiang Mai City. The researcher thus adopts similar environmental assumptions in order to design some learning activities which cover the contents as the followings. First, the contents cover the environmental issues related to the dimensions related to natural resources, crops, trees, animals, forests, waterways, in certain ecological system and biodiversity like those of Suthep-Pui National Park, Doi Inthanon National Park, Pha Daeng National Park, etc. Second, the contents cover the environmental issues related to the dimensions on waste and environmental hazards such as air pollution, waste problem, flood problem in Chiang Mai, as well as water quality in Ping River or its branches.

Awareness to Local Environment

Awareness means the awaken conditions and realization/conscience of self of the surroundings through the five senses, i.e., sight, taste, smell, sound, and touch. Creating awareness can develop human beings with constant realization and benign awareness in three parts, which are the awareness toward family, awareness toward occupation, and awareness toward community/society. Awareness of a person is the likely result from the learning that happens through direct experience that stimulates the mind of learners in form of beliefs, values, and attitudes to certain behaviors. This awareness is the character of minds that have passed through intellectual process and it form responses to social events or situation (The Royal Thai Dictionary, 1982 : 253; Supoj Saikaew, 1999 : 46).

The awareness that is expressed in form of socially accepted deeds is believed to be good and therefore should be promoted to be part of human action. A characteristic outcome of the learning process of the individuals, this awareness is desirable as part of individuals. It is composed of three parts or domains (Kramol Thongthamachad and Pornsak Phongphaew, 1996 : 38) as the followings.

1. The Cognitive Domain, which means cognitive or direct experience with things around individuals in forms of abstract and concrete concepts learned through all senses and arouses individuals into realization or awareness, understanding, and practical usage. Afterward, these individuals can analyze, synthesize and evaluate the values of such concepts and conserve them in their own cognitive domain.

2. The Affective Domain, which means personal affection such as having interests or paying attention in a thing, showing reflective action an experience, seeing or attaching values to experiences, arranging the system of values, and creating some habits.

3. The Psychomotor Domain, or behaviors or expressions that can be obviously seen in form of personalities and behaviors.

Creation of awareness, knowledge, and understanding to children and young students is meant to induce them to see the values and importance of the environment. This attempt is very important because it is useful for these young learners to values of coexistence between human beings and nature or among groups of human beings sharing the same natural resource. Therefore the process of building constructive habits and creating the awareness for environment conservation should be promoted seriously. Below are some studies that analyzed the use of curriculum to develop students' awareness to the environmental conservation.

Siranee Opala (1998) has compared the levels of environmental awareness among the students who have been trained through certain "projects" on environment. Having tested the same students twice in a pre- and post-training tests, the study finds that the students' scores on environmental awareness are higher after they take the project-based courses than before they take it (statistical significance at $P = 0.01$).

Runjit Kongkham (1998) has studied the environmental awareness and the learning achievements among the students who take the course called "Things around Us." The study findings show that the students who take the course, with certain procedures to implant habitual environmental awareness among the students, score higher after they take the course than before they take it. The statistical significance level for this finding is $P = 0.001$.

Thipawan Kor. Buakaesorn's (1999) study shows that students who are taught using Discovery Teaching Technique, on the one hand, and those using Direct Instruction Technique, on the other hand, for the same subjects regarding attitudes toward environmental conservation and abilities to solve environmental problems produce different scores in the similar tests. The level of statistical significance for the differences between the students trained with two different techniques is P = 0.01.

The study of Phuvadol Katemongkol (2001) finds that English lessons related to the environment of the students have increased the levels of environmental awareness among the students. The students' scores in the post-training tests are distinctively higher than those recorded in the pre-training tests. Also increasing are the learners' abilities to solve the problems found in their own environment and efficiencies in accomplishing environmental projects (three projects under the English lessons).

Nantha Chutipatwipha's (2002) study shows that the students who are taught in environmental science (the sufficient economy) score better on tests related to environmental science, environmental management, and environmental awareness after they take this course compared to their scores for the same tests before they take the course. The statistical significance calculated from the students' differences in the scores for the tests is P=0.01.

Ratchaneekorn Ruedeerach's (2003) shows that the students who are taught about environmental conservation by using a "conservation camps" with the normal learning group and finds that the students' study achievements and attitudes toward the environment are different (before and after joining the camps) with the statistical significance at P=0.05.

A study from Sirirat Siricheapchaiyan (2005) has shown that the students who learned by using the learning set called Science for Quality of Life get better score on tests about science and environmental awareness after they take the course. The statistical significance level for the differences between the students' scores of pre-course and those of post-course stands at P=0.01.

Most of the studies above have utilized various teaching methods including practice-based curriculum in some subjects in order to create habits and environmental awareness among the learners. This study therefore proposes that in inculcating constant environmental awareness among the young learners toward their own environment, the most important part of the attempts is the practical experience of the learners within their own local environment. This can be developed by arranging the learning procedures about local environment that affect the learners' Cognitive, Affective, and Psycho-motor Domains. In order to create stimuli in the minds of the learners on their beliefs, values, attitudes that create reflective behaviors to the local environment, the researcher develops the curriculum on local environment in the context of Chiang Mai Province that integrates the teaching methods focusing on learning process for the students of grade level 4.

Learning Management

Learning Through Experiential Learning

Experiential learning is the learning by doing by exposing the learners to experiences that stimulate the learners into a reflexive thinking mode, which leads to new thoughts, attitudes, skills and practical knowledge (http://www.infed.org/b-

explrn.htm; http://www-ice.upc.es/butlleti/innsbruck/ 416-212.pdf). The diagram of the learning components focusing on the experiential learning offered by Kolb and Fry (1975) shows a method with four steps: (1) reception of experiences through abstract concepts, (2) reflective thoughts about experiences from many perspectives, (3) summary of the knowledge from the observation and reflective thoughts provoked by abstract concepts as well as summary of the methods or principles from the integration of observation and theory, and (4) application of knowledge into practice use or experiment in situation shown in Figure 2.

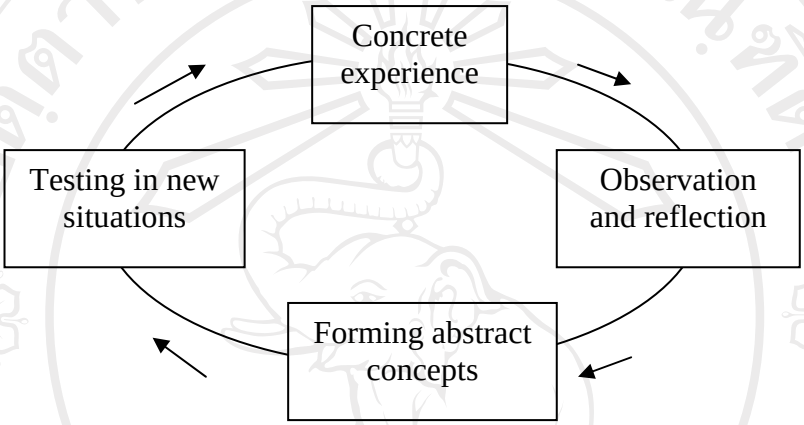

Figure 2 Learning Components Focusing on Experiential Learning

Somsak Phuviphadawat (2001 : 39-41) summarized the experiential learning into five steps, which are (1) experiencing activities in real situation, (2) presenting and exchanging experiences to others through writing, speaking, and presenting (Publishing), (3) discussing for better understanding, (4) summarizing and generalizing outcomes from the previous steps, and (5) applying the learning into daily life.

Furthermore, the learning methods with experiential learning proposed by Pimpan Dachakupt (2005 : 71) have four basic thoughts as the followings. First, the learning is based on the experience of the learners. Second, the learners learn by doing until they are able to create new knowledge. Third, the reaction and reflection of the learners should be able to expand the produced knowledge broader. Fourth, the synthesis for this produced knowledge is communicated to others through spoken or written means.

The experiential learning leads us to view that in experiential learning process the learners must practice and the teachers must provide stimuli for the learners to awaken reflective thoughts from the students' experiences. Then the teachers and students summarize the produced knowledge and learn to apply the knowledge into different situations.

Project Work

Project work is the implemented form of education (i.e., surveys, studies, experiment, creative projects) for learning of topics for the individuals or group of learners' choices in which the learners can learn by themselves. The work process is

clear as the teachers are the persons who give stimulation, advices and consultation (Somsak Phuviphadawat, 2001 : 81; Suchart Wongsuwan, 1999 : 6). Therefore, it is clearly a self-directed learning method.

The prominent feature of the learning using the Project Work is the process through which the learners can seek knowledge or answer the questions they want to know or to solve. This is the model of learning where the learners are freed choose the subjects according to their individual or group interests. The decisions are made together as individuals belonging to a group. This method of learning thus utilizes many integrated learning methods together such as “Group Procedures,” “Thought Procedures,” “Problem Solving,” “Process-centered Learning,” “Learning by Thinking Together” (Brainstorm), and Learning through Project Work. These methods are interconnected to develop the concepts offered by Bloom on the six stages of knowledge application, which are memory, comprehension, application, analysis, synthesis, and evaluation. Together these methods can create a learning process focusing on the steps of learning procedures starting from planning the lessons, designing the learning, applying the produced knowledge, and evaluating the project work together with teachers assuming roles as learning managers (Office of Education Council, 2007 : 1-2).

The learning process through project work (Somsak Phuviphadawat 2001 : 81; Suchat Wongsuwan, 1999 : 13; http://www.pm.ac.th/vanida/sitti1.html) has six important steps as the followings.

1. Creation of an appropriate atmosphere in class for work shared among the group members.

2. The stimulation process to invoke interests and attention from the learners.

3. Selection of titles or subjects for data analysis and arrangement of titles for project work.

4. Planning for learning process in steps, identification of areas for project work, and analyses of learning process steps.

5. Implementation of practice according to chosen titles and the steps to perform tasks according to framework of the project work.

6. Planning for methods of report for outcomes or implementation process to the class. This step allows transfer of knowledge and feeling of solidarity to the classroom’s member through the reversible process.

Office of Education Council (2007 : 4-5) identifies four stages of the learning implementation procedures in project work as the followings.

1. Presentation stage, which is the stage where teachers distribute to the learners the handouts (information), identification of the situation, study of the situation, techniques for questioning, all of which have been identified in the learning implementation plan to be held as learning guidelines.

2. Planning stage, which is the stage where the learners help one another in planning for their own learning through brainstorming, class discussion, and summary of the group discussions.

3. Implementation stage, which is the stage where the learners apply their planned activities and write reports of their outcomes.

4. Evaluation stage, which is the step of evaluation in real situation where both teachers and students evaluate their finished lessons together.

The Project Work methods commonly used for arranging the learning plan are known in four types. These types are (1) the experimental type, (2) the creative type, (3) the data survey type, and (4) the theoretical type. In arranging learning activities, teachers participate in creating proper class atmosphere, stimulating learners to implement the agreed steps for project work, and providing reflexive data back to learners to elucidate the outcomes of the plan. The learners, in turn, can apply these processes for further use later. In the steps of learning process arrangement, utilizing the Project Work, this study acknowledges the procedures suggested by the Office of Education Council. This study thus focuses on the learning arrangement in group in which the arranged activities are the guidelines for the learning work plan to promote the learners, side by side with teachers and friends, as the active parts in planning, accomplishing the activities, and evaluating the real situation.

Creative Thinking (a Learning Method)

The Creative Thinking is the powerful source of human imagination in creating new products (Spearman, quoted in Department of Teacher Education, 1980 : 10). It symbolizes the process reactive human feeling that reacts very quickly to problems or missing parts of a whole system. After gathering original thoughts as assumptions, human thinkers collect the data, analyze it, test the assumptions, and juxtapose the outcomes of the test with the assumptions, and build new guidelines (Torrance, 1962 : 47). This is the characteristics of divergent thinking, which means thinking broadly in various directions or aspects. This thinking leads to inventions of new things including ways to solve problems successfully (Guilford, 1967 : 60-62). To define creative thinking, these following words such as discovery, creative, new things, expanded knowledge, models, imagination through divergent thinking, and connection of thoughts and problem-solving should be considered (Suwat Niyomkha, 1988 : 437-438). The process of creative thinking is reconnection among different things or thoughts into a single unity (Somsak Phuviphadawat, 1994 : 2). This is a high intelligence process that combines many thought processes together in order to create new things or solve existing problems. The creative thinking, however, appears whenever freedom on thought abounds. Creative thinking, a capability to see things in various perspectives or accomplish things in unique method, is connecting apparently unrelated things together into a harmonizing scheme. Creative thinking can be retraced from products it creates, processes of its implementation, among others. Creative thinking can be classified into four types, which are innovation, synthesis, extension, and duplication. Each type of creative thinking can not exist by itself but must be interconnected to the other types (Office of Education Council 2007 : 1-3).

The awakening of creative thinking can be done through various techniques such as brainstorming, the Gordon Technique, Forced Relationships and Morphological Analyses, and Problem-Solving Process: Secondary Creativity, Technique to Connect Relationship by Comparison (Synectics), or Six Thinking Hats (Michalko,Gundy,Higgins, Mukerjea & others, 2003; Somsak Phuviphadawat 2001 : 81). The activities to promote creative thinking are known as the parts of trainings to solve problems in creative ways, which include brainstorming, questioning techniques, Ready-Made Compact Lessons, and Moral Support and Rewards (Office of Education Council, 2007 : 14-15).

The procedures to arrange learning to invoke creative thinking proposed by Office of Education Council (2007 : 17-18) are the followings.

1. Creation of awareness through teachers' using known techniques incorporated into lessons to stimulate the learners' interests.

2. Brainstorming to provoke the learners' potentials to enhance their search for answers for troubling questions. Both teachers and students must participate in this session.

3. Creation of problems over which all learners who have passed the learning processes can think of their own answers. The learners can accordingly imagine new challenges in new situations.

4. Presentation, which is the most important step where the learners present their works as well as criticize and opinion other people's presentation.

5. Evaluation, a step focusing on learners' own balanced evaluation and necessary correction based on spirits of open discussion.

6. Product distribution, a step where the products of all learners in every group are displayed publicly in various forms such as exhibition or other kinds of public open presentation, to disseminate the produced knowledge and creative thinking for public advantages.

The researcher of this study employs the six steps of Creative Thinking learning proposed by Office of Education Council because the steps can be used properly to enhance the group learning to build learners' awareness, to brainstorm the learners in creation of tasks, to train their presentation and to self-evaluate themselves and evaluate other groups.

Problem-Based Learning

Problem-based Learning is the model of learning that uses the outcomes of work process to create understanding of the nature of problems and their solutions. Problems are the starting point of this learning process and the stimuli for the development of the skills to seek supporting information and solve problems logically (Boud and Felleti, 1997 : 14; Barraws and Tamblyn, 1980: 18; Finkle and Torp, 2003: 1). The problems should be correlated with daily life (Torp and Sage, 1998 : 14-16) or have chance to occur (Office of Education Council, 2007 : 3). The learners employ the self-directed learning to search for knowledge and seek for answers by themselves. Therefore there must be learning targets, planning, implementing the learning activities, time management, selection of learning methods, and learning experience. Including the self-direct evaluation should be done. Learners are freed to learn by themselves and in small groups in order to be able to seek for knowledge, exchange ideas within the group, and work together in the group. The knowledge is thus built from numerous answers and these answers must pass a series of analyses by the learners. There are syntheses and decision-making together so the learning is challenging and enjoyable (Dolmans and Schmidt, 1995 : 228-331; Greenwald, 2000: 28; Office of Education Council, 2007 : 3). The teachers are responsible to be the advisers of students' problems, the arrangers of the environment, and the managers of the learning context conducive for creation of knowledge by the students. The students are trained to be the persons to solve problems and are developed to be the persons who can learn by the self-directed method (Torp and Sage, 1998 : 14-16; Office of Education Council, 2007 : 3). Besides, the balanced mixture of the learning sessions between the school environment and daily life situation allows the learners to adapt themselves better to their environment. The capabilities to solve actual

environmental problems free the learners to be sociable or gregarious in their society (Ratchaneekorn Hongpanat, 2004 : 43-52).

The characteristics of the problem-based learning proposed by Kulaya Tantiphalacheeva (2005 : 77-80) are fourfold as the followings.

1. Problems issued as basis of learning. As the basis for the training, the problems should have shown typical characteristics as (1) commonly encountered, (2) complicated enough to be the problems that deserve solution, and (3) conceptually complex enough to raise questions coming from various aspects. Having utilized the broad basic knowledge, the training should have allowed creation of important concepts.

2. Teaching or learning media. These media should free the learners to select their own subjects of study. Besides, persons and place are parts of the learning media that the learners can also select on their own.

3. Roles of the learners. The learners must be responsible for their own study. They must assist one another in discussing the issues of knowledge to probe and the kinds of answers capable to solve the problems.

4. Roles of the teachers. The teachers are responsible to support the learning process in pursuing its objectives by consistently following three responsibilities as the followings. First, the teachers provide to the learners sufficient learning equipments for getting the answers sought by the learners. Second, the teachers offer advice whenever necessary in order that the learners can learn by themselves. The teachers may offer initial knowledge to the learners in case that the learners can not conveniently find the answers for their questions on their own efforts. Third, the teachers constantly evaluate the capability of the learners throughout the learning. This includes motivating the learners to respect the learning guidelines, to think together through discussion, to exchange ideas, to ask questions, and to summarize the important learning issues after each section.

The steps of learning through the problem-based learning as suggested by Office of Education Council (2007 : 7-8) are given as follows.

1. The steps on identification of the problems. These steps must be arranged using the right situation by the teachers to stimulate the learners' interests and thus absorbance in the problems and then to identify the problems for which they eager to find the answers.

2. The steps on understanding the nature of problems. The learners must obviously understand first the problems they want to solve and be able to explain concepts related to the problems. In this way the learners preserve alternative options for solutions for the problems.

3. The steps on thorough study on the problems. The learners identify inquiries they want to solve and launch a research on their own through various methods.

4. The steps on synthesizing of the newly-formed knowledge. This is the step where the learners can exchange and discuss the knowledge from their own study with peers as a means to asses and analyze the properties of the knowledge.

5. The steps to summarize and evaluate the answers of the learners' questions. The learners in each group summarize the results of their own group's endeavors and evaluate these results. The group members freely test the appropriateness of their collected information through exchanges of opinions or

supportive concepts within group discussion. Every member helps one another to check the knowledge in holistic manner.

6. The steps to present the outcomes or results of groups' study in peer and public review. The learners reveal the data as the building blocks of the newly acquired knowledge system through public presentations in various forms. All the learners in every group and concerned individuals to the problems are allowed to evaluate and assess these results.

These steps of arranging the problem-based learning above are adopted by this study in setting learning activities with the learners' own environment as the main contents. Environmental-related problems are the most important parts in each step of activity implementation to encourage all learners to help one another to think, to implement the training steps, and to answer the questions together.

Self-Directed Learning

The self-directed learning follows the basic belief that all human beings have potentials and capabilities to develop their own potentials in unlimited manners. They have interests and eagerness to learn for knowledge. Human beings are also responsible for their own behaviors and to add the values for those behaviors (Amornrat Chanthawong, 2007). There are several self-directed learning methods such as learning by reading, learning through website (Web-based Learning), learning through individually identified project, learning through contacts with knowledgeable persons, searching for knowledge in communities, shared learning with friends, exchanging knowledge, learning by doing, etc. In selecting the learning methods for this study, the researcher focuses on the self-directed learning methods in form of "Learning Through Reading" and Web-Based Learning. These methods can empower the learners to arrange to flexible changes in learning process on their own, to learn on their own volition, to carry responsibilities and roles to be good learners, and to initiate a life-long learning.

Learning Through Reading

Reading is a learning process with sources from printed materials. The information disseminated through media like books, magazines, or journals is one way communication; from the sender to the receiver. Reading is useful to gather knowledge, thoughts, creative insights, and relaxation in one's attempts to develop and adapt to one's society better, in daily or professional life (http://www.school.net.th/library/create-web/10000/generality/10000-8057.html). Reading assists readers to catch up with the present world, to get along with society, to build imagination, to gain experience, to get relaxation, to be entertained. A kind of concentration practice (www.childthai.org/cic/c271.htm), reading can develop brains and train the brains to process information quickly and efficiently by both sides human brains. Reading trains human thinkers to analyze, synthesize, and criticize any information. It also helps human beings to gather information to think, inspirations to build good personalities, examples to build good attitudes and personalities through the processes analyzed by the theory of memory. Human brains can solve problems and make decisions efficiently through reading, an important tool in developing education and preparing the e-Learning system (http://www.improved-reading.co.th/Bord04.htm).

e-Learning and Web-Based Learning

E-Learning is a form of online learning process that corresponds closely with the basic concept of Bruner's Discovery Theory because the learners must study by themselves. E-Learning develops learners through created relationships with teachers, classmates or colleagues, other interested persons, and other people in the interconnected system covering the whole parts of the globe (http://202.28.249.241/~kc/firstpage/cmuonline). E-Learning is related to learning theory through self-directed learning, and in addition, it is correlated with the theory of individual teaching (The Individualized Instruction Theory) that frees the learners to choose study contents, time, and activities. Similarly, the other theory called the collaborative learning theory supports the methods through which the learners join freedom to study in groups by using the communication tools such as e-mails, web boards, or newsgroups. This freedom connects the learners with their classmates and experts in a shared learning with others (http://www.nectec.or.th/courseware/cai/0030.html).This kind of learning encourages a two-way communication between the receiver and the sender.

E-Learning is corresponding to Gagne teaching methods that advocate the provision of learning guidelines for the learners who can thenceforth begin activities by themselves. In addition to this provision, the teachers also advise the methods to guide activities, the methods to search for information sources, the way to practice, the means to be reflexive about the information gathered, and the safe limits for the learners in their activities. The learners then can study using the self-directed learning methods more efficiently. Therefore, it is always necessary to support and urge the learners to accumulate knowledge and understanding about self-discipline including awareness of the importance of the healthy habits in learning. They know how to select, evaluate, and collect the information and know how to organize, analyze, synthesize, and presenting the information from their own understanding. With effective educational reforms, the learners can prepare themselves to study efficiently. They become not only keen students but also avid researchers (http://www.improved-reading.co.th/Bord04.htm). The good things about e-Learning as noticed by Thanomporn Laohajaratsaeng (2001 : 88-90) are as the followings. First, it opens chances for the learners to come to preset "class" on time and venues that the problems of time limitation and space constraint are gone. Second, e-Learning supports the concept known as the life-long learning. E-Learning constantly responds to the needs of the learners who eagerly seek for knowledge and builds mega-cognitive skills to measure their own learning abilities efficiently. Third, it opens convenient access to information, promotes the learning materials and environment that interconnect their knowledge and real life problems, and mingles the world context (Contextualization) and learning (Problem-Based Learning) by following the concept of constructivism. Fourth, websites are excellent sources for almost unlimited technical information covering world-wide sources with little language barriers. Fifth, e-Learning has expanded the limited choices within the traditional searching method through the book-based libraries. It opens to the learner access to experts and information of all branches of knowledge known in the world. The learners thus can communicate, inquiry, or ask for information they want to collect from real experts directly, thence saving time and budgets compared to those of other traditional means of communications. Sixth, e-Learning opens larger venues for the learners to

presenting their works to readers or others in the world. It creates outer motivations for the learners to produce good works that pass careful scrutiny from acknowledged experts and to see others' quality works from which they can improve their own works.

It is apparent that the flexibility of the web-based learning demands the learners with high levels of responsibility, enthusiasm in study, and willingness for new knowledge. There is also a kind of communication with others or experts through various communication tools such as e-mails, web boards, chats, newsgroups, which is more advantageous compared to the learning through mere readings. Nevertheless, these two compared types of self-directed learning correspond well with a learner-centered learning system. Teachers are merely persons who give suggestions and advice through knowledge sources that relate to the learners' chosen study. As the result, the learners can adapt their self-learning attempts through reading and web-based activities to their previous knowledge and thus able to analyze and synthesize information and create new knowledge to be exchanged in a cooperative learning with other members in mixed class group.

Learning in Multi-Grade Group

Little (1994) defines learning in the mixed class group as the learning and teaching in a group composed of students with different age ranges and classes but sharing equal capabilities levels. At present the vocabularies related to mixed class group cover several terms such as multi-grade teaching, multi-level class, multiple class, composite class, vertical groups, or family class, etc. In the United States, the words "multi-age" and "multi-grade" are generally considered as having the same meanings.

The report composed by Birch and Lally (1995) stated that the multi-grade teaching is usually utilized for the teaching method at elementary schools. The details for this teaching, however, are different in the context of country to country. Multi-grade teaching in Nepal, for example, means the teaching by a teacher over students more than one class levels at the same class time. It can also mean the teaching at one same class or different classes (at the same time).

In Malaysia, the word multi-grade teaching means the teaching of learners coming from more than two class levels. Nevertheless, most the class members are mixtures of rather closely similar levels or classes: i.e., grade 1 students mixed with grade 2 students or grade 5 with grade 6.

In China, multi-grade class or multiple-group teaching is focused on the class levels, age levels (age-based groupings), and arrangement of groups depending on the language usage (language-based grouping). Thus the mixed class concept in multi-ethnic China emphasizes not only on the age and class levels but also on the problems on different languages of the learners. The teachers in China obviously must have guidelines to solve this problem.

In the Philippines, multi-class teaching is the teaching where one teacher is held responsible for teaching in the class composed of learners from more than two levels or classes. The learners may have different levels of capabilities, racial, and lingual backgrounds.

Miller's study (1991) on the teaching of mixed class group in rural areas of the United States was focused on the teachers in the mixed class groups (i.e., the flaws

in teaching preparation, structures of the classroom, and the learning process of the students). Part of this research of Miller is the survey of the real actual teaching of the teachers in schools that arrange teaching in mixed class groups. Miller's study shows that the students in mixed class groups show higher level of independence in their development and positive inter-dependent among themselves, which is considered good according to the principle of this teaching method. Principals of schools teaching of this method and their students highly appreciate this kind of mixed class group method and they show positive attitudes toward the schools and themselves and tendencies to build satisfactory levels of socialization. The main findings of Miller's research show that the students' levels of achievement in this kind of mixed class group are about the same level as those of single-grade classroom. Miller then hypothesizes the important factors that enable the multi-grade class to be successful. These factors are the structure of the class that facilitates children to develop themselves, the plans of teaching that can support the students to be responsible, larger allowance of times for students' own learning efficiently, the improved teaching curriculum, development of skills that empower the students to learn on their own, the learning done through the cooperation of classmates, and the use the peer tutoring in teaching.

Mason and Burns (1994) from University of California Riverside observe the mixed class group and find that the attitudes and achievements of both kinds of students (learners in mixed class and learners in single-grade class) are not markedly different. However, Mason and Burns (1994) offer to the teachers of mixed class groups the suggestions on (1) sufficient development at personal level including the study orientation, (2) preparation of alternative curriculum and extra teaching equipments, (3) more work using teamwork, and (4) support for better class arrangement or scheduling as well as more varieties for evaluation systems.

Milburn (1981) launches a longitudinal (5 years) comparison study on two Canadian Elementary Schools that use the mixed class group and normal single-grade class. The findings show that there are little differences between the two kinds of class. The study finds, nevertheless, that younger children gain more benefits from the mixed class system more than the older children. The students in mixed class group show more positive attitudes toward their class than those in normal single-grade class toward theirs.

In Thailand, Roong-a-roon School has arranged the learning for students with special needs such as the students with Down Syndrome symptoms groups, autistic children, children with short concentration spans, and children with other abnormal symptoms in learning (i.e., abnormal eyesight, hampered hearing) to study in normal classes. This mixed class groups are arranged for students from grade level 3 and 4 and those who are unprepared to join mixed class are trained first, as the preparation to join mixed class group later, in classes of arts, music, dance, physical education, etc, to develop their capabilities (http://www.roong-aroon.ac.th/prathom_mixclass.html).

Ban Pangwoon School, Uttaradit Province (under Office of Basic of Education Commission) also has arranged a teaching activity that focuses on developing the occupational skills for the students at grade level 3 by using the mixed class method to develop the learners' occupational skills. An observation over this arrangement shows that these students appear delightful and enjoy the learning activities, show good levels interaction, and learn together in harmony. The older

students can transfer their knowledge to the younger students, especially in training for patience and efforts in performing occupational skills. The older students also show higher level of skills in occupational skills and both older and younger student can produce quality products with commercial values (www.pangwoon.th.gs/web-p/angwoon/ job.doc).

The arranged mixed class and mixed age groups, however, pose hopes and challenges for schools (under Office of Basic Education Commission) with small size of teachers all over the country. Because the numbers of teacher are insufficient for all classes, it is of necessary to mix students from 2 to 3 classes to study together. Teachers must face problems in teaching because of their lack of training for teaching the mixed age class. Kasama Worawan Na Ayuddhaya, Secretary General of Office of Basic Education Commission, in cooperation with administrator of UNICEF on the implementation plan, has developed training modules for teachers in mixed class in 2008 (http://news.sanook.com/education/education_232577.php , Education news).

From the plan above, most of arrangements for mixed class groups are set for learners in Elementary School levels with rather similar ages or class levels and the plan is focused on the structure of classroom and the learning methods. In addition, the arrangements for mixed class between normal students and students with special needs are prioritized in order to develop special skills and to overcome limited numbers of teacher. This present study, therefore, has arranged the mixed class group for the learners at Mathayom Suksa at grade level 4 to allow learners from different classes or levels to study together according to their capabilities and interests in certain subjects (including compulsory courses) to train cooperation in learning between students from different ages and class levels. This arrangement is deemed as able to create a joint learning naturally.

Cooperative Behavior in Learning

Department of Curriculum and Instruction Development (1999 : 52) has stated that within an educational scheme for development of students' skills and training for working together with others, there are three factors to consider as the followings.

1. Exploration of potentials of each student and utilization of these potentials in use with those of other in group performance to achieve targets of group cooperative works with highest chance of success. This means that the success of each student would include the social acceptation of others toward each student's personality and personal achievements.

2. Participation of each student in the work process with others is focused on three aspects, which are (1) heart, or students' intention and willingness to perform activities in the learning process and group work, (2) head, or students' opinions or concepts during the learning process and group work, including their thoughts, analyses, decision-makings, and summaries of the lessons, and (3) hand, or students' performance of the tasks or activities by themselves or discussion on their own with other members of group.

While working together in a group, it is necessary for its members to identify the roles and responsibilities of each member. The group, for instance, needs leaders, secretaries, and group members. All of these roles could be rotated open chances for students' practicing different skills in working with other member or other groups,

including skills such as identifying group targets, planning and identifying the working procedures, solving problems or conflicts, making decisions, cooperating in doing work and evaluating information. All of these skills are important to train before the students can perform the tasks smoothly.

3. Interactive atmosphere with other colleagues in a group is considered as important factor to solidify the group works, to achieve the group targets, and satisfy the group members in working together. Therefore members of the group must create cooperative atmosphere in work such as positive attitudes toward friends and the work of the group, skills in communication, acceptance toward one another, and support and hospitality to one another. Group members must help one another and tolerate unintended mistakes. These social skills can "combine the members' hearts together" lead to "thinking together," and "join the hands" in order to achieve group targets in satisfactory interactions among group members.

The promotion of cooperative learning similarly can be implemented well in normal class groups. Yupin Pothirat's study (1994) claims that students who have joined group activities show higher levels of cooperation with other members of the group compared to those who have joined only "normal" class. The level of statistical significance of these differences is P = 0.01.

From this information about cooperative behavior in learning, this present study argues that cooperation must rely on group processes or procedures, willing members' participation in teamwork, thinking together, join hands together, and healthy interactions among group members. These will help the group to achieve its objectives and then the promotion of cooperative behavior in mixed class groups of learners from different classes can be done as well as in normal single-level classes.

Advanced Thinking Skills

Bloom (1956) classified the objectives of studying on Cognitive Domain into six levels which are: (1) Memory Level, (2) Comprehension Level, (3) Application Level, (4) Analysis Level, (5) Synthesis Level, and (6) Evaluation Level.

Generally the levels of Memory, Comprehension and Application stand as the basic skills while the levels of Analysis, Synthesis, and Evaluation belong to the achievements in Advanced Thinking Skills.

Analysis is composed of analyses of elements, analyses of relationship of elements, and analyses of element organization principles. The analysts must be able to classify the data or information into pieces in order to find prominent characteristics of stories and their elements. The expressed behavior during analysis are analysis attempts, search for information, the structure of elemental design, creation, facts, thoughts, written summaries on reasons, supports, conflicts (i.e., logical principles), components, objectives, etc.

Synthesis is composed of the production of unique communication plan, production of a plan, a proposed set of operations, and production of set of abstract relations. The persons who synthesize the information must be able to gather or mix at least two elements or concepts together before they becomes a single unit of produced concept, which is uniquely different from the original concepts. The apparent behaviors during this stage are the forms of writing, creations, initiations, installments, expansions, and productions (i.e., work plans, implementation methods,

methods, structures or framework, projects, statements, theories, conclusions, summaries, assumptions, presentations, etc.).

Evaluation is composed of judgments in terms of internal and external criteria. The evaluator must be able to judge by criteria and standards on the students' cooperative behavior such as the coherence of the information, crosschecked data reliability, data correctness, information completeness, reasonability of data, data appropriateness, summary of alternative information, theories of behavior, stories, events related to behaviors, etc.

Urai Mawhinthon (1999) has compared the learning achievements, analyses by instincts, and cooperative behaviors in group works of the students at Mathayom Suksa 4 who are trained or taught through experience-based methods according to the Teachers' Manual of Department of Curriculum and Instruction Development. The findings of this study reveal that the learning achievements of these participating students on social sciences, analysis method, and cooperative behavior in group work are higher (statistical significance at P=0.01) than the scores of the control groups.

Patraporn Pithaktham's study (2000) shows that the learning achievements on social science (i.e. abilities to analyze social facts and attitudes toward social science) of the students who are taught by the Inquiry Method using the "Abstract Diagram" are better than the achievements of the students taught with ordinary teaching manuals. These differences in the scores of abilities of analysis and attitudes toward social science are statistically significant at P=0.05 and P= 0.01, respectively.

Jit Nuankaew (1999) has studied and developed a process of promoting and developing capabilities in advanced thinking skills for students. The findings point that the sample groups' scores in pre- and post-training tests on abilities in advanced thinking on five aspects-creative thinking, critical thinking, evaluation thinking, making decision thinking, and problem solving thinking are markedly different (statistical significance at P = 0.05). (The post-training test scores are higher).

Munmanat Sudsin (2000) reveals the differences between the scores of the students who are taught with the Inquiry Model Teaching Method and the "Abstract Diagram" and the students who are taught following ordinary teaching manuals. The tests for skills on procedures of science and analysis abilities show that the former score better (statistical significance at P = 0.01) than the latter on the levels of Memory, Comprehension, and Application.

Lawan Raksat (2001) has developed a process of teaching the science subjects (environmental sciences) at secondary High School to enhance students' abilities in making decision and solving environmental problems through conservation. The findings show that the students who have passed the learning with the applied curriculum and teaching procedures developed by Lawan Raksat's research score better in post-training test than in pre-training test.

Thiwawan Phasukham (2002) has studied the use of the "Abstract Diagram" on the problems of resource management toward the thinking levels (levels of Memory, Comprehension, Application, Analysis, Synthesis and Evaluation). The findings show that the achievements in the levels of thinking after the course taken are higher than before the course taken. The average scores for tests in thinking levels are significant in the levels of Analysis, Synthesis and Evaluation, which belong to the advanced thinking levels, with statistical significance at P = 0.001.

Piyarat Kanthap (2002) has developed a teaching model and methods to develop advanced thinking skills through a learning process called Web Quest

teaching procedures. After the models and procedure are applied to the student samples, who undertake pre-training and post-training test, the students scores better in the post-training test for the advanced thinking skills, the achievements of the course contents, and the ability to use computer than in the pre-training test (statistical significance at P=0.01).

Teaching students to think at higher level (advanced thinking skills) is correlated with teaching focusing on the procedures or learning by doing. This method of learning by doing begins from the real situation, facts, and problems for the learners to solve by their existing experiences and practices on their own together in a group. The procedures of learning process are taking place with the forms called Project Work, Creative Thinking Learning, Problem-Based Learning, Self-Directed Learning through Reading, Web-Based Learning, e-Learning as well as sharing experience, supporting and helping one another, joining the hearts, heads and hands, integrating the knowledge that has been analyzed and synthesized, and turning this knowledge into fresh, alternative knowledge.

Basic education curriculum of B.E. 2544 emphasizes the acquisition of desired characteristics of the learners in terms of their knowledge, ethics, morality, and personal self-development into good citizens. The learners should be able to analyze, to work, to build awareness on natural resource conservation and environment, and to take beneficial actions for the society. The basic curriculum creates chances for the educational institutions or schools to add elective courses for certain learning contents. Schools can assign the subject codes for the students in different class levels to choose according to their interests and to study together at their capabilities and interests. In addition, the necessary basic skills for learning, which are composed of learning skills, thinking skills and communication skills, are encouraged as parts of advanced thinking skills and cooperative learning in response to the principle of the curriculum that focuses on the relationship between the curriculum and the students' daily lives. This principle relies on the teaching methods that focus on process or self-directed experiences of the learners. Therefore it is necessary for the curriculum to arrange various process-oriented learning activities.

In promoting the relationship between the curriculum and the learner's daily lives, the surrounding communities and societal environments of the students should be also considered. The learning should be centered on the students themselves. Recently as both the urban and rural communities in Chiang Mai context are facing environmental problems, especially on the overused natural resources, forest fires, floods, garbage problems, polluted water, and polluted air. Therefore, it is urgent to quickly provide knowledge, create awareness, and promote the right conducts to the environment among young students.

From the above-mentioned information, this present study has created a learning plan for an elective course related to the local environment in Chiang Mai for the young learners to build skills to manage the environment, abilities to solve environmental problems, implant awareness to their own environment, and produce positive attitudes toward environmental conservation. Group participation creates quality work and cooperative behavior in group work by focusing on the contents of local environment through the process-centered learning procedures. The students who study in mixed group class proposed by this study are expected to undergo a transformation into students with advanced thinking skills, constant awareness to their own environment, and cooperative behaviors in learning.