THE CONSTRUCTION OF MULTIMEDIA COMPUTER ASSISTED INSTRUCTIONS ON " ECOTOURISM " FOR YOUTH

SUCHAYA PINYO

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION (ENVIRONMENTAL EDUCATION) FACULTY OF GRADUATE STUDIES MAHIDOL UNIVERSITY 2003

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Thesis
entitled

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THE CONSTRUCTION OF MULTIMEDIA COMPUTER ASSISTED INSTRUCTIONS ON " ECOTOURISM " FOR YOUTH

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ABSTRACT

This study aimed to construct and apply a multimedia computer assisted instruction set on " Ecotourism " for youth. The authoring system program was used to construct the content and instructions, afterward the constructed instructions were checked by experts. There were three trials for the modified instructions with a number of high school students of the Bangmodwittaya School. The revision and modification procedure was made again after each trial of the constructed instructions. The modified instructions were used by 120 high school students of the Dhaweewattana School. A pre-test control group of 60 students who did not use the constructed instructions was designed to help compare and investigate and evaluate knowledge gained by the experimental group of 60 students who did use the constructed instructions.

The results showed that the post-test scores of the 60 students who used the multimedia computer assisted instructions were statistically significantly higher than their pre-test scores at a 0.05 level, and higher than post-test scores of the control group students who did not use the computer assisted instructions at a 0.05 level. The results from this study might conclude that these students could gain knowledge on " Ecotourism " by using the constructed computer assisted instructions.

Recommendations from the study are that, research about learning with CAI lessons for other topics in order to develop the teaching-learning process to be more efficiency should be conducted. Also CAI lessons on ecotourism for other groups should be delveloped.

KEY WORDS: COMPUTER ASSISTED INSTRUCTION / MULTIMEDIA / ECOTOURISM / YOUTH

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การสร้างบทเรียนคอมพิวเตอร์ช่วยสอนแบบมัลติมีเดีย เรื่อง “ การท่องเที่ยวเชิงนิเวศ ” สำหรับเยาวชน (THE CONSTRUCTION OF MULTIMEDIA COMPUTER ASSISTED INSTRUCTIONS ON “ECOTOURISM” FOR YOUTH)

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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อสร้างและทดลองใช้บทเรียนคอมพิวเตอร์ช่วยสอนแบบมัลติมีเดีย เรื่อง “ การท่องเที่ยวเชิงนิเวศ ” สำหรับ เยาวชน การสร้างบทเรียนได้ใช้โปรแกรมคอมพิวเตอร์ประเภทโปรแกรมสร้างบทเรียน (Authoring System) และนำบทเรียนที่ผ่านการปรับปรุงแก้ไขตามการประเมินของผู้เชี่ยวชาญแล้ว ไปทดลองใช้กับนักเรียนชั้นมัธยมศึกษาตอนปลาย โรงเรียนบางมดวิทยา จำนวน 3 ครั้ง หลังจากได้แก้ไขปรับปรุงแล้ว จึงนำไปใช้กับนักเรียนชั้นมัธยมศึกษาตอนปลาย โรงเรียนทวีวัฒนา จำนวน 120 คน แบ่งเป็น 2 กลุ่ม คือ กลุ่มควบคุมและกลุ่มทดลอง กลุ่มละ 60 คน โดยใช้รูปแบบการทดลองแบบสองกลุ่มวัดก่อนและหลังการทดลอง แล้วนำมาวิเคราะห์โดยใช้ค่า t-test

ผลการวิจัยพบว่า นักเรียนกลุ่มที่ได้เรียนบทเรียนคอมพิวเตอร์ช่วยสอน มีผลสัมฤทธิ์ทางการเรียนเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติที่ระดับ 0.05 และสูงกว่ากลุ่มที่ไม่ได้เรียนอย่างมีนัยสำคัญทางสถิติที่ระดับ 0.05 จึงสรุปได้ว่า บทเรียนที่สร้างขึ้นเป็นบทเรียนที่สามารถช่วยเพิ่มพูนความรู้ความเข้าใจ เรื่อง การท่องเที่ยวเชิงนิเวศ ให้แก่เยาวชนกลุ่มนี้ได้เป็นอย่างดี

ข้อเสนอแนะควรทำการวิจัยเกี่ยวกับการเรียนด้วยบทเรียนคอมพิวเตอร์ช่วยสอนแบบมัลติมีเดียในเนื้อหาหัวข้ออื่นๆ เพื่อพัฒนาการเรียนการสอนให้มีประสิทธิภาพ และควรทำการวิจัยเกี่ยวกับการพัฒนาบทเรียนคอมพิวเตอร์ช่วยสอนแบบมัลติมีเดีย เรื่อง การท่องเที่ยวเชิงนิเวศสำหรับประชาชนกลุ่มอื่นๆ

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CHAPTER I
INTRODUCTION

1. Rationale and Justification

The tourism of Thailand has expanded increasingly, therefore the income from this industry in 1999 was about 253,018 million Baht (Tourism Authority of Thailand, 1999), as a whole it resulted of good economy of the country. On the other hand of the rapid growth of tourism industry caused the environmental degradation in the tourism sites. Management of tourism was facing the problem of natural environmental conservation and development incessantly. Hence the idea of searching for the new mean of tourism to reduced the negative impact of the tourism sites and local community in order to create the balance between development and conservation. It crated the three aspects of important current in tourism development (Tourism Authority of Thailand, 1997: 9), were as follows:

1) The demand of environmental and natural resources conversation.
2) The demand of learning and had experimental on environment and natural resources.
3) The demand of human resource development with people participation.

Form the influence of three currents, the concept of sustainable development was established so it affected to the tourism management system and the pattern of tourism. Moreover, the alternative tourism was introduced by presenting in the different forms. The most popular mentioned form was ecotourism or the ecological approach tourism. It was the tourism that highlighted on natural areas and culture connected to ecosystem. At present, the ecotourism was pushed and promoted to be an essential compartment of the sustainable development (World Commission on Environment and Development, 1987) and it was used as a tool or a measurement to

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promote for the biological resource conservation (Boo, 1990 cited in Tourism Authority of Thailand, 1997).

Therefore, in few years there had been extensively numerous accepting and referring in Thailand about this kind of tourism by different sectors both government and private. The ecotourism was high demand, subsequent business in this facet was occurred a great amount so that it influenced to the change of the pattern of tourism market tremendously. From the survey of Thailand Institute of Scientific and Technological Research, it found that Thai ecotourism tourists were distributed in the age group of 15-24 years to the age group of 35-44 years by having the closed proportion of these two group-the age group 14-25 years were 31.1 percents, the age group of 25-34 years were 27.9 percents, and the age group of 35-44 years were 28.7 percents. It aimed for emphasizing on the awareness raising and responsibility growing in environment and natural resource conservation to retain its status and to provide the advantage sustainably, it should not over look these group of tourists as aforementioned above, particularly, the age group 15-25 years or youth (Office of the National Youth Commission, 1999: 2).

In Thailand there were total 21 million youth (Tourism Authority of Thailand, 1998: 3) since they were the essential and valuable resources of country because it was the age with full physical and mental powers, including in the period of the readiness for learning, receiving, and transferring the experiences for long time thus it was the hope of country development. It was relevant to the Eight National Economic and Social Development Plan in the aspect of promotion of national human resource development to be good tourists who love, concern, and conserve tourism and environment heritage. For that reason, to educate on ecotourism, it should make the youth to gain knowledge and awareness on the problem occurred from tourist's activities at the moment, and to develop the youth to have proper experience for ecotourism. Thoroughly, they would be able to transfer their knowledge to other tourists and the involved people who live in the same habitat.

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To develop the ecotourism (Tourism Authority of Thailand, 1999: 5-20), there were aims to develop the tourism as the whole in order to have role and appropriate change direction in promoting of conservation and rehabilitation of natural resources, and environment maintenance was included as well. By making the process of tourism development to be educational media, it made the tourist to learn about ecosystem, and to raise the awareness of conservation to stakeholders as government, private sectors, and general people.

Ecotourism emphasized on the importance to natural resource and environmental education, in additionally, the culture of local community in the tourism site that is the main target of this tourism. If there was no educational process to get knowledge and understanding on environment and ecosystem of tourism resources, to raise the awareness of conservation, it could not be called as ecotourism approach. To define the strategy of educating by emphasizing on the duration of tourism taking place as main was not enough so it should give the information before ecotourism activity took place and education as added after activity had done too.

Tourism Authority of Thailand stated that the education was the important basic compartment in the process of management of ecotourism development, especially, by stressing on consciousness creating, and responsibility taking for natural resource and environment conservation to be stable and to provide the sustainable benefit further by under the participatory management of tourist, stakeholders of government, private and local people. The educational implementation in the process of ecotourism was highlighted on the pattern, method, and use of educational media in order to learn through their experiences by themselves directly, and to participate in that learning. The most importance were interpreting, training, on the job training, case study, role play, game dynamic, brain storming, discussion, and educational media.

Creating and building the consciousness and knowledge, it can be done in different mean as mentioned earlier, and the use of media was a mean that was an important component (Institute of development of educational technique, 1999: Kor)

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in the teaching-learning process besides the teacher, learner, and various techniques. The role of teaching-learning media was medium or carrier or instrument or channel to introduce the stories, knowledge, or information of sender or teacher to receiver or learner in order to make learning or teaching to achieve the set objectives or aims successfully. teaching-learning media have been continuously developed and it is relevant to the technological development since the past that the media were talked language or written language until at present the media are in different types and forms so the teacher can consider to properly select according to the its special characteristics or properties. The most modern media in the moment are the media as computer software style that have been developed rapidly and relevantly to the technology in the computer aspect that was called “Computer Assisted Instruction: CAI or “Multimedia”.

Multimedia Computer Assisted Instruction is one form of teaching-learning medium, which has the attribute of giving knowledge content in term of CAI by being presented in all forms of text, graphics, images or animation, sounds, and video. Besides it is able to be interactive with the learner. Currently, it plays numerous roles in the teaching-learning process. The advantage point of CAI as multimedia is able to show the picture that looks like reality so it can attract the learner’s interest since it is the mixed and integrated of different forms of media and used various techniques such as picture, sound, movement, interaction between learner and CAI lesson, furthermore the learner is able to learn by themselves and they are able to record the learning evaluation. It has been obviously seen that the Ministry of Education had arranged the huge budget for providing the CAI program since the budgetary year of 1997 (Burana Somchai, 1999: 19).

Due to the importance of ecotourism issue, to educate the youth, it would increase the youth’s knowledge, awareness, and perception of the importance of ecotourism in order to assist to maintain the ecosystem of tourism sites to be capable of sustainably keeping. Because of the importance of multimedia CAI that plays a role in teaching-learning process as mentioned above, it should be introduce to use for educating for youth further. As reason aforementioned, the researcher was interested

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and realized to the importance and necessity of multimedia CAI construction on the topic of “Ecotourism for Youth” therefore, the research was done in this topic.

2. Research Objectives

2.1 To construct and experiment the multimedia CAI on “Ecotourism” for Youth.

2.2. To Study the youth’s learning achievement after they studied the multimedia CAI on “Ecotourism”.

3. Research Questions

3.1 Did the constructed multimedia CAI on “Ecotourism” is effective for teaching or not ?

3.2 Did the learning achievement of The youth who studied the constructed multimedia CAI on “Ecotourism” increase ?

4. Research Hypothesis

4.1 The experimental group who had studied multimedia CAI on “Ecotourism” had the mean scores higher than those of the control group statistically significant at level of 0.05.

4.2 The experimental group had mean score of the posttest (after studied the multimedia CAI on “Ecotourism”) higher than pretest scores (before studied the multimedia CAI) statistically significant at level of 0.05.

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5 Research Scope

5.1 The content areas of the multimedia CAI on "Ecotourism" were:

1. The meaning of ecotourism.
2. The main components of ecotourism.
3 The main activities of ecotourism
4 The impact might be occurred from ecotourism.

5.2 Youth in this research were the person who had age between 15 – 25 years old and studying in the higher secondary level of Dhaweewattana school

6 Research Definitions

6.1 **Ecotourism** meant the tourism that all stakeholders had the responsibility not to destroy or to degrade the natural resource and environment in the natural tourism sites by emphasis on knowledge receiving on the environment and ecosystem on the tourism site by tourism process in order to increase knowledge, experience, appreciation, awareness and consciousness for tourists, local people, and involved entrepreneurs. It was regarding to the local participation and local benefit by distributing the income, raising the quality of life, benefit return for maintenance and management of the tourism sites.

6.2 **The multimedia CAI** meant the instruction that constructed from the defined contents and it was able to present in forms of text, graphics, images, animation, sound and video, furthermore it was able to be interactive with learner by using the computer to present contents and patterns of presentation.

6.3 **Learning Achievement** meant the scores of pretest and posttest after studied the multimedia CAI by the learning achievement test.

6.4 **Youth** meant the person who had age between 15 – 25 years old and studying in the higher secondary level school, Ministry of Education.

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7 Research Advantage

The results of this study, besides obtained the multimedia CAI on "Ecotourism", but the youth who had studied the instruction would have knowledge and understanding their roles on tourism site and the environment conservation, moreover it should create them to have consciousness, to be proud for being Thai, to love the nature, and it would be the guideline for media production in the field of environmental education in both formal and non-formal education and to stimulate the stakeholders to take responsibility for natural environment and ecosystem.

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CHAPTER II
LITERATURE REVIEWS

"The Construction of Multimedia Computer Assisted Instructions On " Ecotourism " For Youth", the researcher divided the related literatures into 4 parts as follows:

1. The documents about definition of youth
2. The documents about concept of ecotourism
3. The documents about the multimedia Computer Assisted Instruction (CAI)
4. The related researches

The details as follows:

1 The definition of "youth"

The Office of the National Youth Commission developed a plan for developing youth aged 15 – 25 years (Office of the National Youth Commission, 1999: 2).

Mayuree Jarupan and Juejant Jongstityu (1985:5) officially defined youth in the National Youth Policy (which was announced for use for the first time on November 22, 1973) as follows: youth consists of people aged from birth to 24 years. The decree of the Office of the National Youth Commission, section 5, in 1978 defined youth as individuals who are not over 25 years of age.

Temsiri Bunyasing (1989:12) defined youth as individuals from 15 – 25 years of age, while youth in school consists of the youth who are going to either public or private schools. Youth not in the school system means the individuals who are aged

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between 15 – 25 years of age and are not studying in any educational institution, public or private.

From the definitions of youth as mentioned above, the researcher established the definition of "youth" for this study as individuals aged 15 – 25 years of age who are still studying in the school system of the Ministry of Education.

2 Concept of Ecotourism

2.1 The Basic Concept (Tourism Authority of Thailand, 1999: 2-49)

Tourism direction has been subjectively changed to be the sustainable tourism development in about 1980 by proposing the alternative tourism form in term of different labels or forms such as appropriate, soft, green, sustainable form, and ecotourism. Ecotourism was the pattern that was extensive expansion widely in the tourism industry rapidly. It was selected by different parts that had opinion that it was appropriate for developing to be a main form of tourism and to be proper for management, and the basic philosophy of aiming to or being a part of sustainable development (Ecotourism a Way to Sustainable Development, TAT). Understanding to this form of tourism might be similar to or closed to the other tourism forms so it might cause the confusion and unclear in some part. To give the importance to the pattern of tourism at moment, it was occurred into 2 guidelines as follows:

1) Guideline requires to define the clear frame of this form of tourism by defining the component that were rather specific in order to be a form of tourism that needs to have the management for the special group to be pertinent to the target group mostly.

2) Guideline was employed for general understanding or particular part of this type of tourism, including the using the appropriate management to apply for the tourism, which had the closed attributes or the whole tourism in order to accomplish the sustainable tourism development. It was used as standard word to assist the development or sale in the tourism marketing.

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Ecotourism is a form of tourism that aims to take care of the environment of tourism sites and various resources, particularly, ecosystem of tourism sites.

Ecotourism is a part of conservation tourism that is the tourism form that will develop to the sustain tourism according to the Universal Charter of environmentally sustainable development by considering from the existing tourism forms. It is obviously seen that the ecotourism covers some part of every form of tourism in the group of conservation tourism.

Ecotourism is different from the sustainable tourism because sustainable tourism will cover tourism form wider, and it does not regard to importance of giving education or learning or stressing on conservation raising (Rulf Buckley, 1995 cited in TAT 1997), but there is a management to decrease impact or to have no impact at all, and the tourists have satisfactions as essence or in the other word ecotourism form is a sustainable tourism form but the sustainable tourism does not have only ecotourism and it is not ecotourism form. Sustainable ecotourism is a management of tourism sites in the ecological approach that maintains the highest income and highest employment. Additionally, it support the social and cultural component of directly and indirectly involved people (Glen Hvennegaard, 1991 cited in TAT 1997).

2.2 Definition of Ecotourism

Ecotourism is the tourism with taking the responsibility to natural sites that had specific feature for particular locality and the source of culture that connected to ecosystem in that area by having the participatory learning process of stakeholders under the environmental management and participatory tourism management of the local community in order to highlight on awareness raising for maintaining the ecosystem sustainably.

Hector Ceballos – Lascurain, 1990, (Kittiwat Ratanadidok Na Puket, 1998: 41) of Inter-national Union for the Conservation of Natural Resource-IUCN. It can be said that he was the first person who established the meaning of ecotourism was a tourism

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form that related to travel to natural sites by having the objectives to admire, study, learn, and amuse with the view, plants and wildlife, including the characteristics of cultures that were appear in those natural sites.

TAT has gathered, compiled, and arranged the definition of ecotourism from different documents of foreign countries as follows:

Elizabeth Boo, 1991 who was association with the research on ecotourism in Latin America and Caribbean Islands, and wrote the report of "Eco-tourism: The Potentials and Pitfalls" had given the definition of ecotourism that the natural tourism that facilitated for conservation due to the income for area maintenance, and build the work for community or locality, the environmental awareness raising was included as well.

The Eco-Tourism Society, 1991 was the private organization that had the direct roles to provide education, planning, and distribution knowledge on the aspect of ecotourism, and it had defined the meaning of ecotourism in the primary period that to travel to visit the natural sites by having the objective of learning about culture and history of nature with carefulness of change or destruction of ecological value whilst it built the economic opportunity for local people to gain the benefit from natural resources conservation.

Afterward, the above definition of the eco-tourism Society was improved by Western, 1993 to be shorter and concise but it gave the more complete meaning through giving meaning that it was to travel with taking the responsibility to natural sites by having the environmental conservation, and making the living standard of local people better.

From the definitions of ecotourism as mentioned above, the researcher established the definition of "ecotourism" for this study as the tourism that all stakeholders have responsibility not to destroy or to degrade the environment and natural resources in the tourism sites by stressing on knowledge receiving about the

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environment and ecosystem of tourism sites and transferring through the tourism process to increase knowledge, experience, and appreciation to create the proper awareness and growing the right consciousness to tourists and local people and involved entrepreneurs. It is regarding to the local people participation and benefit by distributing the income, raising the quality of life, benefit return for maintenance and management of tourism sites.

2.3 The Main Components of Ecotourism

The scope of ecotourism covered the 4 key elements (Tourism Authority of Thailand, 1999: 2-44) as follows:

1) To be tourism in the natural tourism site as nature-based that had the identical or authentic or endemic or Unique, and the cultural and history sites connected to ecosystem in that area were included.

2) To be a tourism with sustainable management in order to attain the tourism that had responsibility travel and it had no or low impact to the environment and social aspect.

3) To be a tourism that had learning process by giving education about environment and ecosystem of tourism sites, it was increment of knowledge, experience, and appreciation to create the proper awareness and growing the right consciousness to tourists and local people and involved entrepreneurs.

4) To be a tourism that regarded to the involvement of local community or people participation to create local benefit by distributing the income, raising the quality of life, benefit return for maintenance and management of tourism sites. As a results, if any locality is able to control the development of tourism with quality approach.

Therefore, if there is any tourism has the component complete as aforementioned attributes, it was defined as ecotourism completely, however if there is lacking of any component the completeness would decrease and it may become other form of tourism (Figure 1).

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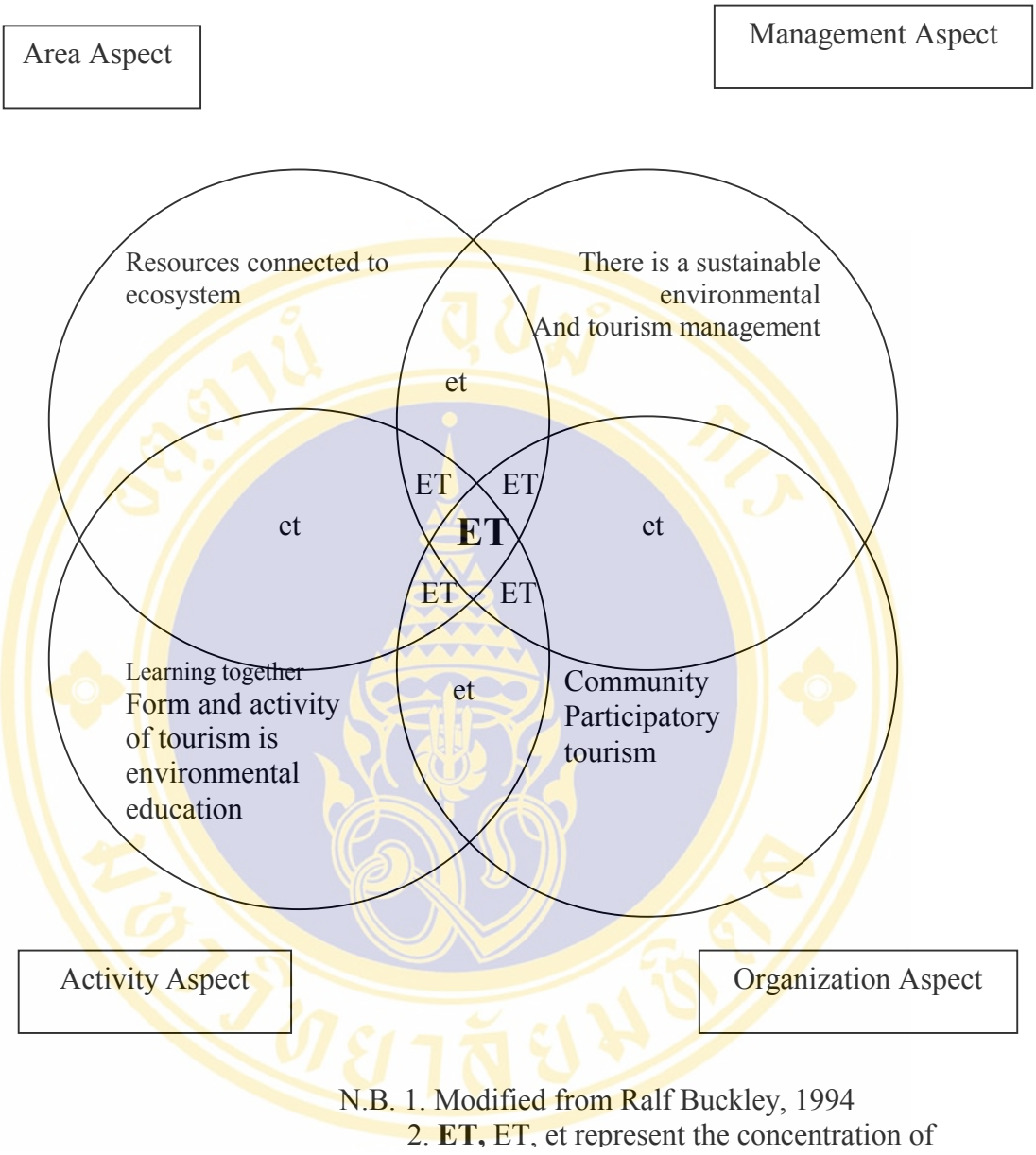

N.B. 1. Modified from Ralf Buckley, 1994
2. **ET,** ET, et represent the concentration of

Figure 1. The Important Basic Principle of Ecotourism

Hence the ecotourism is emphasizing on the natural tourism sites that is clearly separated from the interest on history and culture, and with these specific attributes that made ecotourism is not cultural tourism or historical tourism (except the features of culture that has the lifestyle as nature). In the same manner, every natural tourism is not ecotourism since it depends on its objectives of that tourism. Therefore a variety of tourism sites, there is some part is arranged as ecotourism or any tourism site may have the ecotourism and other type of tourism as well.

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2.4 Ecotourism Activity (Tourism Authority of Thailand, 1998: 44).

Ecotourism activity could be done in different patterns in the natural area that had different ecosystem such as group of ecosystem of hill forest would be emphasized on activity of camping, and using the recreation resources by using the forest, wildlife, water resources such as water reservoir, like, cascades, landscape of land form and the dominant geographical form or the dominant feature of historical value, ancient place, ancient objects and original culture of community in the area as the important principle, but for the group of ecosystem of islands and coastal areas, it was paid the attention in the aspect of marine resources that still consists of perfect beautiful natural situation such as coral reef, beautiful fishes, and beautiful beach but the hill, forest, and water resources would be the subsequent interest. Therefore, the ecotourism activity would emphasize on coastal area/ beach, and sea water mainly. For the group of wetland ecosystem, the activity of ecotourism that was the most popular was bird watching, particularly, the migrated birds that were rare for seeing. To consider that was which activity should be promoted and developed to occur in that natural area under the concept of ecotourism it should consider on the two main factors as follows:

1) Factor about area and recreation resources in the area that would be ecotourism site. The original situation and value in nature were the heart of ecotourism activity such as forest trekking depended on state of plants, wildlife, landscape, and the interest in nature as base of attraction to impress the tourist impression and satisfaction but it must not be the thing that was built or modified afterward therefore the natural tourism sites even though it was beautiful but it is vast developed from the original situation until it lost the prior feature, these tourism sites would not be in the criteria of ecotourism such as Pattaya Beach, Chonburi Province, Pa-tong Beach, Puket Province for instance. Moreover the activity of ecotourism should not degrade area and natural resources until it could not recover again. The natural area that had tendency to be impacted when the ecotourism activities are established are endangered plant /wildlife species sources etc, so it should be omitted to promote for ecotourism activity arrangement in that area.

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2) Factor about the ecotourism activity that should be promoted, besides the aim of tourist amusement and satisfaction and closed to nature, it should be an activity that promoted the tourists to a change more or less to learn the nature by channel of natural interpretation in different forms.

Nevertheless, to arrange the ecotourism activity in the natural area, it might need to consider on the other tourism activity that did not emphasize on nature and environment learning together in order to attract the tourists to be more amuse. This type of activity was called as tourism activity for ecotourism promotion, and it was activity was arranged in the natural area and it must be limited the number of tourists for group activity in order to do not build the impact to natural situation. These supplementary activities could not be grouped but it was the tourism activity that stressed on the appreciative recreational activities, and adventurous recreational activities for three tourism activities that were ecotourism activities (main activities), the appreciative recreational activities (supplementary activities) and adventurous recreational activities (supplementary activities) that can be concluded as follows (Tourism Authority of Thailand, 1998: 45) :

Ecotourism activities (main activities) (Tourism Authority of Thailand, 1998: 45).

1. Hiking/Trekking Activities

The features of activity was to walk in the forest for long distance (more than 2 kilometers) and it was the activity that let the tourists contact with the nature closely by taking themselves to nature along walking trail through the forest by passing the beautiful attractive points. Besides the tourists closed to the nature but they had a chance to learn the various things in nature from tourist guide who had knowledge of ecological aspect and had high skill in the area. Trekking activity was divided into 2 features that were struggle trekking by having the aim to create the excitement for tourists. There was walking in the trail that was rather difficult to walk, and it challenged the tourists' abilities such as climbing or walking at the steeped mountain etc. Another type of trekking activity had the aim to let the tourists learn and be

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appreciate with the beauty, strength and charming of nature. The trekking activity should not have tourists more than 15 persons and it needed to have local guide who was familiar with the area, thoroughly he should have the good ecological knowledge to educate to tourists along the trail. Trekking activity might be camping in the forest hence the all consumption things should be brought back from forest; including the wastes particularly the one could not be decomposed. It was necessity to have the bags or containers to keep these wastes back from the forest every time.

To arrange the walk way in the forest, it should be wide for one or two persons to walk, and to keep it in the prior state mostly and it should not cut the branches of tree without necessity. It should not go through the area of fragile ecological area or sources of endangered plants/ wildlife species, particularly, the area that was necessary for wildlife to live and to reproduce if the human went through it would bother their natural activities. It should be define the passed trail that had the view point to see the interesting nature, and archeological view, and water sources in order to let the tourists be fun, and not be bored. The trekking trail should not pass the dangerous point to tourists. The starting point and terminal point of trail should provide the basic facilities and labels for natural interpretation. The work unit that was the area owner should define the proper trekking and take care of the trail to be usable. The person who should plat role for trail maintenance was guide of trekking and tourists that should keep the cleanness and should not destroy the natural situation and understand to practice themselves when they traveled in these natural area.

2.Nature Education

Feature of Activity: was the tourism activity did not only support the tourists to be amuse from the travel in the natural area but also received the knowledge about the nature on different issues through the program of nature interpretation in different forms that was held in the area.

The facility that promoted this type of tourism activity was visitor center, label for nature interpretation, wayside exhibition, outdoor exhibition, including the nature interpretive trial arranged for tourist to touch and to learn the stories of the

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nature in the area. The feature of the nature trail should not be too difficult to walk and it should be cut pass through the interesting point and to be able to provide knowledge of nature to tourists by arranging the sign for nature interpretation to explain and / or to give knowledge about nature that was not too difficult to understand for tourist along the trail or to provide the leaflet as self-guided trail for tourist to study or to have a guide to explain the nature walk trail and it should not too long distance (about 1-2 kilometers) and it should be a loop trail style.

To maintain the visitor center and outdoor exhibition were the duty of the officer of work unit in the area, and the program of different nature interpretations in the center might be supported by TAT and private sectors. To maintain the nature trail should be the obligations of the officer of work unit in the area by cooperation with tourists and guides. The work unit in the area should have duty to take responsibility to be in the good state for use by not degradation, keep clean such as preparing the garbage bin at the proper point in the trail for disposing the waste regularly.

The tourists had duty to follow the area regulation to keep clean, and did not destroy the objects such as drawn the labels, dragged and wrote on the sign or label or stone or three and did not make a loud noise or bring radio and the musical instrument to play to annoy the animal. Guide should have duty to give knowledge to tourists before entering to the forest to do any activity by explaining about how to practice to conserve the natural state and not to cause impact to the area. To control the tourist to follow regulations, it was the duty of the officer of work unit in the area who took the responsibility.

3. Nature Photography, Video Taping and Sound of Nature Audio Taping

Feature of Activity: was taking the photograph, and taping the video for natural view and interesting things, which was the detail in the nature such as flowers, rare plants, and animal foot-print for instance, including recording the natural sound liked as sound of water falling, water flowing, bird singing, insect sounds, and other animal sounds.

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The facility that prepared for this type of tourism activity was nature trail that provided for tourist to walk in order to take the photograph, to tape video, to record the sound at the beautiful and interesting view point, thoroughly the details or historical objects. Guideline to maintain the nature trail for this type of activity, it can be done in the same way like as the trekking nature trail.

4. Bird Watching

Feature of Activity: was the special activity for the person who was interested in watching birds. The various kind of bird were the attraction of this type activity, they were the local bird, the migrated bird, and rare species. The trail for this type of activity should be wide enough for two persons to walk together, and it should not have any development, except the rest station for the tourists to record the story of birds that had been watched. The group of bird watching should not be too large so it should not be more than 5 persons per group, and it should have guide who had knowledge about birds and nature in the area for the tourist who lacked of skill of bird watching activity before, in addition the guides should prepare the camera for bird watching, bird guide books for the tourists and they can get the fee for borrowing for the activity in the aspect of bird and bird habitat conservation.

The importance of trail arrangement, it should not pass through the area that the bird netting, or egg laying, and it should be have strict control by not allowing to have tourism during the period of egg laying or reproduction for instance.

5. Cave Exploring/ Visiting

Feature of Activity: was the activity that the tourist had a chance to learn about the cave such as process of cave formation, feature of rock/minerals and the geographical form, type of cave, living thing in the cave, and cave maintenance etc. Moreover, the tourist would amuse from the unique strange beautiful cave. To visit the cave, particularly the one that had not enough light and the cave was deep and had a maze pattern, it needed the guide for providing the safety for tourists. The management of tourism service, it should provide the facility for tourists and for cave maintenance such as rising the walk way in the case of flooding, having the program

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of nature interpretation, giving the suggestion about cave exploring, and other facilities, for instance. It was the duty of work unit the area that might be asking the cooperation from academic persons from other units or private sectors, subsequently, the work unit had duty to control the tourists to practice follow the regulation, and provided the security for tourists as well.

6. Sky Interpretation

Feature of Activity: was the activity that the tourists had chances to learn about the sky and astronomy, type of star and group of stars, feature, position, and orbit consequently, the history and the relevant native story. The natural area that appropriate for this type of activity was the open area or the high plain such as islands, the open coastal area, open field without the big trees to block the sightseeing for instance. The proper season for this type of activity was winter season because there was no cloud to block the sky. This activity needed the experts to give knowledge for tourists; it needed the equipments to accomplish the activity such as telescope, and astrological map.

7. Boat Sightseeing

Feature of Activity: was the activity that let the tourists touch and learn nature, it needed the guide to give knowledge, and to make amusement. Boat sightseeing can be done in both waterway, natural water sources, sea or water reservoir that had the natural environment surrounding. The caution for this type of activity were oil spill to the water resources, waste, noise pollution from the engine disturbance, and not to disturb process of egg laying and reproduction of aquatic animal. It was the responsibility of tourist entrepreneurs, tourists, and the officers of work unit in the area to control the tourism activity not to cause the environmental impact and natural environmental degradation. Furthermore, the necessary area development was the point of ferry for boat, which was to design to harmonize with the nature.

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8. Canoeing/ Kayak / Browbeating /Sailing Boat

Feature of Activity: was the activity that let the tourist touch, learn the nature, and use their ability to control the boat, and exercise. It can be done in the waterway, natural water sources, sea or water reservoir that had the natural environment surrounding. The caution for this type of activity were number of boats, oil spill to the water resources, waste, noise pollution from the engine disturbance, and not to disturb process of egg laying and reproduction of aquatic animal. It was the responsibility of tourist entrepreneurs, tourists, and the officers of work unit in the area to control the tourism activity not to cause the environmental impact and natural environmental degradation. Furthermore, the necessary area development was the point of ferry for boat, which was to design to harmonize with the nature.

For the activity of boat rowing, it should be an appropriate proportion in order to control the crowdedness so it should have the proportion as follows:

-Canoe boat, kayak boat, browbeating boat, it should be 1 boat per 2.4 kilometers length of waterway

-Sailing boat. it should be 1 boat per 0.00 4 square kilometers of waterway area.

9. Snorkel Skin Diving

Feature of Activity: was the activity that let the tourist touch, learn the nature of under the sea that was colorful and beautiful so they was able to learn about aquatic plants and animals without the using of scuba for diving but use only snorkel. The proper area for this type of activity should not be deep more than 0.9 meters and it was the source of complete diverse coral reef and the beautiful plants and animals, and complement with the not vigorous stream and clear water so it should arrange the undersea self-guided trail and handbook for study about undersea resources for tourists.

The importance should be regarded about the activity that had the attributes as the same as snorkel skin diving, nevertheless it should pay the attention about the safety.

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Appreciative Recreational Activities, Adventurous Recreational Activities

1. Relaxing

Feature of Activity: was the activity that provided the chance for tourists to admire and close to the nature, and it was supplementary activity that supported the other activity of ecotourism as aforementioned. The sightseeing can be done in the manner of walk trail that arranged for relaxation along the beaches or any point that the tourist can take a rest for sightseeing and the peaceful station for recreation resources, which was the importance for this type of activity. It can be said that the tourists had a chance to admire the nature closely, and to realize the importance about the nature around the tourists so it would promote the tourism site be more valuable.

Besides the sight seeing the nature was done in the manner of sitting in the car along the trail by passing the beautiful places and there was appropriate station points along the way. It should be arranged wayside exhibition at rest station as the important recreation resources for this activity, which was the scenic beauty, including the various sequence of landscape along two sides of the trail. This activity should be highlighted on quality of tourism that paid respect to nature such as not doing the loud noise, keep clean etc.

2. Terrain / Mountain Biking

Feature of Activity: was the activity that required the mountain bike and the trail should not be the same as walk trail for trekking or nature education or bird watching. There was different level of steep by beginning with 0-20 percents. The criteria to select the trail was the same as the development of walk trail that it should not pass the area for necessity of wildlife living, and reproduction. The landscape should have the different features in order to challenge the tourists not to bore, thoroughly, there was an interesting point, natural beauty, and not cutting the big trees, and no need to build the trail with the construction materials, but it may have water drainage or simple wood bridge or water channel.

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The work unit in the area had the obligation to maintain the mountain bike trail to be the good condition to be usable and keep clean, furthermore, they should regulate the tourist to follow the regulation such as biking in the prepared trail, and provide the assistance as necessity according to the tourist requirement.

The tourist should obey the area regulation and keep clean by not throwing the garbage along the trail, and they should not make noise during biking.

3. Rock /Mountain Climbing

Feature of Activity: was the activity that served the tourists' demand in term of challenging with the difficulty that occurred according to the nature creation. The area that was allowed to climb should be safe at one level and it caused the damage to nature both inside and outside the boundary that arranged for climbing.

4. Tent Camping

Feature of Activity: was different pattern of tent camping by beginning with the developmental pattern in the service areas to the simple overnight at the forest, which had no any facility. However, the tent camping activity aimed to let tourists live and touch closely with the nature by not depending on the facility more than necessity. It was an activity that was done together with other activities such as trekking, nature education, and bird watching etc.

The work unit should have duty to look after the camping area to be clean. In the case of camping in the service area, it should have the necessary facilities such as area for camping, garbage bin, bathroom, toilet, and cooking area, and camp fire area, including arranging the camp fire activity to learn about the nature or having the proper behavior to travel in the natural area.

The tent camping activity should stress on let the tourist close to the nature more than have fun by singing together, and drinking until it destroyed the peacefulness of area at the camping site The camping site of each group should be separated and have the private appropriately.

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The tent camping activity was the activity that brought tourists themselves to close to nature and searched for peacefulness that it could not be found in the city. It was not activity that held for fun only. Therefore the tourists should help in maintenance the area that was camping by throwing the garbage to the proper places and not using the difficult to decompose materials, and if it needed to be used they must brought outside the area as well.

5. Hang Glider

Feature of Activity: was the activity depended on hang glider without engine by using aerodynamic principle to control the hang glider by hanging from the high cliff with self-controlled but this type of activity can cause the sight pollution in case of too many activities.

6. White Water Rafting

Feature of Activity: was the activity that aimed to emphasize the tourist to touch the nature, and gain an amusement from the velocity of stream, different level of waterway, the state of the two sides of landscape, rubber boat/ rubber raft so it should have the capacity for rafting and knowledge in the aspect of nature. The number of tourists per raft should be about 4-6 persons and it depended on the size of raft/ boat. The criteria for proportion of raft to waterway area were the same as the activity of canoeing. Before the activity was started, there was an introduction about the characteristics of activity, self-performance, and the importance rules for safety and receiving the good experience from activity performance. It may arrange the overnight at the bank as complementary activity besides the activity of raft/ boat rafting and this activity needed to provide the up and down point of ferry for rafting.

7. Picnicking

Feature of Activity: was the activity that a recreation by picnicking or buying food from the shop nearby. It was activity that arrange to join with other activities such as visiting waterfalls, trekking, biking, and nature trail walking etc. It should arrange the place for resting and picnicking in the ecotourism area that had peaceful circumstance so the tourists would admire with the nature better than in the

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atmosphere of noisy with the musical instruments. Therefore the work unit that was the owner of area should provide the area for this type of activity and complement with suit of facility such as table, bench, rubbish bin , and the grilled stove, and this area should be shady and good point for sight seeing for scenic beauty but it should not be the ecological fragile area, and not far from the parking space.

The tourist needed to keep clean, and were careful for fire, and did not feed the wildlife or left the food after they finished eating. The containers was thrown away should be the disposed materials, and if there was no place for waste disposal so they should bring the rubbish back.

8. Waterfall Visits / Exploring

Feature of Activity: was the popular activity for forest tourism- mountain, waterfalls were important components of tourism sites. To visit waterfall, there were many complementary activities such as swimming, surveying, picnicking, or sight seeing so it should arrange the program of nature interpretation for tourists to receive knowledge about waterfall and other interesting environments together by highlighted on the activity that did not damaged the natural peacefulness, the waterfalls area should free from foods and drinks in order to keep the environment of waterfall.

The tourists should be quiet and did not disturb other persons, and price themselves for their safety. the work unit that was the owner of area should keep clean and looked after the tourists to follow the regulation and provide the security for them.

9. Wind surfing

Feature of Activity: was the water activity that made fun and exciting, and it was self-satisfaction of ability about to control the wing surfing. The appropriate area for this type of activity should be open water source and it had wind current, but it was not turbulent and surrounded with beauty scene.

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These ecotourism activities can be considered on promoting in the natural tourism areas that had high potential, nevertheless, to promote activity, it needed to carefully consider on the possibility and capacity of area, and limitation of management to avoid the impact to environment due to these activities. In order to let the ecotourism management in the natural area accomplished the aims of ecotourism and was appropriate for Thailand.

2.5 The Situation of Ecotourism in Thailand (TAT, 1999: 4-1)

Thailand had high potential tourism as a whole because there were different tourism resources that were well known, beautiful, unique culture, and peaceful land. The tourisms are implemented in the present are the cultural approach, education tour, and recreation, therefore the tourism is in the pattern of being causal or recreation, shopping, and travel in the different sites. The new tourism that is the alternative tourism such as education tourism, ecotourism, and are not popular adventure tourism and there are not readiness to serve the tourists since it lacks of the clearness in the promotion, and including lack of the appropriate management.

When considering on the tourism situation in the moment according to various component, it can be concluded as follows (TAT, 1999: 4-11):

Tourism Site Resources

From the primary potential of ecotourism site evaluation in Thailand by classifying the level of potential according to the feature of resource, it was emphasized on the essence of ecosystem in the area, identity, pure tradition, attraction for tourism, and ecotourism management therefore ecotourism was arranged into 5 potential levels and the Level A and level B were high potential and proper to be developed to be a ecotourism site. There were the tourism sites as types of waterfall, forest, and islands (coral reef) that most of them were in the national park, but for the cultural tourism sites had few sites and it was community type, historical site, archeological site, and temple that were still keep the ecosystem.

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The province that had potential to be ecotourism sites were as follows:

- South Region: The provinces that had highest potential were Satul Province, Surachthanee Province, Pang-Nga Province, Trang Province, Chumporn Province, Krabi Province, and Ranong Province. These provinces had the islands and it was the sources of coral reef as main resources. It can be classified as tourism group that were upper Andaman group(Puket Province, Pan-Nga Province, Krabi Province, and Ranong Province) and lower Andaman group (Satul Province and Trang Province).
- North Region: There were Chiangmai Province, Nan Province, Tak Province, and Mae-Hong-Sorn Province that had the forest, waterfall, community, and caves as main resources. It can be classified as North-West group, and Nort-East group by including the nearby provinces as network.
- Middle Region: There were Kanchanburi Province, Trad Province, Petchaburi Province, and Saraburi Province that had the natural resources as forest, waterfall, caves, and coral reef. It was classified into 3 groups by including the nearby province as network.
- North-East Region: There was only Loei Province that had the highest potential, subsequently Udornthani Province, and Mukdaharn Province.

However, in the development, it should regard to the province that had high potential even though, it had not much sites but it should develop as particular area. Especially, in the national park, and forest park, they could be an ecotourism at all.

Tourism Market

Tourism market meant the demand of tourisms towards the tourism resources, and the demand was reflected in features of patterns, activities, and behavior of tourists that were different according to group of tourists as race and age.

Tourism market as whole of Thailand can be classified into 2 groups the foreign tourists who entered to travel in Thailand, and Thai tourists who travel in Thailand.

The foreign tourists were estimated to have the ecotourism activity were 2,043,733 persons or 29.40 percents (The estimation of the Research Institute of

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Science and Technology of Thailand, from the data of tourist in 1995) of total foreign tourist, and the tourists who had concentrated ecotourism activities were 1,883,242 persons or 27.09 percents of total foreign tourists who entered into Thailand. It was classified as European tourists were 578,127 persons (34.30 percents of European tourists) Asian tourists(excepted Asean) were 1,080,514 persons (36.10 of Asian tourists), and Australian group 64,009 persons (26.6 of Australian tourists and nearby country), and from Asean group 223,035 persons (13.70 percents of Asean tourists). The activities that tourists participated in were forest tour, bird watching, animal seeing, snorkel skin diving, trekking, and nature study, and nature education, were 661,752 persons, 464,318 persons, 458,316 persons, 430,399 persons and 312,084 respectively.

Thai tourist were estimated to be ecotourism 12,130,435 persons or 67.39 percents (the estimation of the Research Institute of Science and Technology of Thailand, from the data of tourist in 1994).

For Thai tourists, there was about 12,130,435 persons or 67.39 percents were ecotourism tourists (the estimation of the Research Institute of Science and Technology of Thailand, from the data of tourist in 1994) of total tourists who traveled in Thailand.

The concentrated ecotourism tourists were 11,774,704 or 65.41 of Thai tourists. The activities were participated by the Thai tourists were nature education, bird watching/ animal seeing, cave exploring, snorkel skin diving, camping, rafting, trekking, and nature walk, were 6,865,613 persons, 4,766,798 persons, 2,845,850 persons, 2,632,411 persons, 2,561,265 persons, 2,418,972 persons, 2,276,680 persons, and 2,098,814 persons respectively.

Tourism Service

The important service for ecotourism was composed of shelter/food service, traveling/guide service, and other tourism activity services.

1) Shelter service: there were different types of shelter, and generally, the tourist shelter was divided into as follows:

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(1). Hotel and bungalow had numerous types but there was no arrangement and management as a eco-lodge truly, but there was only some resort that had suitable feature for eco-lodge development.

(2) The lodge in national park of Department of Forestry had every parks of 105 parks. Some park used the officer houses for tourist lodge, besides there was tent and camp in all national parks. At present there are 28 parks 163 houses, total 336 rooms, and all these type of shelters are suitable for ecotourism shelter but most of them lack of pattern and the complete management according to ecotourism.

(3) Governmental shelter such as shelter in the dam, water reservoir, Boy Scout camp, operation center in the area of different work unit, there was not arranging for business service, so most of them were still arranged in the attribute of ecotourism shelter.

(4) Home stay was a pattern that aimed to let the house owner have income and exchange the cultures. It was new styles of shelter that was in the tried out period of stakeholders such as Ban Prasart (Supported by TAT), Ban Kiriwong, Nakorn Sri Thammarach Province, Yao Island, Pang-Nga Province, and Ban Siraraeng, Nan Province (Supported by Volunteer for Social fund), Ban Linthin (Natural Conservation Tourism Service Cooperation, Kanchanaburi Province), and hill tribe village according to the trekking trail in the North Region for instance. These types of shelter could be able to develop to be eco-lodge.

2) Traveling/ Guide Service

The most activities were served were the trekking (overnight) had the 59.5 percents of service of entrepreneur, subsequently village/ community traveling, rafting had 42.9 percents only. For cave visiting, snorkel skin diving, nature study, bush traveling, rubber rafting, and bird watching were 40.5, 33.3, 33.3, 31.0, 26.2, and 23.8 percents respectively. Besides there was wildlife tour activity, browbeating, and skin and deep diving.

Presently, ecotourism service still lacks of standard and direction for implementation, so the server requires the right suggestion and support from the involve work unit, besides there is lack of the special guide who give clear detail information for tourists.

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Education and Awareness Raising

Since the requirement of tourism server was a process of education provider and awareness raising for tourists and stakeholders in order to assist for tourism resources maintenance, and environment as a whole so it affected to the education provider pattern in the system by arranging the curriculum in the educational institute or training/seminar, and provide the learning process in the tourism sites by using nature interpretation in numerous forms, and giving the data, information, education through the all type of mass media.

-Educational Institute

In 1996 there were educational institutes that open for hotel and tourism teaching 69 places from the report of TAT, it was found that There were institute that taught in the bachelor degree, diploma, vocational training for 1-3 years and guide training 57,37, and 26 institutes respectively, and it open all three curriculums for 13 places, besides there was other institutes provide education in the tourism aspect increasingly such as Mae Jo University had the curriculum of environmental conservation, Srinakarintarawirote University had established the institute of Tourism for Environmental Conservation Development, Faculty of Forestry, Kasetsart University, and other universities established the environmental curriculum about the environmental planning, environmental management, and environment and natural resources administration, and geographical aspect, including the principle of tourism, particularly, the ecotourism was included in the teaching.

To consider on this study view, it viewed on the organization potential that would well support for ecotourism further.

-To arrange the interpretation were generally presented in the tourism sites in the national park but it had not enough quality for changing the behavior and awareness raising seriously.

-To give the information through media

For information giving, and educating through the common various mass media and it was interesting by the tourist and public people highly but it lacked of the presentation with the certain shared directions and targets clearly in the ecotourism. Mainly, there was highlight on touching with the new experience in natural sites or culture only.

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People Participation

The concept of participation by emphasizing on the participation of local people was in the limited boundary and lack of balance such as the cooperation between the national park and local organization for ecotourism development, and the cooperation between the people in the area and the area controller who looked after the resources, and the link between the entrepreneur and government sectors for instance.

The form of people participation was still had the feature of activity arrangement about supplementary income from tourism so it was business in tourism more than taking part in the process of tourism development. There was only some local administrative organization had a chance to manage. In some area, the people had established the group and implemented the tourism management by themselves by proposing the community visiting at their agricultural area of community and closed conservation area such as Ban Kiriwong, Ban Yao Island, Ban Prasart, Ban Linthin, Karen Village, Elephant feeding village, and villages in the conservation forest boundary for instance.

TAT mentioned about situation of ecotourism that Thailand had high potential tourism as a whole because there were different tourism resources that were well known, beautiful and unique culture but ecotourism is not popular adventure tourism and there is not readiness to serve the tourists then the multimedia CAI on ecotourism could give information about ecotourism for tourists and person who interested in this instructions had knowledge and understanding about conservation of tourism resources and maintain environment of Thailand .

2.6 Environmental Impact from Ecotourism (TAT, 1999: 3-58)

The environment might be impacted by the tourism activity, it might be considered as follows:

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2.6.1 Problem Origin

The problem origin in hereby meant person or activity that caused the lost or degradation to something or to someone who was involved at one time and one place in the ecotourism. The polluter can be defined into two groups as tourist group and the tourism activity was included, and tourism service group (shelter service/food shops for instance).

1) **Tourist Group and Tourism Activity :** ecotourism tourists are the people of every race, sex, and age who are interested in the tourism site that they travel by they would have the tourism activities in the natural tourism sites, and historical-cultural tourism site that connected to ecosystem.. There were diverse activities of natural tourism such trekking, nature study, photograph taking, sound recording, animal seeing, bird watching, cave visiting, sky interpretation, boat sightseeing, coral reef diving, animal foot print/ excrement studying. Tourism activities involved natural appreciation and recreation, and adventurous recreation such as viewing, biking, climbing, camping, rafting, glider hanging, recreating/picnicking, waterfall playing, swimming, horse riding, elephant riding, fishing, golfing, and sport playing for instance. Tourism activity of historical-cultural tourism sites such as beauty seeing, ancient studying, and historical erected studying, praying according to their believes, photographing, learning the living, and souvenir shopping.

2) **Tourist Services :** tourist service hereby are food shop service (it will be local shop with the familiar service) and shelter service for tourists by serving the shelter that may be tent, entertained house, resort, eco-lodge, hut, bungalow, and hotel for instance.

2.6.2 Impacted Area

The impacted area, particular the negative impact both indirect and direct impacted from the tourist practice, tourism activity, and tourism service such as tourism area, tourism trail that served for tourism and local community.

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2.6.3 Impact from Ecotourism

Impact from ecotourism occurred within the tourism sites due to the tourism activities, and shelter/ food services had the features and severity more or less difference according to the situation of area and the state of fragility or carrying capacity in the area. The impact composed of soil erosion, noise disturbance, dust, garbage, animal and plant disturbance, forest destruction, resources rupture and degradation, scraping, destruction, oil crust , burning, and encroaching the public area for instance.

Table 1. Tourism Activity According to Objective, Area, Size, Form, and Impact

Tourism Activity	Objective	Area	Size	Form / Equipment	Impact
Appreciative Recreational Activities, Adventurous Recreational Tourism Activities					
1. Trekking	- Study to search for knowledge - Fun -Touch nature -Exercise -Exchange and transfer experience -Adventure	- Forest – Mountain -Steep area -Stream/ Islands - Waterfall - Cliff - Cave	- Individual - Small group	- Overnight -Have Guide -Short walk -Not Overnight	- Waste - Loud Noise -Step on the plant/ cut the tree branch - Disturb the egg laying of bird/ Reproduction -Involved community
2. Nature Education	-Relaxing - Study knowledge -Touch nature and components	- Forest – Mountain/ Savannah - Mountain - Cave - Cliff -Dam/ Reservoir	- Individual - Small group	- Have Media -Have Guide -Not Overnight	- Waste - Loud Noise - Destroy View - Ancient place (Temple, Palace, Ancient city)
3. Animal Seeing/ Bird Watching	- Study knowledge -Touch nature	- Forest – Mountain/ Savannah - Mangrove - Mountain	- Small group	- Overnight -Not Overnight -Have Guide,Media (telescope)	- Disturb the egg laying of bird/ Reproduction

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Table 1. Tourism Activity According to Objective, Area, Size, Form, and Impact (Continued)

Tourism Activity	Objective	Area	Size	Form / Equipment	Impact
4.Cave/ Waterfall Visiting	-Relaxing - Study knowledge - Adventure -Touch nature	-Cave and surrounding - Waterfall / surrounding	- Individual - Small group	-Not Overnight -Have Guide - Have trail conductor - Have Media (Label)	- Waste - Scraping the cave wall - Destroy View Step on the plant
5. Boat Rowing / Canoeing/ Kayak /Browbeating /Sailing Boat /Wind surfing	- Relaxing - Exercise - Adventure - Fun -Touch nature	- Sea -Dam/ Reservoir -Stream/ Islands	- Individual - Small group	-Not Overnight	- Disturb the egg laying of aquatic animal Reproduction of aquatic animal - Waste - Noise
6. Diving to see the coral	-Study nature -Touch nature	- Sea / beach - Islands / Rocks	- Small group	-Not Overnight -Have Media (Handbook for diving)	-Coral reef was damaged by anchoring -Oil Spill -Step on -Collect
7. Camping	-Study nature	- Forest – Mountain/ Savannah -Sea / beach -Open area/ Public area	- Small group	-Overnight	-Waste -Excretion -Loud Noise -Burning -Disturb animal habitat
8. Rafting	-Adventure -Fun -Touch nature	-Stream/ Islands	- Small group	-Overnight -Not Overnight -Have trail conductor	-cut wood to make raft -Waste - Disturb the egg laying of aquatic animal
9. Horse and Elephant riding	-Fun -Touch nature and components	-Forest -Mountain -Community -Savannah	- Individual - Small group	-Not Overnight -Have Guide Mahout/ Trainer	- Step on tree

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Table 1. Tourism Activity According to Objective, Area, Size, Form, and Impact (Continued)

Tourism Activity	Objective	Area	Size	Form / Equipment	Impact
10. Photographing / Video taping / Sound recording	-Touch nature and components	Forest/ Mountain -Savannah -Waterfall -Cliff	- Individual - Small group - Big group	-Have Guide -Supplement other activities	
		-High plain -No cloud -Open beach -Islands	- Small group - Big group	-Have Guide -Have Astronomist - Have Media (Camera and Map)	-few impact -Waste -Require shelter
12. Mountain Biking/ Traveling	-Relaxing -Study knowledge -Touch nature -Exercise -Adventure	-Forest/ Mountain -Steep Area	-Individual - Small group - Middle group	- Not Overnight - Have Media (Label) - Trail	-Loud noise -Waste -Cut the tree branch -Safety
13. Climbing	-Touch nature -Exercise -Adventure	-Mountain -Cliff	- Individual - Small group	-Overnight -Not Overnight	-Cut the tree branch -Soil and Rock erosion
14.Fishing	-Relaxing -Adventure	-Stream/ Islands -Dam/ Reservoir -Sea	- Individual - Small group	-Not Overnight	
Historical and cultural Tourism Activities					
15. Beatty/ ancient/ identity	-Relaxing -Study knowledge -Touch components	- Ancient place (Temple, Palace, Ancient city) - World heritage	- Individual - Small group - Big group	-Not Overnight -Have Guide	-Waste -Community crowding -Noise from automobile
16. Study the history of tourism site	-Touch components	-Community -Temple -Ancient place (Ancient city)	- Individual - Small group - Big group	-Not Overnight -Have Guide	-Waste -Community crowding -Noise from automobile

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Table 1. Tourism Activity According to Objective, Area, Size, Form, and Impact (Continued)

Tourism Activity	Objective	Area	Size	Form / Equipment	Impact
17. visit art, and culture	-Appreciate -Learn	- Artistic site - Temple, Palace, - Community	- Individual - Small group - Big group	-Not Overnight -Have Guide	-Waste -Community crowding -Noise from automobile - Scraping, touching
18. join the learning behavior activity	-Relaxing -Exchange -Transfer experience	-Festival -Tradition - Community -Handicraft - art house	- Individual - Small group - Big group	-Not Overnight in community -Not Overnight	- Cultural change -incomplete exchange
19. Study souvenir and local goods	-Learning -Response requirement -Shopping	-Handicraft house -Art -Market	- Individual - Small group - Big group	-Not Overnight -Have Guide	-Community crowding -Noise from automobile -take advantage, and deceive
Management system of tourism activity					
20. Boat sightseeing	-Study knowledge -Relaxing -Touch nature	-Stream/ Islands -Dam/ Reservoir	- Small group - Big group	-Overnight -Not Overnight -Have Guide	-Oil spill -Waste -Excretion
20. Boat sightseeing (Continued)			- Individual - Small group - Big group	-Boat for rent	- Noise - Irritate the Ecological situation
21. Sightseeing	-Relaxing -Touch nature	-Dam/ Reservoir -Cave -Waterfall -Sea -Public Park	- Individual - Small group - Big group	-Not Overnight -Media (Label)	-Waste -Noise -Destroy the scenic beauty -Scraping, on tree, cave, label

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Table 1. Tourism Activity According to Objective, Area, Size, Form, and Impact (Continued)

Tourism Activity	Objective	Area	Size	Form / Equipment	Impact
22 Relaxing Picnicking	-Relaxing -Touch nature	-Cave -Waterfall -Dam/ Reservoir -Public Area -Public Park	- Individual - Small group	-Not Overnight	-Waste -Noise
23. Swimming Sun bath	-Fun -Relaxing	-Stream/ Islands / Waterfall -Sea -Dam/ Reservoir	- Individual - Small group - Big group	-Not Overnight	-Water pollution -Waste
24. Praying according to belief	-Relaxing -Touch component	-Temple -Ancient place	- Individual - Small group - Big group	-Not Overnight -Have Guide	-Waste -Community crowding -Noise from automobile
25. Photographing	- Touch component -Relaxing	-Temple -Ancient place -Festival -Tradition - Community -Handicraft, art house	- Individual - Small group - Big group	-Not Overnight -Have Guide -Other additional activities	-Step on the tree -Destroy the ecosystem -Community crowding
26. See/Sport	-Exercise	-Stadium	- Individual	-Overnight	-Noise from automobile
27. Meeting-Seminar	-Exchange Knowledge Experience	-In city/ service place -Conservation area	- Big group	-Overnight	-Noise
28. Entertainment	-Relaxing -Fun	-In city/ service place -Arrange in the tourism site	- Small group - Big group	-Not Overnight	-Might have the activity degrade the morality, drug addict -Noise disturbance

Sources: The Final Report of Implementation for Establishment of Ecotourism Policy by the Research Institute of Science and Technology of Thailand

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3 Related Documents about Computer Assisted Instruction

3.1 Meaning of Computer Assisted Instruction (CAI)

The numerous academic persons gave the meanings as follows:

Kidanan Malithong (2531: 168) gave meaning of CAI that it was the teaching technological media, which provide the interaction between the learner and computer liked as the teaching-learning between teacher and student in the regular classroom. Moreover, CAI was able to response the information that was fed by the learner promptly so it can be a supportive force for learner.

Sanit Kayapad, (2536: 16) referred to CAI that was the instrumental teacher assistance for teaching-learning approach excellently. The students can learn by themselves from the computer. The contents were systemically loaded to the computer program., in addition it was able to let the student to press any key according to the defining of computer program. The good CAI should be designed for learner to use easily by selecting press according the program command.

Buppacharti Thunhikorn, (2538: 2), gave the meaning of CAI as the teaching-learning form that used the computer to assist for teaching-learning in every form but the majority was used for student to drill and practice, test, tutorial, instructional game, simulation, and diagnosis the defect of student. It was learnt in the styles of learning from electronic book, and it was used to define the situation for student in term of problem solving.

Surasee Chingtin, (2540: 220) uttered that CAI was a type of programmed instruction, instead of using the lesson in form of programmed text book. CAI had feature like a book that composed of numerous pages together, and saving multimedia in form of screen that can be used by learner and teacher all the time.

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Thanoporn Laohachrussaeng, (1998: 7), presented the meaning of CAI as a form of teaching-learning media by use the capacity of computer for multimedia presentation as texts, pictures, graphic, chart, graph, animation, video and sound for transferring the contents of lessons or body of knowledge in the attribute that closed to the atmosphere of classroom mostly. CAI was a good example of media, which was able to educational media of one by one pattern so the learner learnt by interaction or response together with feedback regularly with the content and activities of CAI due to learning. Besides the CAI was a medium that was able to well respond to the difference of learner , including being evaluation, and examination the understanding of learner all the time.

Burana Somchai, 1999: 17, concluded that multimedia CAI was the computer ability to present in all form of media such as picture, sound, video, and interaction.

3.2 Important Characteristics of CAI

Thanomporn Laohacharussaeng, (1998: 8-10) referred to the important characteristics of CAI had 4 attributes as follows:

1. Information

Information hereby meant the good arranged content that caused the leaner to know or a gain skill according to the defined objectives by presenting the content in different form that may be direct or indirect.

2. Individualization

The different individual response was the important characteristics of CAI because each individual had different learning as a result of the personality, intelligence, interesting, different basic knowledge since the individualization was high flexible for learners to control their learning, in additionally, selection of the proper form to be suitable for themselves. There were diverse characteristics but the importance were as follows:

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a. To control the content by selecting to learn in which part and skip which part of the lesson or to return back to the one that was passed over.

b. To control the learning sequence by selecting to learn which lesson as priority or subsequence or creating the learning step by themselves.

c. To control the practice and test by selecting to do or not do, and few or much according to their desires.

3. Interaction

Interaction hereby meant the interaction between the learner and CAI lesson , the best learning approach was the teaching-learning in the manner of providing the chance for learner to interact with teacher as most as possible. Besides, the effectiveness of human leaning ability was not only observing, but it must have the response or interaction, particularly, the being interactive with the teachers. Therefore, The good designed CAI should facilitate for the interaction between learner and CAI lesson continuously for the whole lesson.

4. Immediate Feedback

Immediate feedback to learner punctually, the complete CAI less must had the test or evaluation for content understanding of learners or the skills according to the set objectives so to immediate feedback was the mean to assist the learner to examine their learning abilities.

3.3 Types of CAI

Thanomporn Laohacharussaeng, (1998: 11-12) classified the type of CAI into 5 classes as follows:

1). CAI as Tutor was the CAI the present the content to learner whether be a new content or revised for the prior content. Most of this type would have the test or exercise for testing the learner understanding. Nevertheless, the learner had independence to choose to make the decision to do test or exercise or not or how or to select which part of content, and to sequence in which form because to learn by CAI the learner were independent to control content as their own desires.

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2) CAI as Exercise Type was the CAI that stressed on providing for learner to do exercise until they were able to understand the content in that lesson from CAI as lesson type. It was very popular particular in the university level owing to there was open a chance for the poor student or the incapable to keep up in the class so they could revise the important taught lesson by teacher and kept up the others and it did no need to be explained again in the classroom over and over so it would be increased teaching effectiveness.

3) CAI as Simulation Type was the CAI that presented the lesson in term of simulation by imitating the actual situation and commanding the learner to make decision to solve the problem of the lesson, and providing the recommendation for decision making of learner and presenting the learning results of decision making. The usefulness of this simulation type of CAI was to decrease the cost and danger that might be happened in the real situation.

4) CAI as Games Type was the CAI that made the user to be fun, and to be amuse in order to forget that they were learning. Educational game CAI was an important since the CAI would stimulate the learner to be interested in learning. It was popularly used by beginning from the primary school level to high school level. Moreover, it could be used in the university level to be good basic attitude for leaner about computer learning.

5) CAI as Test Type was the computer program using for test construction, examination management, for score checking, calculating the test results. The advantage point of this type of CAI was that the learner received the immediate feedback, which was the limitation of other type of tests that were used in general. Furthermore, to use the computer for test calculation, there were good points of accuracy and speediness.

From any types of CAI were described, research used tutor type for constructed multimedia CAI on " Ecotourism "

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3.4 Usefulness of CAI

Thanomporn Laohacharussaeng, (1998: 12) had divided into 3 issues as follows:

1. CAI was occurred due to the attempt that tried to help the learner who were poor for learning would be able to use the out of class time to practice skill and to increase knowledge in order to improve their learning in order to keep up the other students in the class. Therefore, the teacher should introduce the CAI for supportive teaching and revising for usual teaching in the classroom by the teach no need to repeatedly teach again for the one who could not keep up in the classroom or arrange the extra-teaching.

2. Learner was able to bring the CAI to use for learning by himself in the convenient time and place such as in stead of traveling to learn in the class as usual, the learner could learnt at his home besides the he was able to learn at any time that he wanted for instance.

3. The advantage point of the CAI was if it was correctly designed according to the principle of CAL designation it could motivate the learner to be enthusiastic to learn and to be amuse to learning according to the present concept of "Learning is Fun" that meant to learn is fun.

3.5 Educational Value of CAI

Thanomporn Laohacharussaeng, (1998: 13-14), explained on the cause that the CAI was popular and it had tendency to the important medium in the future because CAI had another educational value that was the CAI was able to solve diverse problems as follows:

The Problem of Teaching One by One

At present, the proportion between teacher and learner is very high, so to teach one by one in the classroom as usual was impossible therefore the CAI was compared to be another alternative mean for selection to compensate the teaching of one by one, which was claimed as the best form of teaching since the teaching pattern

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that allowed the learner to have a chance to have interact or response with the teacher mostly, and the teacher was able to response the needs of learner promptly.

The Problem of the different background of Learner

Each learner had different background of knowledge, so CAI would help the learners to study according to their knowledge and ability by selecting the characteristic and form of learning that were suitable for themselves such as the slow or quick of lessons, content and sequence of learning for instance.

The Problem of Time Lack

The teacher had problem of having not enough time to work, therefore the CAI was another alternative way that was interesting mean because there were numerous research results found that when compare the teaching by using the CAI with The usual method, the teaching by using CAI was consumed time two of third of usual time.

The Problem of Expert Lacks

The institute that located in the area far from community had faced wit the lack of teacher so the CAI was the mean that open an opportunity for the learner to learn from CAI. Besides the institute that lacked of expert in this aspect whist the experts in stead of traveling to teach in various institutes so they were able to transfer their knowledge to the CAI and distribute to learner in the other institutes because the CAI was a form that was readiness teaching form to readiness of working and teaching all the time.

3.6. The Limitation of CAI (Education Technology Center, 1998;20-21

1. To design the effective CAI, it needed a lot of time and ability since the teachers who knew the content but they were not able to build the CAI by themselves but they needed the one who knew and had ability to construct. In Thailand, there were few persons who had the knowledge about CAI construction so it was problem of searching for CAI lesson.

For this limitation, researcher used Authorware program for constructed multimedia CAI, this program was designed to work by putting the icon on flowline according to the sequence of working liked as writing the flowchart of for

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program design or work plans so the person who was not programmer could be able to construct the work without worrying about the program language.

2. CAI had a limitation for teaching the learner to learn about the high learning behavior in the cognitive domain, including the learning behavior of affective domain, and psychomotor domain. Furthermore, the CAI did not support the learner to develop the social skill since they would use their time and skill to interact with the computer more than with the other persons.

3. If the learners had ever used the computer as usual it would decrease their eager and motivation to use computer.

For this limitation, researcher used pictures, animations, musics and sound effect in vary form for each window that not repeated, for reinforcement learner had eager and motivation.

4. CAI might usually have the principle of design to learn step by step that would command the learning pattern of learner so some type of learner such as adult dislike to learn according to their sequence.

For this limitation, researcher designed CAI to branching program for learner can choose contents in order by their interest.

5. CAI needed the suitable environment to learn with computer such as room, place, and data base so it made the use of CAI had a limitation because it could be used in the city that had ready situation and it could not be used in the rural areas that lacked of the basic facility such as no electricity supply, no telephone communication for instance.

For this limitation, researcher tested with youth who studied in school of Bangkok that had ready and suitable.

3.7 Program Computer for Presentation

The CAI was constructed in this research; the program was employed for construction to present the information about ecotourism was Authorware version 4.0.

Authorware version 4.0 (Suthee Kijchawee, 1998:9-21) was authoring system was used for construction of media application whether was the results presentation, and it was able to used for game construction as well. It was design to

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work by putting the icon on flowline according to the sequence of working liked as writing the flowchart of for program design or work plans so the person who was not programmer could be able to construct the work without worrying about the program language.

Authorware version 4.0 had various characteristics for design application, including the distribution to users as follows:

- Object Authoring was program design with object authoring technique so it made the one who did not familiar with program design or the person who had experience before was able to pay attention to the details of content and the method of interactive of user without the anxiousness about to write the program. To use the symbol or icon substituted the command that made the constructor could create the program with the high quality easily.

- Multimedia Tools in Authorware version 4.0 program composed of instrument for animation and video together to make it the effective application to construct teaching-learning media, presentation, and working simulation for good presentation, and advertising.

To design the program to be used in different system whether on Macintosh computer or under the window system on the personal computer that had the same working system and it was able to connect to the external system whether it would use the data base system computer network system. The work command in the Macintosh or version of working under window, there was not much difference, except un the part of multimedia and the working of program in the different circumstance.

To design the different commands in form of icon was a part of Authorware that made it easy program to use. To construct program can be done by place the icon on flowline so no needed to learn about the command use in form of program language. Authorware version 4.0 was designed in the 15 attributes, and each attribute was used as command for application development completely. It was easy for working when that symbol was selected whether the command involved in the logic of program or work command as multimedia.

The work characteristics was composed of icons that ordered on flowline was the defined step of program working.

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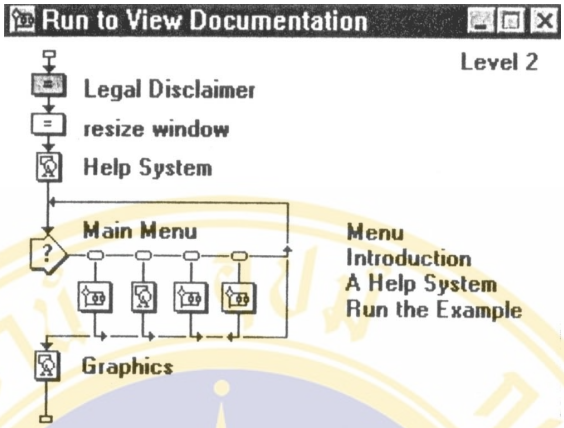

Figure 2. Working Composed of Icons Placed in Sequence on Flowline

Moreover, there was control press to defined the detail of work and it was able to define the detail of program that to proceed or to restart every time, subsequently, showing icon while program run.

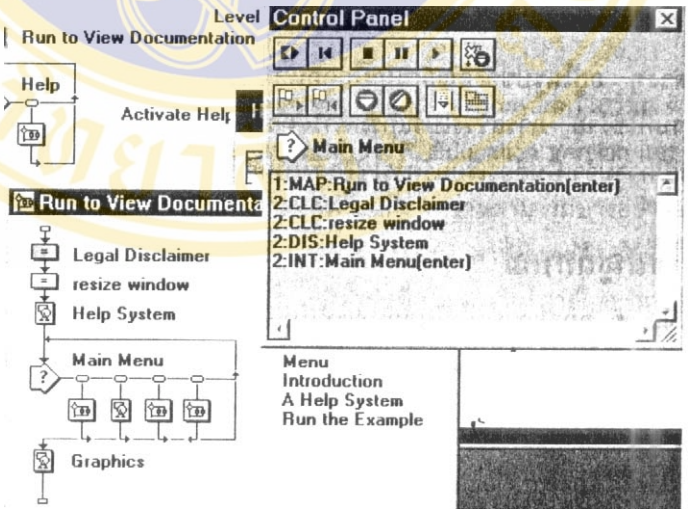

Figure 3. Showing the Icon while the program Running

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Authorware version 4.0 required hardware system on window operating system (window OS)

- CPU 486/66 or higher than, and at least the Pentium was recommended.
- Window operating system 95 or window NT (3.51 or 4.0)
- Random Access Memory (RAM) 16 MB was minimum requirement.
- Display Card 640x480, 256-color disk space (higher resolution and color depth commended
- Free hard disk space 85 MB was minimum requirement
- Sound card should be sound blaster or compatible
- Support AVI and Quick Time for Windows

For Macintosh Computer

- CPU 68040 or higher Power Macintosh was recommendation.
- Random Access Memory (RAM) 16 MB was minimum requirement.
- Drive CD ROM
- Display Card 640x480, 256-color display (higher resolution ant color depth recommended)
- Free hard disk space 85 MB was minimum requirement
- AV capability

This research, the researcher selected the Authorware version 4.0 as instrument since it was easy to use.

3.8 Theory and Human Psychology learning for CAI design

(Thanomporn Laohacharussaeng, 1998: 51-67).

3.8.1 Human Learning Theory Involved the CAI Design

1. Behaviorism Theory

It was theory that believed that scientific study of human behavior and learning of human being that could be observed fro external behavior. The response to stimulant of human being was occurred together in the appropriate

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period. Besides the human being learning behavior was operant conditioning that had the reinforcement was the mediator. The Behaviorism theory was not mention to the internal taught of human, memory, image, and feeling and those words were taboo.

CAI was designed according to this theoretical concept would have liner characteristics by every learner would receive the presentation of the most effective sequential content. Besides there was setting regular questions to learner, if the learners gave the right answer they received the response as positive feedback or reward. In the opposite, if the learners gave the wrong answer they would receive the negative feedback and explanation or punishment. These feedbacks were claimed reinforcement to create the desirable behavior. The designed CAI according to this theory would compel the learner to pass the evaluation according the set criteria before going to the next content. They could not pass according to the set criteria so the learner would go back to study the previous content again until they can pass the evaluation.

2. Cognitivism Theory

It was the concept of Chomsky believed that human behavior was the insides mind of human being who had the different thought, emotion, and internal feeling. Therefore, to design the teaching-learning, it should regard to the internal difference of human being. This theory caused the concept of design the learning lesson in branching characteristics of Crowder who designed learning lesson in the branching characteristics. The learner had the independence to control the self-learning. Particularly, there was more independence for selecting the sequence of content presentation that was appropriate to himself. The structure of lesson would be branching form as well so every learner would not receive the same content sequence because the content would be presented to learner according to the learner's ability, aptitude, and interesting as importance.

3. Shema Theory

It was concept with the belief that the internal structure of knowledge that had the node attribute or group that connected together. To learn the

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new knowledge the human being would bring it to connect with the pre-existing knowledge. Within the human brain is a capacity for learning that leads to the perception of information through stimulation from particular situations, which integrates new knowledge together with existing knowledge. Perception is important to learning because no knowledge can happen without perception. In addition to helping with perception, the learning capacity also helps in the recall of things already learned.

4. Cognitive Flexibility Theory

It was concept with the belief that the each body of knowledge had the more or less certain and complex structure so it would affect to the thought of design for response to different structure of body of knowledge that was concept of learning media as hypermedia.

Therefore to design The CAI, it should to combined the theories and concepts by integrating to be appropriate to the content feature and structure of body of knowledge of the different branches.

3.8.2 Psychology of Human learning involved the CAI design

1. Attention and Perception

Human learning was occurred from the human being gave the attention to stimulant and perception the stimulants correctly. The good CAI would be designed to be most easy and accuracy for perception by regarding to various factors such as the detail and being liked reality of lesson. To use the multi media and different visual effects to support the lesson to stimulate the learner's attentions whether it was sound, stand still picture, and animation. Besides, the constructor must to regard to the design of screen, and media positioning of media on the screen, and selecting the kind and size of the letter or color used in the lesson as well.

2. Memory

The thing that was perceived by human being would be kept and it was recalled back to use afterward. Even though, people can remember a variety of stories but to be sure that the perception was kept orderly, and it was ready to be used

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afterward was the different thing to control, particular when the perception was countless therefore, the learning technique that would assist to store and remember all those things were the necessity. The CAI Constructor must design the lesson by regarding to two important principles to help for remember were principle of readiness management or organization or repetition.

3. Comprehension

Human being could be able to bring the knowledge to use in the daily life, they must pass the process of interpretation of that knowledge and integrated with their experiences and the modern knowledge. Therefore the right mean of learning was not only to remember and recalled that thing back when they needed but their abilities to explain, to compare, to identify, and to apply to use that knowledge in the proper situation for instance. Principle about concept acquisition, and rule application directly involved to the concept of design of CAI about the evaluation before using the lesson, and giving the various definitions, inserting the examples, integrating the rules, and letting the learner to explain by using their own statements by having the learning objectives as defining for pattern of CAI presentation and activities in the lessons such as selecting to design the exercise or test in the attribute of choice question or short question for example.

4. Active Learning

Human learning was not only observing but it included the the practice by interaction not only paying attention, but it assisted to create the new knowledge and skill for learners. One of the advantages of CAI that was above the other media was the ability to interact with learner. Nevertheless, there was emphasizing on the part of interaction but it was found that most of the CAI product had a few interaction in the learning lesson so it caused boring to learner. To design the lesson to be enthusiastic to learn it needed to design the lesson to create the eager to learn, it must be designed to let learner interact with the lesson regularly, and involve to content and facilitate for learner learning.

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This research designed multimedia CAI had many choice in each window and any choice had many form for learner had interaction about instruction continual.

5. Motivation Theory

Motivation theory that was able to applied for CAI design were as follows:

1. Intrinsic and Extrinsic Motivation of Lepper that believed that the motivation was used for learning lesson should be in the intrinsic motivation or motivation about learning lesson more than extrinsic motivation that was not involve with the learning lesion. Lepper suggested techniques for CAI design to create the intrinsic motivation as follows:

-Use the game technique in the lesson

-Use the special technique for presentation

-Provide the learning atmosphere that let the learner to free for selecting to learn and /or surveying the thing that was surrounding.

-Give an opportunity for learner to free for control their learning.

-Have the challenged activities

-Make the learner to be curios

2. Theory of Motivation Construction of Malone, there were 4 attributes to cause the motivation according to this theory.

- Challenge

CAI should have the activities that challenged the learner. The activity that challenged the learner should have the clear and appropriate target for learner. Above and beyond, it should give a chance for learner to select the difficult/east level of activity as requirement or abilities.

- Fantasy

To make the learner to have an imagination, to stimulate the learner to create their image in different situation so the learner could apply the learning information of being learnt.

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- Curiosity

The curiosity was divided into 2 features (Malone, 1981 as follows:

1). Sensory Curiosity

The sensory curiosity was initiated by stimulating through auricular sensory (hearing), and visual sensory (seeing) by the strange and attractive stimulant. Therefore CAI was designed by the different media in various forms for the strange and attractive presentation on the screen all the time that the learners watched on the screen, it would keep the curiosity of them.

2). Cognitive Curiosity

The cognitive curiosity in feature of keen to desire to learn the strange, unexpected, and uncertain, and it was exception and different from the rules for instance. These unexpected and uncertain were the stimulators to make the learners eager to learn the new thing.

- Controlled Felling

CAI must be clear designed since the learner would able to obtain the different results from learning the same content by different methods. These different results was due to the different learning ability. The good CAI must be designed to let the learners have a change to select the learning sequence or the level of difficult/ease of learning by themselves according to their aptitude.

3. ARCS Model Theory

- Arouse

Arousing should not be limited at the beginning of the lesson so it was the duty of designer to attempt for attracting the learner attention for the whole lesson. One way could arouse the learner's attention was to make the learner to have curiosity.

- Relevant

To stimulate the feeling of learner to be relevant with learning issue, it made the lesson to be useful and have meaning for learner.

- Confidence

To make the learner know about their expectations from learning and

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have a chance to success according to their expectations self-confidence, and together with the useful recommendation, it created the self-confidence of learner and provided a opportunity for learner to control their learning program.

- Satisfaction

It can be done by arranging the activity that give a chance to learner to apply the learning knowledge to use in the real situation and providing the positive feedback to learner after the learn had shown the progression and appeasing the learner when they missed by base on the justice.

6. Learner Control

The important variable of CAI designed was the design of learner control such as the control of learning sequence, content, type of lesson. Therefore the design must be regarded to content etc. The learning control had 3 attributes were program control, learner control, and combination between program control and learner control. The lesson would be effective more or less, it depended on the appropriate design of the combination of these components

7. Transfer of Learning

To bring the knowledge from learning the CAI lesson and to Modify. Then it was applied to use in the actual world. It was knowledge transferring. The fidelity of lesson, type of lesson, quantity and diversity of interaction, and type of CAI would influenced to human ability to transfer of learning.

8. Individual Difference

Each learner had different ability to learn, designed lesson that had flexibility would response for individual capability was an important point. The relevanceto human learning was different in aspect of personality, intellect, learning method and the sequence of learning consequently, the CAI designer should regard to these difference and to design the lesson must to response the individual difference as much as possible.

This reseach designed multimedia CAI that give an opportunity for learner to free for control their learning, to select the difficulty and east level of

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activity as requirement or abilities and used the different media in various forms for the strange and attractive presentation on the screen all the time that the learners watched on the screen, it would keep the curiosity of them.

3.9 Design of CAI

1. Concept of CAI Construction (Buppacharti Thunhikorn, 1992: 49-50).

During the passed 20 years, programmed instruction was interesting as technical method that assisted the learner to have good learning, since it used the theory of principle of learning psychology by regarding on the individual differences, reinforcement, and information feedback to learner. In that period there was dreaming about the proper instrument for lesson feature, and the feature of instrument that the educators have dreamt in present and future has presented in form of equipment that is called computer.

CAI (Computer Assisted Instruction) closely involved to the teaching-learning as program type that was using computer in order to drill, practice, and tutorial.

Lesson as program type had emphasized that learning would be happened when the leaner had changed the behavior that could be observed and measured. The learning might be measured from behavior or skill in one the following domains:

(1) Cognitive domain

(2) Affective domain

(3) Psychomotor domain

The behavior changing would be occurred and be durable further with conditioning process, and this process had basic that related to stimulus-response by having the principles as follows:

1. Give the stimulant to learner such as content, text, or question.

2. Give the suggestion or guideline for learner to response the stimulants such as answer the question, or select the given answers.

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3. Give the immediate reinforcement when the learner gave the right answer such as very good, and excellent.

The programmed lesson had the feature of presentation through one by one frame. The programmer would lead the learner to have correct response or as their expectation, and when they gave the right response so they would know or inform that they had give right answer so they had feeling that they had success, consequently, it would affect to them to have a change to give the right answer increasingly.

The popular used program had 2 forms as follows: (Kidanan Malithong, 1993: 170-171).

1.1 Linear Program

There was a principle to construct the learning lesson by holding the principle of content dividing as step in each frame with the question but let the learner answer in two manners as follows:

1. The lesson that let the learner to construct the answer by himself, it was the concept of behavior theory of Skinner and it was lesson that was divided the content into small and short step and had frame explained the whole content in that step. To construct the lesson in manner that contained two features as follows:

a.) To construct the answer of learner made the learner so each step needed the short content and small step to assist the learner to answer correctly, and they can remember for long time. To learn little by little made the learner to easily understand and assist to give the wrong answer.

b.) When the learner could answer question correctly, they would have willpower likewise the reward received and they would success in learning but if they gave a lot of wrong answers. It can cause the learner to be discourage to learn further.

2. The lesson that let the learner to choose the answer, the program was designed that if the learner gave the right answer, subsequently, it would offer the next stimulant, and if the learner chose the wrong answer, they must to go back to study the previous frame again, then they can select the new answer until they

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can select the right answer then they would receive the reward or reinforcement, and they would learn from the right answer

1.2 Branching Program

It was the concept of Crowder by ordering of step or frame and it can be not in sequence if the learner can answer the question in that frame, therefore they can jump some frame to learn another frame or as the lesson defined but the learner gave the wrong answer they would receive the explanation and they might receive the additional lesson from the sub unit.

The theories and psychology of human learning mentioned above were used by the researcher to design a multimedia computer assisted instruction on ecotourism by combining many frameworks together. The learning format was established as a branching one, according to theory that students should have freedom in choosing which chapters to study before or later according to the interests of each individual. The design of the content was done by adhering to the cognitive flexibility theory, which states that students will learn content differently, depending on their own abilities and interests. This would help stimulate learning in students through the Schema Theory. In addition, according to the psychology of human learning, the content of learning should be easy to understand but also interesting, through the integrated use of picture stills, graphics, movies, videos, colors, fonts, formats, and the interaction with the student, all of which would stimulate curiosity and the desire to learn.

2. Step of Teaching Design of CAI

The instruction steps were as follows: (Gagne et al., 1988 cited in Thanomporn Laohacharussaeng, 1998: 41-48).

2.1 Attraction

In order to stimulate and give reinforcement to learner, it was done by using the picture, color, or animation and multimedia as importance to arose their attention.

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2.2 Tell the Objective to Learner

To tell the objectives to learners, it was done in order to make the learner to well understand the content and to build the motivation for learning better, therefore, they should be short, and concise to be comprehensive and it must be used the appropriate statement to be relevant to the level of target.

2.3 Revise the previous knowledge according to knowledge theory of Schema Theory, the perception was the importance to create the learning since there was no learning that can be occurred without perception. Besides the perception of information, it created the meaning by connecting the new knowledge together with the prior knowledge. Under the frame of pre-existing knowledge and from the stimulation, it would connect the both knowledge together therefore, to arrange the necessary knowledge base, it needed for perception of new knowledge to learner was necessary.

2.4 To present the new knowledge by using the proper stimuli, it can assist the perception effectively by using the media in different forms or it was called as multimedia, it was counted as effective presentation. However, the content presentation in the manner of multimedia, it should be selected to use properly in both qualitative and quantitative approach. Additionally, it regarded to the features and learning ability of learners who were target group as important factors.

2.5 To give the learning guideline, the designer should use the time for technique creation in order to stimulate the learner to search the answer by himself. To design activities or in form of recommendations from CAI learning, it was the recommendation about the sequence of learning, and suggestion for lesson use.

2.6 To stimulate the response for CAI design, it was in term of activities that made the learner to participate in thinking and practice in the interactive approach with the main objectives to made the learner to express their comprehension in the thing that they were learning such as design the questioned press or other creative activities for the learner to answer the short question during learning in order to let the learner have a chance to examine the right understanding that was more or less.

2.7 To give the feedback results or to give the information back to the learner about the correctness and level of correctness of that question, it was a

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reinforcement to make the learner to learn inside themselves. It also gave the learning motivation so the designer should arrange the kind of feedback to create and to be appropriate to characteristics and learning abilities of learners.

2.8 To test knowledge, it was an evaluation about the learners that they had learnt according to the set objectives or not, and how? The lesson designer should use more time for designing the knowledge test in order that the test would be valid. Besides, it should avoid the limitation of program flexibility to assist to construct the CAI for test construction. In the same time it should use the advantage of program to construct CAI, especially, the program that had feature to assist for test construction.

2.9 To remember and to use, the designer should present the conclusion of important concept that covered about the linkage the new knowledge with the pre-existing knowledge of learner by rising the example of situations that differed from the example that was used in the lesson, and it should arrange the suggestion about the source of knowledge additionally.

All 9 steps were not the rigid steps , it was flexible in itself so the designer can bring to use as main or to modify to be congruent with the different factors that influenced to learning of learners in a content.

3. The Step of Design and Construct CAI

Alessi and Trollip, 1991 cited in Thanomporn Laochrussaeng, (1998: 29-39) stated about to design the CAI as 7 steps as follows:

1. Preparation

1.1 Determine Goals and Objectives was set the target that the learner would be able to use the lesson for what story and what features such as main lesson, supplementary lesson, additional exercise or test for instance, including defining that after finish learning the learn should be able to do what. Before the targets and objective to be established, the designer should know the background of target firstly.

1.2 Collect Resources was to prepare the readiness in the aspect of information resources about materials such as textbook, journal, referent book, ands pictures, and content experts, but for instructional development such as

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text for lesson design, paper for story boards, media for graphic design, calculation program, and experts of CAI design, and resources in the step of instructional delivery system that were computer. Texts, and CAI experts

1.3 Learn Content, it collected from the expert interviewing, and studying on the related textbook and other documents for instance.

1.4 Generate Idea was by stimulating the learner to creatively think in order to get a lot of opinions from team work in a short period by holding the quantity more than evaluating the correctness value.

2. Design Lesson

2.1 Elimination of ideas, after the brain storming, the designer would bring the whole ideas to evaluate that which idea was interested. The ideas that can not be practiced or repeated ideas were eliminated, subsequently, gathering the rest concepts to consider for discussion about the detail, and to modify the ideas as well.

2.2 Task and concept analysis, to analyze the task, it analyzed the content that wanted to study and until to obtain the required knowledge, but to analyze the concept, it analyzed on the content that the learner carefully considered in order to obtain the content about learning and clearness. Therefore to analyze the task and concept were to search the principles of learning to be appropriate for that content, and to obtain the work plan for design the effective lesson.

2.3 Preliminary lesson description, after ask and concept analysis was done, the lesson designer must bring the task and concept that was harmonizingly integrated under the theory of learning, and the lesson must be effectively designed by creating the involved task or activity to stimulate the learner to interest continuously and regularly. Besides it needed to design the sequence of presentation in order to obtain the structure of CAI that can response the individual difference of learner actually.

2.4 Evaluation and revision of the design, it must be done periodically during designing, and it was not only after designing. After designing, the content should be evaluated by experts of content, design, and learner, and after it was improved it needed to be evaluated again until it obtained the qualified

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CAI that was satisfied by all stakeholders in the team before the third step would be implemented further.

3. Flowchart writing

It was the suit of symbols that explain the working step of program, the flowchart would present the program information such as what will happen when the learner gave the wrong answer or when the lesson will finish. To write the flowchart, there were different level by depending on the detail of each flowchart and the type of lesson, and the lesson was not complex such as tutorial type, exercise type, and test type. It should use the flowchart in the common feature and not go on the details. It should present the holistic view and the essential sequence of lesson but for the complex lesson such as simulation type or game, it should be write the flowchart in detail by showing the step of algorithm, the repeated out of order of program, rules and regulation in detail.

4. Create Storyboard

It was the preparation for presentation of text, picture, and media in form of multimedia on the paper to show on the computer screen further, including, scripting (Script was the content in the lesson) such as content, information, question, feedback results, recommendation, explanation, the attraction statement, standstill, and animation for instance. In this step, it should be evaluated and corrected the storyboard by experts of content and design. The learner who was not familiar with the content so it should examine the confused and unclear content that were too difficult or too easy.

5. Produce Lesson

It was the process the changing the storyboard to be CAI. In the present to write program, it may mean to use the program to assist the CAI to construct the lesson, in the lesson construction such as Multimedia ToolBook. In this step, the lesson designer must know to choose the proper program. The main factor that must be considered for program to construct the lesson was hardware, that the designer must regarded to the user as a main that the user had the limitation of hardware or not, and what type of computer they had, how many speed they had, did

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they have the multimedia system or not for instance. For the factor of characteristics and types of lesson, the designer must understand the advantage and disadvantage, and the difference of each program, and the factor of budget, and experience of lesson constructor that should be appropriate to assist the lesson construction convenient and hasty.

6. Produce Supporting Materials

The supporting material for the lesson composed of 4 types that were Handbook for use of learner, handbook of use of instructor, handbook for technical problem solving, and other additional documents. The learner and teacher had the different requirements. The handbook for technical problem solving was essential if the installed process was complicated or it must use the tools or equipments for instance. The additional documents may be a chart, test, or other documents be used for leasrning supporting.

7. Evaluate and Revise

The experts who evaluated on the presentation should be the person who had prior experience. To evaluate working of lesson, the designer should observe the learner's behavior while they were learning or after use it should interview the learner. Besides the learner might be tested after learning by CAI and this step covered the pioneer test and expert evaluation.

The 7 steps of design the lesson was the principle criteria that can be flexible, be modified, and interchange of the steps so after the evaluation of each period, they can go back to correct and the designer can be go back to correct in the different part as it needed.

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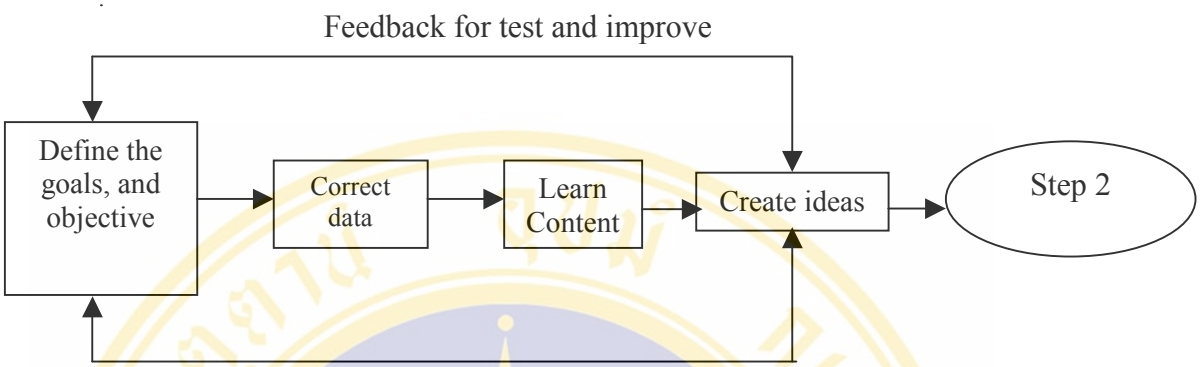
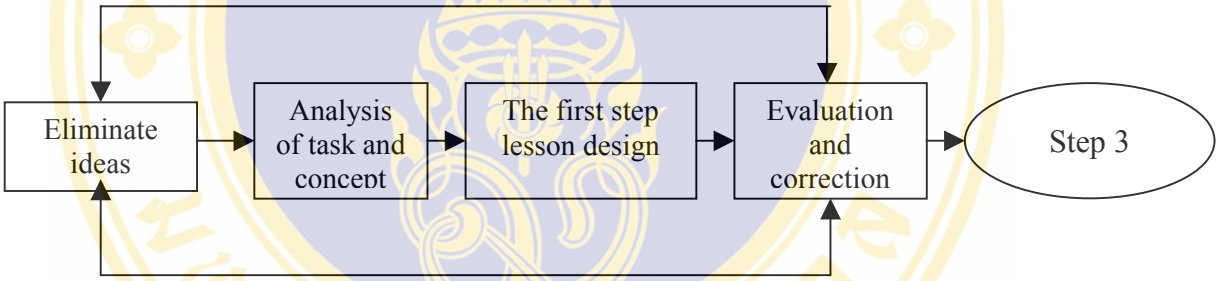
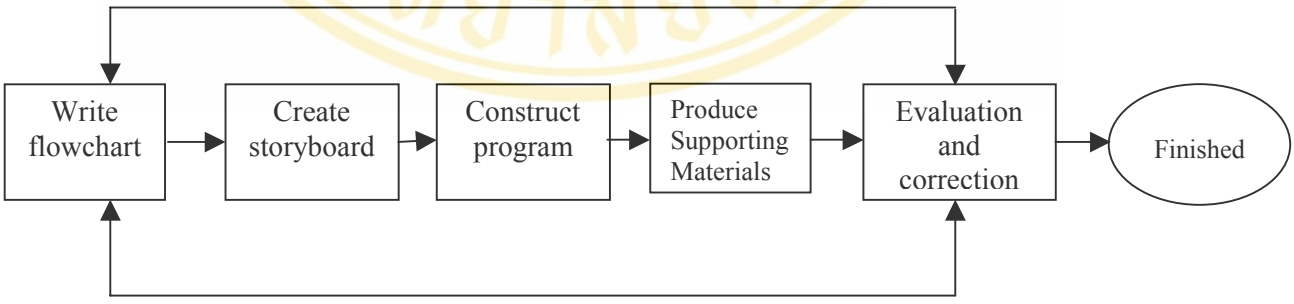
Step 1 : The Step of Preparation



Step 2 : Design Lesson



Step 3 - 7 :



In this study, the researcher used a modified version of the 7 steps in creating the multimedia computer assisted instruction on ecotourism, which consisted instead of the following 5 steps:

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1. Preparation – the establishment of goals and objectives of the learning material, the collection of content, and the development and design of content.

2. Design Lesson – the collected data is analyzed to find the principles of suitable learning in order to get an instruction plan for designing the learning material.

3. Flowchart Writing – these are used to explain the steps in the working process of the program.

4. Production lesson – the transformation of the flow charts into a multimedia computer assisted instruction on ecotourism.

5. Evaluation and revision of work.

4. To Evaluate the media of Teaching or Learning

It was considered on the value or effectiveness of media in order to improve to get the results as set objectives. To evaluate the media quality, there were 5 means (Chaiyos Ruengsuwan, 1990: 128-129).

4.1 To Determine the Effectiveness of Media

1. Evaluation was done by teacher who had the good experience in teaching, media production, and media use.

2. Evaluation was done by experts in the aspect teaching-learning media and they had the experience in evaluation that might be the lecturers in the university that taught the subject of media and educational technology and lecturer in the aspect measurement and evaluation.

3. To evaluate by special committee, they were the group of persons that the work unit appointed to evaluated for media evaluation, and quality evaluation, effectiveness of use evaluation, and other characteristics of media evaluation.

4. To evaluate by learner, it was an evaluation for improvement to be proper to learner, and it should evaluate after use the media, and evaluate for media only. The learner might have less experience of evaluation so it should be explain the criteria and evaluation items to learner to understand before they evaluated.

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5. To evaluate the effectiveness of media, it must regarded to the objective of media and learning achievement of learner after learning. There were two types of evaluation as follows:

a) To evaluate by use the criteria according to the standard of each types of media had established such as standard at level 90/90, 80/80, and 75/75.

b) To evaluate by without setting the criteria before, it was the evaluation by comparing the results of posttest and pretest that the posttest score would be higher than pretest statistically significant or not. If the comparing results showed that the score of posttest higher than pretest score statistically significant that meant the media was effective.

The evaluation of the multimedia computer assisted instruction on ecotourism was done by qualified experts and students. In finding the effectiveness of the learning material, comparisons were done whether the average scores of the post-test was significantly higher than the pre-test.

4 Related Researches

4.1 The Research related to CAI as Multimedia type

Pianpan Kittiwongsopha (1988 : Abstract), researched on the topic of " Comparative Study of Academic Achievement, Opinions and Learning Retention of Health Education Subject among Junior Health Worker Students Using Programmed Lessons with Multi-Media and Regular Classroom Instruction", the research results found that the learning achievement on opinion towards the instruction, and learning retention of experimental group were statistically significant higher than the comparison group at the 0.001 level.

Duamgjai Srithawatchai (1992: Abstract), studied on topic of "Computer-Assisted Instruction in ' Natural Resources and Industry' for Secondary School Level'', the results of the study indicated that the Pre-post test scores of all six units of CAI programme were significantly difference at the level of 0.01.

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Yaowalak Poolthong. (1992: Abstract), studied about “An Investigation of the Current Status of and Problems in Implementing Computer-Assisted Language Learning (CALL) in State Universities in Thailand and Recommendations for Future Development”, the suggestions based on the results of study that it should hold the training for personnel to have knowledge, and understand the characteristics of CALL. Moreover, the administrators should support in term of budgets, and opportunity to receive more additional knowledge on CALL.

Boonsueb Pandee. (1994: Abstract) investigated about “The Development of Computer Assisted Instruction for Biology Subject at Upper Secondary School on the topic of “The Working Structure of Gene, it was found that the experimental result indicated the comparison between pretest and posttest of learning was statistically significant at level of 0.01

Saipin Noppaket. (1995: Abstract) studied about “The Construction of Computer-Assisted Instruction on Water Resource for Upper Secondary School Level” it was illustrated that the constructed CAI on water resources was effective, and convenient to be used, and able to increase the students’ knowledge, moreover it stimulate them to interest and pay attention for learning by themselves.

Khanchai Rattamanee. (1993: Abstract) researched on “Computer Assisted Instruction: Hyperlipidemia and Therapy”, the results showed that the posttest scores of the experimental group were statistically significant higher than the pretest scores at the level of 0.05 and they had positive opinion towards CAI program.

Jiraporn Sriamonruttanakul (1997: Abstract) researched on “The construction of Computer Assisted Instruction in Public Health Nursing of Epidemiology and Surveillance for Sophomore Nursing Students in Boramarajonani College of Nursing, Bangkok” , and the results demonstrated that The posttest scores of nursing students were statistically significant higher that pretest score at level of 0.05, and it can be used effectively for self-learning practice of nursing students.

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Phanit Kumsaranee. (1997: Abstract) studied about "Construction of Computer Programmed Multimedia on 'The Separation and Recycling of Solid Waste' for High School Students" , and the posttest scores of students who learnt on computer programmed multimedia were statistically significant higher than pretest score at level of 0.05, and their scores also higher than control group's scores, hence it was found that they were satisfied with the media quality in term of their pictures, illustrations, content, sound, and language used and they had satisfaction at level of more to most.

Suthathip Yamfak. (1999: Abstract), studied on "The Development of the Computer Multimedia Programme on Infectious Waste Management for Nursing Students". The results verified that the posttest scores of nursing student who used the computer multimedia programme were statistically significant higher than their pretest scores at the 0.05 level, while the pretest and posttest scores of control group were not statistically significant. Therefore, the students were able to acquire knowledge from the multimedia programme. The students were satisfied with the programme's quality in term of its pictures, illustrations, content, sound and language used, and they had satisfaction at level of more to most.

Natchaya Yimwilai (2001), studied on "The Development of A Computer Assisted Instruction Program on Forest and Wildlife for Early Childhood". The results revealed that the achievement scores of experimental group pupils obtained from the posttest was statistically significant higher than those of the pretest at 0.05 level, and the experts and pupils assessed the quality of the CAI program at good level.

Merritt, R.L. (1983) studied the learning achievement by using and no using the Computer Assisted Instruction in the school middle level. The research design was Pretest-Posttest Control Group Design. The experimental group learnt by using CAI lesson, and the control group learnt in the ordinary classroom, the results illustrated the experimental group had the learning achievement scores higher than control group both reading and calculating.

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Guzdial, M.J. (1993) constructed the Computer Assisted Instruction System was EMILE programme for teaching the subject of kinematics by using the computer in the experiment by constructing the model of kinematics with the graphic system. The studied results found that the students were able to use EMILE program for model construction very well

4.2 Researches related to Ecotourism

Sasi-Apa Prasopthup .(1996: Abstract) investigated on "Youth Participation on Promotion of Ecotourism: A case Study of the Youth Leader Training Program for conservation Tourism". The research results found that the youth participation for ecotourism promotion was at rather high level, particularly, the factors that affected to youth participation were sex, and education. The female youth participated in activity of public relation and awareness raising more than male students. For the education factors, the youth who had diploma degree or higher education level participated more than the other levels and the youth who had ever traveled more than 3 times would participate in activity of study tour more than the one who had less traveling.

Sureeporn Padtrapornnan.(1998: Abstract) studied about "Tourists' Attitude Towards Ecotourism: A Case Study of the National Park in Kanchanaburi Province". The results revealed that the majority of the sample group had moderate level of knowledge about the ecotourism, especially, knowledge on its goal and objective was higher than the level of knowledge on management and local participation. Their attitude toward ecotourism were positive or supported ecotourism at medium to high level. However, the attitudinal score to promote environmental education was highest. Results of the independent test revealed that attitudes toward ecotourism of tourists who visit the National Park in Kanchanaburi Province were different based on marital status, education and knowledge of ecotourism but hey were not different based on domicile, sex, age, occupation, income, news and information receiving, number of trips per year, participation in environmental activities and type of trip at 0.05 level of significance. These ecotourism activities should be promote at the National Park in Kanchanaburi Province through environmental education programs arranged for

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tourists. The curriculum of environmental education programs should be clear and enhance the learning process of tourists as well as to provide local people an opportunity to participate and be more involved in the management of ecotourism.

Saowaluck Nawajaroenkul. (1998) investigated Ecotouristic Behavior of the Thai Tourists at Sai-Yoke National Park, in Kanchanaburi Province. The results showed that the level of correct Ecotouristic behavior by the Thai tourists at Sai-Yoke National Park was at intermediate level, and for the results of ANOVA analysis indicated that age, level of education, value placed on environment and natural resources were significant factors which affected the ecotouristic behavior at the level of 0.001. A average income per month, knowledge of ecotourism were significant factors which affected the ecotouristic behavior at the statistical level of 0.01, and occupations, purpose of traveling information received about ecotourism were significant factors which affected the ecotouristic behavior at the statistical level of 0.05.

Chalong Nuichim. (1999), studied on "The Development of Historical and Natural Interpretation Guide Book for Ecotourism in Phu Hin Rongkla National Park". The studied research showed that the guide book increased the visitors' knowledge statistically significant at 0.001 level. They were satisfied with and interested in the guide book at the most level, and suggested that this guide book should be published and be sold to visitors.

Suchada Wanthamanee (1999: Abstract). Study on the Relationship between Information reception about Ecotourism and Knowledge, Attitude, and Behavior of University Students in the Bangkok Metropolis Area. The results revealed as follows:

1. The sample group received the information about ecotourism from the radio medium at the most level, and subsequently television, newspaper, and magazine respectively. They had knowledge and ecotouristic behavior at the moderate level and had positive attitude toward ecotourism.

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2. Sample group who studied in the different class, different institute, had different domicile, and join with different activity group would receive ecotourism information from different channel.

3. Sample group who had different sex and studied in the different type of institute would have different knowledge on ecotourism.

4. Sample group who had different sex and different domicile, and join with different activity group would receive would have different attitude toward ecotourism.

5. Sample group who studied in the different type of institute, and join with different activity group would have different ecotouristic behavior.

6. The sample group received the information about ecotourism from the magazine medium had positive relation to activity and attitude toward ecotourism.

7. The sample group received the information about ecotourism from the radio television, newspaper, and magazine had positive relation to ecotouristic behavior.

8. The knowledge sample group on ecotourism had positive relation to attitude of ecotourism but had no relation to ecotouristic behavior.

9. The attitude of sample group on ecotourism had positive relation to ecotouristic behavior.

From the documents and researched had been collected, it was found that ecotourism was a pattern of tourism that aimed to maintain and conserve the environment and natural resources of tourism sites, particularly, the ecosystem, therefore reseacher prepared contents about ecotorism for youth and give knowledge to youth would assist youth to have knowledge and recognize the importance in order to look after the ecosystem of tourism sites to be sustainable. Reseacher used multimedia CAI to present about ecotourism because it was high quality medium that could present in terms of text, pictures, animations, VDO and sound.

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CHAPTER III
RESEARCH METHODOLOGY

The construction of multimedia computer assisted instruction on "Ecotourism" for youth was the experimental research using the Pretest-Posttest Control Group Design. The population was the youth who were studying in the higher secondary level school that located in Bangkok Metropolis and had computer for experiment, and the students had never studied subject content about ecotourism before.

The sample group, the limitation of this study was about the experimental instrument, therefore, to select the sample group was employed the purposive sampling technique. The sample groups were youth who were studying in Muthayomsuksa 4,5,and 6 of Dhaweewattana School, Dhaweewattana District. Each level composed of 2 classes that were similar in science-math program so one class would be control group and the another was experimental group and randomized 20 students from each class for study. Finaly the total of 60 students were in the experimental group and 60 students were in the control group. The researcher had implemented the study according to the following step :

1 Primary Information Study

1.1 To studied and reviewed the related ecotourism information from the textbook, journal, documents, and research works.

1.2 To studied and searched the information about multimedia computer assisted instruction (CAI) from the textbook, journal, documents, and research works. (Thanomporn Laohacharussaeng, 1998:29)

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2 Construction the Multimedia CAI on “Ecotourism”

From the study of ecotourism content, the researcher had worked out the following steps of media constructions by Alessi and Tollip Concepts.

2.1 Preparation

2.1.1 Stated the General Objectives

1 To give knowledge and understanding about

- The meaning of ecotourism
- The components of ecotourism
- The main activities of ecotourism

2 To give knowledge and understanding about impact might be occurred from ecotourism.

2.1.2 Stated the Behavioral Objectives

1 The youth were able to tell the meaning of ecotourism.

2 The youth were able to tell the main components of ecotourism.

3 The youth were able to explain the main components of ecotourism in each component.

4 The youth were able to tell the main activities of ecotourism.

5 The youth were able to explain the main activities of ecotourism in each activity.

6 The youth were able to tell the impacts that might be caused by ecotourism.

7 The youth were able to tell the guideline for the natural resources and environment conservation..

2.1.3 Stated the Content

The scope of content about ecotourism knowledge given to the youth were as follows:

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1 The definition of ecotourism.

2 The main components of ecotourism

3 The main activities of ecotourism

4 The environmental impact from the ecotourism

2.2 Design the Instruction

1 The instruction was established as a branching program, according to the theory that students had freedom to choose any chapters to study first or later according to the interests of each youth. The design of the content was done by adhering to the cognitive Domain, which states that students will learn content differently, depending on their own abilities and interests. This would help stimulate learning in students through the Schema Theory. In addition, according to the psychology of human learning, the content of learning should be easy to understand but also interesting, through the integrated use of picture stills, graphics, movies, videos, colors, fonts, formats, and the interaction with the student, all of which would stimulate curiosity and desire to learn.

2 The content compilation, script writing, and place the presentation form.

3 To search the pictures, animation, music and sound effect that can communicate and attract the learner attention.

4 To record the description

2.3 Flowchart Writing

The flow charts established the working processes of the multimedia computer assisted instruction on ecotourism in the presentation of the content and the media used. The learning material consisted of 4 chapters that students can choose according to their interest. Once they finished studying each chapter, there would be a test that appears at the end. If they answered correctly, the youth would be able to continue to other chapters, however, if they answered incorrectly there should study the supplementary lesson for that chapters. Afterwards there would be another test, different from the first one. If the students answered it correctly, they could go other

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lesson but if they did not, there would be a solution to the test and the program will return to the main menu.

2.4 Instruction Production

The Authorware version 4.0 was used for production, after the CAI was produced, then it was examined by the thesis advisory committee, experts in the aspect of content, and educational technology for the quality of production. It was improved according to their recommendation.

2.5 Evaluate and Revise

The evaluation of the multimedia computer assisted instruction on ecotourism was done by qualified experts and the youth. In finding the effectiveness of the learning material, comparisons were done whether the average scores of the post- test was significantly higher than the pre-test.

3 Construction of Tools for determination of CAI Effectiveness

3.1 Evaluation Form for the multimedia CAI Quality, for the expert in the aspect of content, it was the opened questionnaire about the content in different aspects by establishing the criteria for quality evaluation as 4 levels were very good, good, adequate, and must be improved. To improve the quality of lesson in each item, the criteria were employed were good level, very good level , and more than 50 percents was approved, if lesser than 50 percent, it must be improved and it was examined again by the thesis advisory committee.

3.2 Evaluation Form for the multimedia CAI Quality, for the expert in the aspect of educational technology, it was the opened questionnaire about the content in different aspects by establishing the criteria for quality evaluation as 4 levels were very good, good, adequate, and must be improved. To improve the quality of the lesson in each item, the criteria were employed were good level, very good level , and more than 50 percents was approved, if lesser than 50 percent, it must be improved and it was examined again by the thesis advisory committee.

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3.3 Evaluation Form for multimedia CAI satisfaction of the youth by asking about the youth satisfaction by establishing the criteria for satisfaction evaluation as 5 levels were the most, more, adequate, less and the least. To improve the quality of lesson was employed mode as criteria, therefore if any item was in the level of less and least, it must be approved, subsequently, it was examined again by the thesis advisory committee.

3.4 Test for learning achievement evaluation of pretest and posttest, it was multiple choices with 4 choices and it composed of 24 items. If the youth gave the right answer he would received 1 score, and if he gave the wrong answer or did not gave any answer he would get no score for that item. The test was examined and improved by the thesis advisory committee, then it was improved according to their recommendations.

4 Development of Multimedia CAI

The multimedia CAI was tried out by the youth of Bangmodwittaya School who were not the sample group for three times of primary trial, There were the steps as follows:

4.1 The first trial, it was single trial by using one youth who had the study result at moderate level to test by studying the constructed multimedia CAI, then let him to evaluate the satisfaction, and having the conversation about the multimedia CAI effectiveness. The improvement was done according to the data of evaluation.

4.2 The second trial, it was the group test by using 9 youth who were studying in Muthayomsuksa 4, 5, and 6 level, and 3 youth from each level that composed of one good grade student, one was moderate grade student, and one was poor grade student, and not included the youth in the first trial. The improvement was done according to the data of evaluation.

4.3 The third trial, it was field test or big group test by using 30 youth who were studying in Muthayomsuksa 4, 5, and 6 level, and 10 youth from each level that composed of combination of good grade student, moderate grade student, and poor grade student, and not included the youth in the first and second trial. In this trial let

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them do the test in order to determine the effectiveness of the test and evaluated the satisfaction as well. The improvement was done according to the data of evaluation.

The results of three trials were analyzed for the level of difficult/ease value, discriminant value for selecting the qualified items for the experiment, including the reliability of the test was determined as follows:

1) Difficulty Power

The test was determined the level of difficulty and ease value by dividing the score into two groups as high score group and low score group, the 27% technique was used, the formula being as follows:

$$\text{Difficulty level (P)} = \frac{P_H + P_L}{2n}$$

Where P = Difficulty level

P_H = Number of respondents in the 25% high group

P_L = Number of respondents in the low group

n = Total number of respondents in both groups

For the criteria in choosing questions, the researcher chose questions with a difficulty level between 0.2 – 0.8 and a discrimination power value of at least 0.2 for the real test.

2) Discrimination Power

After to determine the difficult/ease value, then the discriminant power was determined by the following formula.

$$\text{Discrimination power (r)} = \frac{P_H - P_L}{n}$$

Where r = Discrimination power

P_H = Number of respondents in the 25% high group

P_L = Number of respondents in the low group

n = Total number of respondents in both groups

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For the criteria in choosing questions, the researcher chose questions with a discriminant power value of at least 0.2 for the real test.

3) To determine the reliability by the Kuder-Richardson 20 (KR-20), with the formula as follows (Boontam Kijpreedeeborisut, 1994:172):

$$r_{tt} = \frac{k}{k-1}\left[\frac{s^2{}_x - \sum pq}{s^2{}_x}\right]$$

Where r_{tt} = Reliability value

n = Number of questions

$s^2{}_x$ = Deviation of the total score

p = Proportion of respondents who answered the question correctly

q = Proportion of respondents who answered the question incorrectly (1-p)

The formula for variance was as follows:

$$S^2 = \frac{n\sum X^2 - (\sum X)^2}{n(n-1)}$$

Where S^2 = Variance of total scores

n = Number of sample

$\sum X$ = Sum of test scores

$\sum X^2$ = Sum of tests score square

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5 Trial of the Experimental Group

Method of Experimental Implementation

This research was an experimental research by using the Pretest-Posttest Control Group Design, and the form was as follows:

R	O_1	X	O_2	**Experimental Group**
	O_3	(X)	O_4	**Control Group**

Where R = Random Sampling
X = The experiment was done by studying the CAI
(X) = There was no experiment was done by studying the CAI
O_1 , O_3 = Result measured before experiment (Pretest)
O_2 , O_4 = Result measured before experiment (Posttest)

The Experimental implementation were as follows:

1) The sample group was tested for 30 minutes by the two groups of experimental group and control group (Pre-test) in order to measure their knowledge in the content before studying the multimedia CAI.

2) One week after the pretest was done, the experimental group studied the multimedia CAI on “Ecotourism” about 45 minutes and they examined posttest about 30 minutes and the control group who didn’t study the multimedia CAI examined posttest about 30 minutes.

6 Data Analysis

6.1 To compare the mean scores ($\overline{X}$) of pretest between the experimental group and control group by using t-test, it was done in order to study the prior knowledge before studying of both groups whether they were different or not.

6.2 To compare the mean scores ($\overline{X}$) of pretest and posttest of experimental group by using t-test, it was done in order to study the difference of mean scores before studying and after studying of experimental group.

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6.3 To compare the mean scores ($\overline{X}$) of pretest and posttest of experimental group by using t-test, it was done in order to study the chance of mean scores of the control group.

6.4 To compare the mean scores ($\overline{X}$) of posttest (After studying with the multimedia CAI) between the experimental group and control group by using t-test.

6.5 The evaluation of the multimedia CAI effectiveness by experts were calculate in term of percentage.

6.6 The evaluation for the multimedia CAI satisfaction by students were determined the mode.

The formula for statistics analysis were as follows : (Puangrat Thaweerat, 1997:162)

1) To compare the mean scores of pretest and posttest between experimental group and control group were determined by t-test as the following formula (cited in Puangrat Thaweerat, 1997: 162)

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1 - 1)S_1^{\,2} + (n_2 - 1)S_2^{\,2}}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where $\overline{X}_1$ = Mean scores of Experimental group

$\overline{X}_2$ = Mean scores of Control group

$S_1^{\,2}$ = Variance of scores of Experimental group

$S_2^{\,2}$ = Variance of scores of Control group

n_1 = Number of student in the Experimental group

n_2 = Number of student in the Control group

df = $n_1 + n_2 - 2$, it was red from the table

2) To compare the mean scores of pretest and posttest of the same group of both experimental group and control group were determined by t-test as the following formula (cited in Puangrat Thaweerat, 1997: 165).

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$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$\sum D$ = Total sum of the difference between average scores of pre-test and posttest

$\sum D^2$ = Total sum of the difference between average scores of pretest and posttest, squared

D = The difference between scores of pretest and posttest of each sample

n = Total number of students

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CHAPTER IV
RESULTS

To research on the construction of multimedia computer assisted instructions on “Ecotourism” for youth, the researcher had constructed and developed the CAI and it was tried out with the sample group, and the data were analyzed and it could be concluded the resulted as follows:

1 Quality Evaluation of Multimedia CAI by Content Experts

After the researcher had studied the content on ecotourism then the scope of instruction content, concept, behavioral objectives were defined under the endorsement of the thesis advisory committee. The subsequent step was constructed, then the three content experts would evaluate the quality of CAI, and the results were as follows:

Table 2 Quality Evaluation of Multimedia CAI by Content Experts

Evaluated Items	Very Good Number (%)	Good Number (%)	Moderate Number (%)	Should improve Number (%)
Content Evaluation				
1.Content was relevant to the Objectives	3 (100)			
2.The appropriateness of the introduction to content	1 (33.33)	2 (66.67)		
3.The appropriateness of content sequences	1 (33.33)	2 (66.67)		
4.The clearness of content explanation	2 (66.67)	1 (33.33)		
5.The congruence of content in each step	3 (100)			
6.The exercise was relevant to content	2 (66.67)	1 (33.33)		
7.The appropriateness of content to learner level	3 (100)			

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Table 2 The Quality Evaluation of Mutimedia CAI by Content Experts (Continued)

Evaluated Items	Very Good Number (%)	Good Number (%)	Moderate Number (%)	Should improve Number (%)
The characteristics of Pictures				
1. The ability to interpretation		3 (100)		
2. The continuity of pictures		2 (66.67)	1(33.33)	
3. The pictures related to content		2 (66.67)	1(33.33)	
4. The appropriateness to learner level	1(33.33)	2 (66.67)		
Language use				
1. Correctness	1(33.33)	2 (66.67)		
2. Good interpretation, clearness	1(33.33)	2 (66.6)		
3. To be appropriate to age and class level		3 (100)		

From Table 2, it was obviously seen, the result of the quality evaluation of the multimedia CAI on “Ecotourism” in the content aspects by the three experts, it was found that the CAI quality was in the good level, and the experts required for added supplementary pictures in order to be more appropriate to content therefore the researcher improved according to their recommendations.

2 Quality Evaluation of Multimedia CAI by Educational Technology Experts

They were 5 educational technology experts, and the results of the evaluation of multimedia CAI quality were as follows:

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Table 3 Quality Evaluation of Multimedia CAI by the Educational Technology Experts

Evaluated Items	Very Good Number (%)	Good Number (%)	Moderate Number (%)	Should improve Number (%)
Content				
1. The appropriateness of introduction to content	1 (20.00)	4 (80.00)		
2. The continuity of story flow	1 (20.00)	4 (80.00)		
3. The appropriateness of form and presentation	2 (40.00)	3 (60.00)		
The characteristics of Pictures				
1. Picture size	2 (40.00)	2 (40.00)	1(20.00)	
2. Beautiful color	5 (100.00)			
3. The sharpness of picture	4 (80.00)	1 (20.00)		
4. The continuity of pictures	3 (60.00)	2 (40.00)		
5. The pictures related to content	3 (60.00)	2 (40.00)		
6. The ability to interpretation	2 (40.00)	3 (60.00)		
7. Picture arrangement	1 (20.00)	4 (80.00)		
8. The presentation styles	1 (20.00)	4 (80.00)		
Letter complementary				
1. The appropriate size	3 (60.00)	2 (40.00)		
2. The Beauty	2 (40.00)	2 (40.00)	1(20.00)	
3. Clearness, easier to read		4 (80.00)	1(20.00)	
4. Position arrangement		4 (80.00)	1(20.00)	
5. The presentation styles	2 (40.00)	2 (40.00)	1(20.00)	
Language use for Explanation				
1. Correctness	2 (40.00)	3 (60.00)		
2. Good interpretation, comprehension	3 (60.00)	1 (20.00)	1(20.00)	
3. To be appropriate to age and class level	2 (40.00)	3 (60.00)		
Sound use				
1. The clearness and appropriateness of supplementary sound	3 (60.00)	2 (40.00)		
2. The correctness and clearness of explained sound	3 (60.00)	2 (40.00)		

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From Table 3, it was obviously seen, the result of the quality evaluation of multimedia CAI on “Ecotourism” in the educational technology aspects by the five experts, it was found that CAI quality was in the good level, and the experts required for increased of size of letter in order to be more appropriate therefore the researcher improved according to their recommendations.

3 Trial for Multimedia CAI Development

3.1 The first trial,

The first trial, it was single trial by using one youth of Bangmodwittaya School, and had the studying result at moderate level to test by studying the constructed multimedia CAI, then let him to evaluate the satisfaction, and discussion about the multimedia CAI effectiveness. Youth had the satisfaction in the moderate level to highest level. It was found that he wanted to add more animation and supplementary sound. The improvement was done according to the data of evaluation, and it was implemented further in the second step.

3.2 The second trial, it was the group test

After the multimedia CAI was improved after the first trial had done. The second trial was implemented by using 9 youth of Bangmodwittaya School, who were studying in Muthayomsuksa 4, 5, and 6 level, and 3 youth from each level that composed of one was good grade student, one was moderate grade student, and one was poor grade student, and not included youth in the first trial. After they had studied, they evaluated the satisfaction of the instruction. The results were as follows:

Table 4 Satisfaction Evaluation of Multimedia CAI on “Ecotourism” by youth

Evaluated Items	Most	More	Moderate	Less	Least	Mode
1.Students like to study multimedia CAI	2	6	1	-	-	More
2.Students gain more knowledge on ecotourism	2	5	2	-	-	More
3.This lesson help the students to have more content comprehension	2	5	2	-	-	More

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Table 4 Satisfaction Evaluation of Multimedia CAI on "Ecotourism" by youth (Continued)

Evaluated Items	Most	More	Moderate	Less	Least	Mode
4.This lesson help the student to realize about the importance of ecotourism	-	6	3	-	-	More
5.Students wanted to learn with multimedia CAI in other subjects	4	3	1	1	-	Most
6.The students' opinion about the appropriateness of the following issues were in which levels						
- Content arrangement to give knowledge	1	5	3	-	-	More
-The interpretation of picture use, sharpness, and picture position arrangement	4	5	-	-	-	More
- The continuity of picture sequence	1	5	3	-	-	More
- The beauty, sharpness, and the letter position arrange	-	2	5	2	-	Moderate
- The musical sound harmonized to pictures, and sound presentation	1	5	3	-	-	More
- The clearness of explanation	1	6	2	-	-	More

From Table 4, the result of the satisfaction evaluation of the multimedia CAI on "Ecotourism", most of them were in the mode of more levels. After the researcher had conversion with the students then the researcher adjusted the form, size, color of letter, and time of picture sequence to be faster according to their recommendations. It was implemented further in the third trial further.

3.3 The third trial, it was field test or big group test.

The multimedia CAI was improved after the second trial had done. The researcher brought multimedia CAI tried out by the 30 youth of Bangmodwittaya School, who were studying in Muthayomsuksa 4, 5, and 6 level, and 10 youth from each level. After they had learnt, they evaluated the satisfaction of learning. The results were as follows:

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Table 5 Satisfaction Evaluation of multimedia CAI on "Ecotourism" by youth

Evaluated Items	Most	More	Moderate	Less	Least	Mode
1.Students like to learn the multimedia CAI	1	16	11	11	-	More
2.Students gain more knowledge on ecotourism	5	14	9	2	-	More
3.This Instruction help the students to have more content comprehension	4	15	10	1	-	More
4.This lesson help the student to realize about the importance of ecotourism	8	12	10	-	-	More
5.Students wanted to learn with the multimedia CAI in other subjects	4	15	9	2	-	More
6.The students' opinion about the appropriateness of the following issues were in which levels						
- Content arrangement to give knowledge	-	17	12	1	-	More
- The interpretation of picture use, sharpness, and picture position arrangement	9	15	5	1	-	More
- The continuity of picture sequence	4	16	8	2	-	More
- The beauty, sharpness, and the letter position arrangement	-	18	10	2	-	More
- The music and sound effect harmonized to pictures, and sound presentation	10	14	5	1	-	More
- The clearness of explanation	1	6	2	-	-	More

From Table 5, the result of the satisfaction evaluation of the multimedia CAI on "Ecotourism", most of them were in the mode of more levels in the third trial. After the researcher adjusted the sound of description in some parts that was not clear to be clearer then the music and sound effect were decreased during having the description.

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4 The Effectiveness of Achievement Test

The researcher brought the learning achievement test composed of 24 items were tried out by youth of Bangmodwittaya School who were studying in Muthayomsuksa 4, 5, and 6 level, and 10 youth from each level, and then checking the scores and analysis for the level of difficulty and ease value, and discriminant value by considering with the following criteria with a difficulty level between 0.2 – 0.8 and a discrimination power value of at least 0.2 (Boontam Kijpreedeeborisut, 1988:141).

From analysis of 24 items of test, it were in the criteria established, subsequently the test was determined for the reliability by the Kuder-Richardson 20 (KR-20). It equaled to 0.62 so the test had the moderate reliability according to Chusri Wongwatana (1982, 229) recommendation that the test with high reliability would be in the range of 0.70-1.00, and test with moderate reliability would be in the range of (The detail presented in table 11-13 in the Appendix).

5 Experiment of The Sample Group with Multimedia CAI on "Ecotourism"

After the quality of the multimedia CAI had been improved, and test form of learning achievement were quailed that it was effective, subsequently, it was experimented by the sample group were youth at levels of Muthayomsuksa 4,5,and 6 of Thaweewatana, Thaweewatana District by using the Pretest-Posttest Control Group Design, and the experimental results were as follows:

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Table 6 The Achievement Scores of Pretest and Posttest of Experiment and Control Group

Sample Group	Experimental Group		Control Group	
	Pre-test ($\overline{X}$)	Post-test ($\overline{X}$)	Pre-test ($\overline{X}$)	Post-test ($\overline{X}$)
M.4	14.45	19.85	14.30	14.20
M.5	14.45	19.75	14.35	14.30
M.6	14.75	20.05	14.60	14.35
Youth	14.55	19.88	14.42	14.28

The results of experimental data were compared the difference of mean scores between experimental group and control group by following the step illustrated, and the resulted presented as follows: (The detail were illustrated in table 14-29 in the Appendix)

5.1 Analysis of learning achievement before studying with the multimedia CAI between experimental group and control group were done.

Table 7 Comparison of Mean Scores before studied the multimedia with CAI between Experimental Group and Control Group

Sample Group	N		$\overline{X}$		SD		t
	Exp.	Con.	Exp.	Con.	Exp.	Con.	
M.4	20	20	14.45	14.30	6.58	6.64	0.18
M.5	20	20	14.45	14.35	2.47	6.45	0.15
M.6	20	20	14.75	14.60	3.04	3.09	0.27
Total Youth	60	60	14.55	14.42	3.91	5.25	0.33

t = (df = 118, 0.05) = 1.980

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From table 7, it was obviously seen that the mean scores of the study achievement of experimental group and control group were close each other before the experiment, when it was analyzed the difference of mean scores of two groups by t-test, it was found that there was no difference statistically significant at level of 0.05. It showed that the experimental group and control group had knowledge on ecotourism equally.

5.2 Analysis of learning achievement before and after studying with CAI of experimental group was done.

Table 8 The Comparison of Mean Scores before and after studying with multimedia CAI of Experimental Group

Experimental Group	N		$\bar{X}$		SD		t
	Before	After	Before	After	Before	After	
M.4	20	20	14.45	19.85	6.58	1.92	9.57
M.5	20	20	14.45	19.75	2.47	0.83	14.58
M.6	20	20	14.75	20.05	3.04	1.31	17.67
Total Youth	60	60	14.55	19.88	3.91	1.33	22.14

t = (df = 59, 0.05) = 2.001

From the table 8, it was obviously seen that the mean scores of learning achievement of before (pretest) and after studying (posttest) of experimental group were difference by the posttest mean scores were higher than pretest mean scores when testing with t-test, it was found that the t value from the calculation were higher than t-value from table. Therefore mean scores were the means scores of pretest and posttest were statistically significant at level of 0.05. It meant that to study with the multimedia CAI of youth was able to increase the knowledge about ecotourism.

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5.3 Analysis of achievement before and after studied with multimedia CAI of the control group was done.

Table 9 Comparison of Mean Scores before and after studied with multimedia CAI of Control Group

Control Group	N		$\overline{X}$		SD		t
	Before	After	Before	After	Before	After	
M.4	20	20	14.30	14.20	6.64	5.33	-0.56
M.5	20	20	14.35	14.30	6.45	6.54	-0.18
M.6	20	20	14.60	14.35	3.09	4.34	-0.87
Total Youth	60	60	14.42	14.28	5.52	5.37	-0.93

t = (df = 59, 0.05) = 2.001

From the table 9, it was obviously seen that the mean scores of learning achievement of before (pretest) and after studying (posttest) of control group were close each other, when it was analyzed the difference of mean scores of both values by t-test, it was found that the t-value from calculation was lesser that the t-value from table, therefore the mean scores of pretest and posttest of control group had no difference statistically significant at level of 0.05. It showed that the pretest mean scores and posttest mean scores control group had knowledge on ecotourism equally.

5.4 Analysis of learning achievement after studied with multimedia CAI between experimental group and control group were done.

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Table 10 The Comparison between the Mean Scores after studying with the multimedia CAI between the Experimental Group and the Control Group

Sample Group	N		$\bar{X}$		SD		t
	Exp.	Con.	Exp.	Con.	Exp.	Con.	
M.4	20	20	19.85	14.20	1.92	5.33	9.24
M.5	20	20	19.75	14.30	0.83	6.54	8.93
M.6	20	20	20.05	14.35	1.31	4.43	10.75
Total Youth	60	60	19.88	14.28	1.33	5.37	16.97

t = (df = 118, 0.05) = 1.980

From table 10, it was obviously seen that the mean scores of learning achievement of experimental group and control group were different after studying, when it was analyzed the difference of mean scores of two groups by t-test, it was found that the t-value from the calculation were higher than t-value from table. Therefore mean scores of posttest of experimental group and control group were statistically significant at level of 0.05. It meant that youth who study with multimedia CAI on “Ecotourism” had knowledge increasingly.

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CHAPTER V
DISCUSSIONS

During the passed period, the tourism of Thailand has extremely expanded that affected directly to the whole national economy, but the growth of tourism industry caused the environmental degradation as well. Therefore the concept of ecotourism was introduced because it was an alternative mean to tourism form that aimed to maintain the natural resources and environment of tourism sites. Hence, to give knowledge about ecotourism to youth with the aims to make the youth to have knowledge, understanding, and consciousness and responsibility creating for the conservation of natural resources and environment of tourism sites to be sustainable use by maintaining the state of tourism. The knowledge and understanding given can be done in different manners, so this research had selected to give knowledge and understanding by constructing the multimedia CAI as a medium to give knowledge because it was accounted as a kind of media that can stimulate the youth to gain knowledge effectively. The construction of multimedia computer assisted instruction on "Ecotourism" for youth had the objectives to construct and try out the multimedia CAI on "Ecotourism" for youth, and to study the learning achievement of the youth after studying with multimedia CAI. The results were discussed as follows:

1 Experiment of Sample Group with The Multimedia CAI on "Ecotourism"

1.1 The multimedia CAI on "Ecotourism" was evaluated by the experts in the aspects of content and educational technology.

The evaluation of the multimedia CAI on "Ecotourism", was found that it was relevant to criteria of media evaluation of Kidanan Malithong. (1988) by having the content was congruent to behavioral objectives, and The appropriateness of

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introduction to content, correctness of content, appropriateness of story sequences, and the clearness of content explanation, and for the evaluation of technical quality of media was pertinent to the principle of evaluation of media of Siripong Payomyaem. (1990) that the constructed media should be clear and corrective, be able to communicate, and to be appropriate to age and class level.

1.2 The Experiment for development of multimedia CAI quality on "Ecotourism" was done

The evaluation of youth satisfaction toward the multimedia CAI in first trial and second trial were at mode of more level. Moreover there were asking about content comprehension and attraction of the multimedia CAI , and it was found that they would like to have more animation, and more complementary musical sound so it was improved on pattern, size, letter color and added more attractive complementary musical sound for fun, and proper to age of learner according to their recommendation. Hence the third trial, it was found that most of youth were satisfied the lesson.

Therefore, it can be said that the constructed the multimedia CAI had good quality and it can be used for teaching-learning process because it was systemically developed by following pattern and step according to the standard criteria, consequently, it was qualified by the experts of both content aspect and educational technological aspect and it was supplemented with three trials with youth and it had improved by diminishing all defects according to their recommendations in order to obtain the most appropriate lesson for experimenting with youth.

2 Experiment of Multimedia CAI on "Ecotourism"

The two group design was employed for research implementation was known as "The Pre – test and Post – test Control Group Design". The results of measurement of learning achievement by comparing between mean scores of experimental group and control group with t-test value. It demonstrated that the means scores of both group before studying (pretest) were not different that meant both groups had equal scores, and after studying (posttest) they were different statistically

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significant at level of 0.05 by the experimental group had mean scores higher than control group that showed that the experimental group gain more knowledge from studying with the multimedia CAI on “Ecotourism”.

Therefore, It can be summarized from the research results that it followed the set hypothesis that the experimental group who studied the multimedia CAI on the “Ecotourism” would have mean scores higher than before studying, and higher than mean scores of control group after experimenting at statistically significant at 0.05 level. It was congruent to the studies of Saipin Noppaket (1995: 73), Jiraporn Sriamonruttanakul (1997: 81), Sichol Kuanmetta (2000: 71), Nongnuch Khumnungdhum.(2001), and Natchaya Yimwilai (2001: 93) who had researched on the achievement by using CAI and had revealed that the mean scores of learner after studying were higher than before studying with statistically significant at level of 0.05.

From trior discussion can say that the multimedia CAI on “Ecotourism” had good quality and appropriateness to introduce to use for teaching-learning, because it was created systematically through a plan that was improved from suggestions made by the thesis committee and from evaluations made by qualified experts regarding content and learning technology. The multimedia CAI was developed through repeated testing (3 times) with youth and through the sample group youth in order to find whether the learning achievement of the multimedia computer assisted instruction on “Ecotourism” actually increased.

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CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

This research was the experimental research had the objectives to construct and try out the multimedia CAI on “Ecotourism” for Youth, and to study the achievement of the youth after studied with multimedia CAI. Research Hypothesis were the experimental youth group who had studied the multimedia CAI on “Ecotourism” had the mean scores higher than the means scores of control group, and the experimental group had mean score of posttest after studied with multimedia CAI on “Ecotourism” higher than mean scores of pretest statistically significant at level of 0.05.

The constructed multimedia CAI had the step of construction was to study the essential primary data such as content related to ecotourism, program assisted for CAI construction, academics documents and related researches, designed instruction and flowchart, and constructed CAI following from flowchart. The constructed lesson was developed the quality by the examining of thesis advisory committee, and experts of content and educational technology and the instruction was tried out by the youth were not the sample group 3 times with the one youth, 9 youth, and 30 youth respectively. They were youth of Bangmodwittaya (Sisukwadjuan-Uppartum), Bangkok Metropolis.

The experiment was done with the sample group that was sampling by the purposive sampling technique. The sample groups were youth at levels of Muthayomsuksa 4,5,and 6 of Dhaweewattana School, Dhaweewattana District. Each level composed of 2 classes that were similar in science-math program so one class would be control group and the another was experimental group and randomized 20 persons from each class for study. The research design used the Pretest and Posttest Control Group Design and compare the learning achievement of mean scores ($\overline{X}$) of before and after studying with multimedia CAI by using t-test.

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Analysis of results of construction and tried out by using of multimedia computer assisted instruction on "Ecotourism". It can be concluded as follows:

1 Research Conclusions

1.1 The construction of the Multimedia CAI on "Ecotourism". for youth.

The program was created to give knowledge regarding ecotourism for youth in the form of tutorial instructions through multimedia computer by creating the learning material through the use of Authorware. The creation process was done in a step-by-step fashion, through studying the necessary preliminary information such as the learning content itself and the creation methods in order to prepare, design instructions, create flow charts, produce instruction, and evaluate and revise the process through the suggestions of the thesis committee and through evaluations of the learning material's effectiveness.

The quality evaluation of multimedia CAI by experts of content, it was found that multimedia CAI had quality in level of good mostly, and for the experts of educational technology, it was found that the quality of lesson was in the good level as well such as the characteristics of pictures, content, language used for description, and presentation feature. Before the experiment would be done, it was tried out with the youth who were not sample group three times. The results of experiment and recommendations were as follows:

1) The multimedia CAI was tried out first time with one on one testing with one youth, and second trial was small group testing with 9 youth, and the third trial was field testing with 30 youth in order to observe the reaction of learner with constructed multimedia CAI. It was found that youth were good interested in the instruction.

2) The satisfaction evaluation form of youth towards the multimedia CAI , it was found that most of youth had satisfaction in the more level in both content and other characteristics of instruction.

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Therefore the constructed the multimedia CAI had quality because it was evaluated by the experts and was tried out to determine the defects.

1.2 The youth's learning achievement after they studied the multimedia CAI on "Ecotourism" with the sample group.

The evaluated multimedia CAI was used with two sample groups were the experimental group with 60 youth of Muthayomsuksa 4, 5, and 6 level of Thaweewatana School, by dividing into Muthayomsuksa 4, 20 students, Muthayomsuksa 5, 20 students , and Muthayomsuksa 6, 20 student and control group were 60 youth and was divided into 20 students for each level as well. Tests were held by letting the experimental and controlled groups try the learning achievement tests before letting them use the program. It was found that the average score of the experimental group equaled 14.55 and the average score of the controlled group equaled 14.42, which was not statistically different. These were the scores of the pre-test, which meant that the experimental and controlled groups had similar knowledge regarding ecotourism. After 1 week, the created multimedia computer assisted instruction on ecotourism was given to the experimental group. Tests were given to both groups. It was found that the experimental group had a post-test score of 19.88, which was higher than their pre-test score in a statistically significant way. The controlled group scored an average of 14.28 for the post-test, which did not differ in any statistically significant way from their pre-test score.

The experimental results followed with the set hypothesis that the experimental group who had studied multimedia CAI on "Ecotourism" had the mean scores higher than the means scores of control group, and the experimental group had mean score of posttest after studied with multimedia CAI on "Ecotourism" higher than mean scores of pretest statistically significant at level of 0.05.

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2 Research Recommendations

This research was to construct the multimedia CAI on "Ecotourism" for Youth, the researcher had the recommendation were as follows:

2.1 To construct multimedia CAI, it should use the computer with high capacity because to construct media must be kept pictures and sounds in order to use for lesson construction so it required high RAM capacity because if the CP could not support there was problem of slow working and to object when it was run or used.

2.2 It should be organized the data and store the multimedia CAI systemically in order to prevent data loss.

2.3 To construct of multimedia CAI, it should study different package programs that existed in order to understand the good point and limitation of each program in order to be able to use for lesson construct properly.

2.4. It should examine the readiness of computer of the experimental Place such as checking the sound system, color of pictures appearance is strange from the usual or not. The features of picture appearance is slower than usual or not in order to adjust before use.

2.5 To use the supplementary pictures for lesson construction, it should use the pictures that have rather high pixels. This is to prevent fragment, unbeautiful, and unclear picture.

3 Recommendation for Further Research

In order to be useful and guideline for research on multimedia CAI on the other topics further, the researcher would like to suggest as follows:

3.1 It should research about studying with multimedia CAI for other topics in order to develop teaching-learning process to be more efficiency and to be a perfect multimedia such as increase video directory, animation, sound, and method of interactions by using more techniques or equipments for instance.

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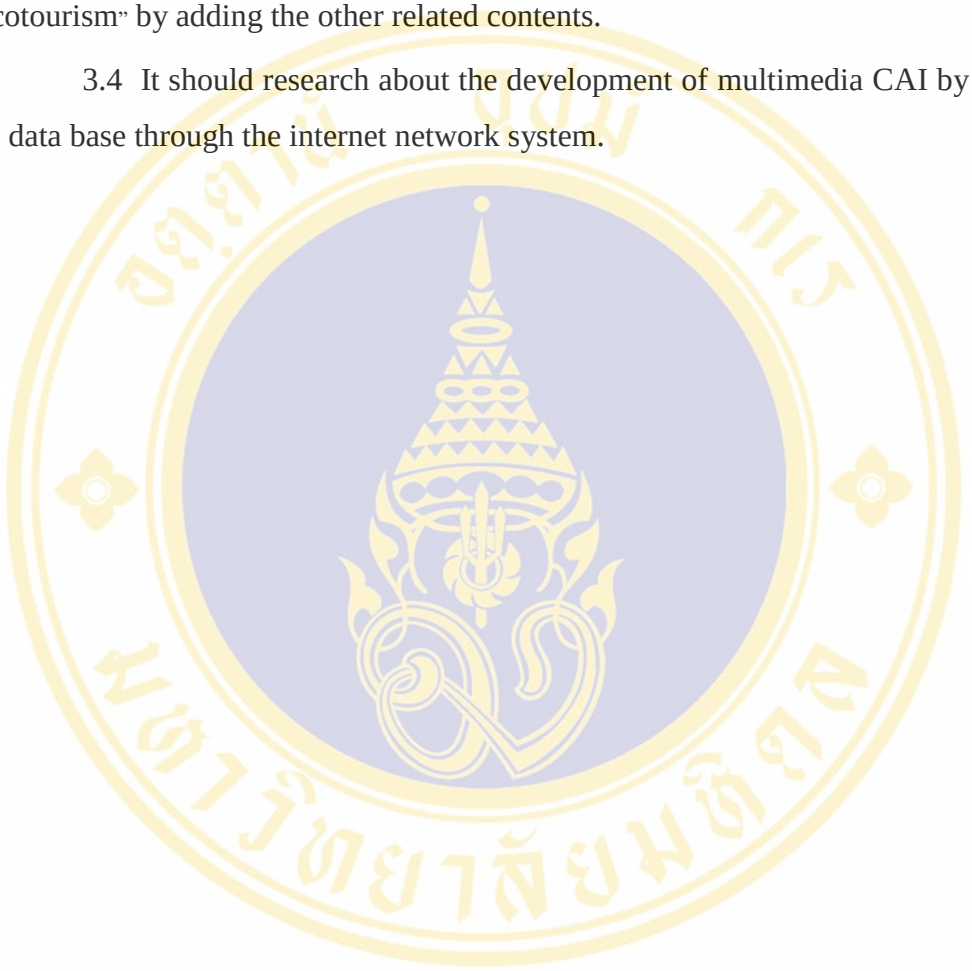
3.2 It should research about the development of multimedia CAI on "Ecotourism" for other group of people in order to promote the learning according to age and ability level.

3.3 It should research about the development of multimedia CAI on "Ecotourism" by adding the other related contents.

3.4 It should research about the development of multimedia CAI by making the data base through the internet network system.



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APPENDIX A
DATA ANALYSIS

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To Determine the Difficult/Ease Level and Difficult/Ease value and the Discriminant Power of Learning Achievement Test

Table 11 Analysis of Difficult/Ease Level and Difficult/Ease value and the Discriminant Power of Learning Achievement Test with 24 Items

Item No.	P_H	P_L	$P_H + P_L$	$P_L - P_L$	p	r
1	7	5	12	2	0.75	0.25
2	6	3	9	3	0.56	0.38
3	4	1	5	3	0.31	0.38
4	5	2	7	3	0.44	0.38
5	7	3	10	4	0.63	0.50
6	6	4	10	2	0.63	0.25
7	7	3	10	4	0.63	0.50
8	8	4	12	4	0.75	0.50
9	7	5	12	2	0.75	0.25
10	7	5	12	2	0.75	0.25
11	8	4	12	4	0.75	0.50
12	7	5	12	2	0.75	0.25
13	7	5	12	2	0.75	0.25
14	6	4	10	2	0.63	0.25
15	8	4	12	4	0.75	0.50
16	7	5	12	2	0.75	0.25
17	7	5	12	2	0.75	0.25
18	7	5	12	2	0.75	0.25
19	7	4	11	3	0.69	0.38
20	8	4	12	4	0.75	0.50
21	6	4	10	2	0.63	0.25
22	7	5	12	2	0.75	0.25
23	8	4	12	4	0.75	0.50
24	7	5	12	2	0.75	0.25

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To Determine the Reliability of Learning Achievement Test

Table 12 Analysis of Reliability of Learning Achievement Test

Item No.	p	q	pq
1	0.83	0.17	0.14
2	0.67	0.33	0.22
3	0.43	0.57	0.24
4	0.47	0.53	0.25
5	0.73	0.27	0.20
6	0.57	0.43	0.24
7	0.50	0.50	0.25
8	0.83	0.17	0.14
9	0.77	0.23	0.18
10	0.80	0.20	0.16
11	0.53	0.47	0.25
12	0.87	0.13	0.11
13	0.63	0.37	0.23
14	0.50	0.50	0.25
15	0.73	0.27	0.20
16	0.87	0.13	0.11
17	0.73	0.27	0.20
18	0.83	0.17	0.14
19	0.57	0.43	0.24
20	0.67	0.33	0.22
21	0.63	0.37	0.23
22	0.83	0.17	0.14
23	0.87	0.13	0.11
24	0.77	0.23	0.18
k=24			$\Sigma pq = 4.63$

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Determination of Variances of Scores of Learning Achievement Test

Table 13 Determination of Variances of Scores

Person Number	Score (X)	Scores (X^2)
1	23	529
2	22	484
3	21	441
4	21	441
5	21	441
6	21	441
7	21	441
8	21	441
9	20	400
10	20	400
11	19	361
12	19	361
13	19	361
14	19	361
15	18	324
16	18	324
17	17	289
18	17	289
19	17	289
20	17	289
21	16	256
22	15	225
23	14	196
24	14	196
25	14	196
26	13	169
27	13	169
28	12	144
29	12	144
30	11	121
n=30	Σx =525	Σx^2 =9,523

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From statistic in table was brought to determine the variance of total scores as follows:

$$S^2 = \frac{n\sum X^2 - (\sum X)^2}{n(n-1)}$$

$$= \frac{(30x9523) - (525)^2}{30(30-1)}$$

$$= 11.57$$

Therefore, it can determine the reliability value from Kuder-Richardson 20 (KR-20) formula as follows:

$$r_{tt} = \frac{k}{k-1}\left[\frac{s^2{}_x - \sum pq}{s^2{}_x}\right]$$

$$= \frac{25}{24}\left[\frac{11.57 - 4.63}{11.57}\right]$$

$$= 0.62$$

The reliability of learning achievement test equaled to 0.62

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Analysis of Learning Achievement Test of the Experimental Group and Control Group before Studying CAI

Table 14 Scores of Experimental Group and Control Group at High School Level 4 before Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	12	144	10	100
2	16	256	15	225
3	16	256	13	169
4	18	324	15	225
5	15	225	13	169
6	18	324	15	225
7	14	196	14	196
8	10	100	12	144
9	14	196	16	256
10	16	256	14	196
11	18	324	8	64
12	15	225	14	324
13	9	81	12	144
14	15	225	15	225
15	13	169	14	196
16	13	169	18	324
17	13	169	18	324
18	13	169	14	196
19	13	169	17	289
20	18	324	15	225
n = 20	$\Sigma x_1 = 289$ $\overline{x_1} = 14.45$	$\Sigma x_1^2 = 4301$	$\Sigma x_2 = 286$ $\overline{x_2} = 14.30$	$\Sigma x_1^2 = 4216$

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The Variance of Total Scores were

$$S^2 = \frac{n\sum X^2 - (\sum X)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x4301) - (289)^2}{20(20-1)}$$

$$= 6.58$$

$$S_2^2 = \frac{(20x4216) - (286)^2}{20(20-1)}$$

$$= 6.64$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$t = \frac{14.45 - 14.30}{\sqrt{\frac{(19(6.58) + (19)(6.64)}{20+20-2}(\frac{1}{20} + \frac{1}{20})}}$$

$$t = 0.1852$$

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Table 15 Scores of Experimental Group and Control Group at High School Level 5 before Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	16	256	18	324
2	15	225	16	256
3	14	196	15	225
4	18	324	12	144
5	16	225	12	144
6	13	169	15	225
7	14	196	19	361
8	11	121	17	289
9	12	144	17	289
10	16	256	17	289
11	15	225	15	225
12	14	196	11	121
13	14	196	11	121
14	16	256	13	169
15	15	225	13	169
16	14	196	12	144
17	14	196	16	256
18	13	169	15	225
19	14	196	11	121
20	15	225	12	144
n = 20	$\Sigma x_1 = 289$ $\overline{x_1} = 14.45$	$\Sigma x_1^2 = 4223$	$\Sigma x_2 = 287$ $\overline{x_2} = 14.35$	$\Sigma x_1^2 = 4241$

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The Variance of Total Scores were

$$S^2 = \frac{n\sum X^2 - (\sum X)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x4223) - (289)^2}{20(20-1)}$$

$$= 2.47$$

$$S_2^2 = \frac{(20x4241) - (287)^2}{20(20-1)}$$

$$= 6.45$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$t = \frac{14.45 - 14.35}{\sqrt{\frac{(19(2.47) + (19)(6.45)}{20+20-2}(\frac{1}{20} + \frac{1}{20})}}$$

$$t = 0.1493$$

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Table 16 Scores of Experimental Group and Control Group at High School Level 6 before Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	12	144	18	324
2	14	196	16	256
3	13	169	12	144
4	13	169	15	225
5	14	196	15	225
6	17	289	17	289
7	15	225	15	225
8	15	225	13	169
9	14	196	11	121
10	19	361	16	256
11	13	169	12	144
12	15	225	16	256
13	17	289	16	256
14	17	289	14	196
15	13	169	14	196
16	15	225	15	225
17	15	225	14	196
18	14	196	15	225
19	14	196	13	169
20	16	256	15	225
n = 20	$\Sigma x_1 = 295$ $\overline{x_1} = 14.75$	$\Sigma x_1^2 = 4409$	$\Sigma x_2 = 292$ $\overline{x_2} = 14.60$	$\Sigma x_1^2 = 4322$

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The Variance of Total Scores were

$$S^2 = \frac{n\sum X^2 - (\sum X)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x4409) - (295)^2}{20(20-1)}$$

$$= 3.04$$

$$S_2^2 = \frac{(20x4332) - (292)^2}{20(20-1)}$$

$$= 3.09$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$t = \frac{14.75 - 14.60}{\sqrt{\frac{(19(3.04) + (19)(3.09)}{20+20-2}(\frac{1}{20} + \frac{1}{20})}}$$

$$t = 0.2727$$

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Table 17 Scores of Experimental Group and Control Group at Youth before Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	12	144	10	100
2	16	256	15	225
3	16	256	13	169
4	18	324	15	225
5	15	225	13	169
6	18	324	15	225
7	14	196	14	196
8	10	100	12	144
9	14	196	16	256
10	16	256	14	144
11	18	324	8	64
12	15	225	18	324
13	9	81	12	144
14	15	225	15	256
15	13	225	14	196
16	13	169	18	324
17	13	169	18	324
18	13	169	14	196
19	13	169	17	289
20	18	169	15	225
21	16	256	18	324
22	15	225	16	256
23	14	196	15	225
24	18	324	12	144
25	16	256	12	144
26	13	169	15	225
27	14	196	19	361

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Table 17 Scores of Experimental Group and Control Group at Youth before Studying CAI (Continued)

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
28	11	121	17	289
29	12	144	17	289
30	16	256	17	289
31	15	225	15	225
32	14	196	11	121
33	14	196	11	121
34	16	256	13	169
35	15	225	13	169
36	14	196	12	144
37	14	196	16	256
38	13	169	15	225
39	14	196	11	121
40	15	225	12	144
41	12	144	18	324
42	14	196	16	256
43	13	169	12	144
44	13	169	15	225
45	14	196	15	225
46	17	289	17	289
47	15	225	15	225
48	15	225	13	169
49	14	196	11	132
50	19	361	16	256
51	13	169	12	144
52	15	225	16	256
53	17	289	16	256
54	17	289	14	196

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Table 17 Scores of Experimental Group and Control Group at Youth before Studying CAI (Continued)

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
55	13	169	14	196
56	15	225	15	196
57	15	225	14	225
58	14	196	15	132
59	14	196	13	169
60	16	256	15	225
n = 60	$\Sigma x_1 = 8735$ $\overline{x_1} = 14.55$	$\Sigma x_1^2 = 12933$	$\Sigma x_2 = 865$ $\overline{x_2} = 14.42$	$\Sigma x_1^2 = 12779$

The Variance of Total Scores were

$$S^2 = \frac{n\sum X^2 - (\sum X)^2}{n(n-1)}$$

$$S_1^2 = \frac{(60x12933) - (873)^2}{60(60-1)}$$

$$= 3.91$$

$$S_2^2 = \frac{(60x12779) - (865)^2}{60(60-1)}$$

$$= 5.25$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}(\frac{1}{n_1}+\frac{1}{n_2})}}$$

$$t = \frac{14.55 - 14.42}{\sqrt{\frac{(59(3.91)+(59)(5.25)}{60+60-2}(\frac{1}{60}+\frac{1}{60})}}$$

$$t = 0.33$$

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Analysis of Learning Achievement Test of the Experimental Group before and after Studying CAI

Table 18 Different Scores of Experimental Group at High School Level 4 before and after Studying CAI

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
1	12	18	6	36
2	16	21	5	25
3	16	18	2	4
4	18	21	3	9
5	15	21	6	36
6	18	21	3	9
7	14	19	5	25
8	10	21	11	121
9	14	19	5	25
10	16	21	5	25
11	18	21	3	9
12	15	19	4	16
13	9	20	11	121
14	15	17	2	4
15	13	18	5	25
16	13	19	6	36
17	13	20	7	49
18	13	21	8	64
19	13	20	7	49
20	18	22	4	16
n = 20	$\Sigma X = 289$ $\overline{X} = 14.45$ $S_x^2 = 6.58$	$\Sigma Y = 397$ $\overline{Y} = 19.85$ $S_y^2 = 1.92$	$\Sigma D = 108$	$\Sigma D^2 = 704$

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The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x7917) - (397)^2}{20(20-1)}$$

$$= 1.92$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - (\sum D)^2}{n-1}}}$$

$$t = \frac{108}{\sqrt{\frac{20(704) - (108)^2}{20-1}}}$$

$$t = 9.57$$

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Table 19 The Different Scores Scores of Experimental Group at High School Level 5 before and after Studying CAI

Person Number	**X (Pre-test)**	**Y (Post-test)**	**D (Y-X)**	**D^2 $(Y-X)^2$**
1	16	19	3	9
2	15	19	4	16
3	14	20	6	36
4	18	22	4	16
5	16	20	4	16
6	13	20	7	49
7	14	20	6	36
8	11	20	9	81
9	12	20	8	64
10	16	19	3	9
11	15	19	4	16
12	14	18	4	16
13	14	19	5	25
14	16	20	4	16
15	15	20	5	25
16	14	21	7	49
17	14	20	6	24
18	13	19	6	24
19	14	19	5	25
20	15	21	6	36
n = 20	$\Sigma X = 289$ $\overline{X} = 14.45$ $S_x^2 = 2.47$	$\Sigma Y = 395$ $\overline{Y} = 19.75$ $S_y^2 = 0.83$	$\Sigma D = 106$	$\Sigma D^2 = 612$

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The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x7817) - (395)^2}{20(20-1)}$$

$$= 0.83$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$$t = \frac{106}{\sqrt{\frac{20(612) - (106)^2}{20-1}}}$$

$$t = 14.58$$

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Table 20 The Different Scores Scores of Experimental Group at High School Level 6 before and after Studying CAI

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
1	12	18	6	36
2	14	19	5	25
3	13	19	6	36
4	13	20	7	49
5	14	19	5	25
6	17	21	4	16
7	15	21	6	36
8	15	19	4	16
9	14	20	6	36
10	19	22	3	9
11	13	22	9	81
12	15	21	6	36
13	17	21	4	16
14	17	21	4	16
15	13	19	6	36
16	15	20	5	25
17	15	19	4	16
18	14	19	5	25
19	14	20	6	36
20	16	21	5	25
n = 20	$\Sigma X = 295$ $\overline{X} = 14.75$ $S_x^2 = 3.04$	$\Sigma Y = 401$ $\overline{Y} = 20.05$ $S_y^2 = 1.31$	$\Sigma D = 106$	$\Sigma D^2 = 596$

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The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x8065) - (401)^2}{20(20-1)}$$

$$= 1.31$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$$t = \frac{106}{\sqrt{\frac{20(596) - (106)^2}{20-1}}}$$

$$t = 17.67$$

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Table 21 The Different Scores of Experimental Group at Youth before and after Studying CAI

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
1	12	18	6	36
2	16	21	5	25
3	16	18	2	4
4	18	21	3	9
5	15	21	6	36
6	18	21	3	9
7	14	19	5	25
8	10	21	11	121
9	14	19	5	25
10	16	21	5	25
11	18	21	3	9
12	15	19	4	16
13	9	20	11	121
14	15	17	2	4
15	13	18	5	25
16	13	19	6	36
17	13	20	7	49
18	13	21	8	64
19	13	20	7	49
20	18	22	4	16
21	16	19	3	9
22	15	19	4	16
23	14	20	6	36
24	18	22	4	16
25	16	20	4	16
26	13	20	7	49
27	14	20	6	36
28	11	20	9	81
29	12	20	8	64

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Table 21 The Different Scores of Experimental Group at Youth before and after Studying CAI (Continued)

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
30	16	19	3	9
31	15	19	4	16
32	14	18	4	16
33	14	19	5	25
34	16	20	4	16
35	15	20	5	25
36	14	21	7	49
37	14	20	6	24
38	13	19	6	24
39	14	19	5	25
40	15	21	6	36
41	12	18	6	36
42	14	19	5	25
43	13	19	6	36
44	13	20	7	49
45	14	19	5	25
46	17	21	4	16
47	15	21	6	36
48	15	19	4	16
49	14	20	6	36
50	19	22	3	9
51	13	22	9	81
52	15	21	6	36
53	17	21	4	16
54	17	21	4	16
55	13	19	6	36
56	15	20	5	25

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Table 21 The Different Scores of Experimental Group at Youth before and after Studying CAI (Continued)

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
57	15	19	4	16
58	14	19	5	25
59	14	20	6	36
60	16	21	5	25
n = 60	$\Sigma X = 873$ $\overline{X} = 14.55$ $S_x^2 = 3.94$	$\Sigma Y = 1193$ $\overline{Y} = 19.88$ $S_y^2 = 1.33$	$\Sigma D = 320$	$\Sigma D^2 = 1912$

The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(60x23799) - (1193)^2}{60(60-1)}$$

$$= 1.33$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$$t = \frac{320}{\sqrt{\frac{60(1912) - (320)^2}{20-1}}}$$

$$t = 22.14$$

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Analysis of Learning Achievement Test of the Control Group before and after Studying CAI

Table 22 Different Scores of Control Group at High School Level 4 before and after Studying CAI

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
1	10	10	0	0
2	15	14	-1	1
3	13	14	1	1
4	15	14	-1	1
5	13	14	1	1
6	15	15	0	0
7	14	14	0	0
8	12	12	0	0
9	16	15	-1	1
10	14	15	1	1
11	8	8	0	0
12	14	17	-1	1
13	12	13	1	1
14	15	16	1	1
15	14	14	0	0
16	18	18	0	0
17	18	17	-1	1
18	14	14	0	0
19	17	16	-1	1
20	15	14	-1	1
n = 20	$\Sigma X = 286$ $\overline{X} = 14.30$ $S_x^2 = 6.64$	$\Sigma Y = 284$ $\overline{Y} = 14.2$ $S_y^2 = 5.33$	$\Sigma D = -2$	$\Sigma D^2 = 12$

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The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x4134) - (284)^2}{20(20-1)}$$

$$= 5.33$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$$t = \frac{-2}{\sqrt{\frac{20(12) - (-2)^2}{20-1}}}$$

t = -0.56

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Table 23 Different Scores of Control Group at High School Level 5 before and after Studying CAI

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
1	18	16	-2	4
2	16	16	0	0
3	15	17	2	4
4	12	12	0	0
5	12	12	0	0
6	15	15	0	0
7	19	16	-3	9
8	17	17	0	0
9	17	17	0	0
10	17	17	0	0
11	15	18	3	9
12	11	10	-1	1
13	11	11	0	0
14	13	13	0	0
15	13	13	0	0
16	12	13	1	1
17	16	16	0	0
18	15	15	0	0
19	11	10	-1	1
20	12	12	0	0
n = 20	$\Sigma X = 287$ $\overline{X} = 14.35$ $S_x^2 = 6.45$	$\Sigma Y = 286$ $\overline{Y} = 14.30$ $S_y^2 = 6.54$	$\Sigma D = -1$	$\Sigma D^2 = 29$

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The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x4214) - (286)^2}{20(20-1)}$$

$$= 6.54$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$$t = \frac{-1}{\sqrt{\frac{20(29) - (-1)^2}{20-1}}}$$

t = -0.18

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Table 24 Different Scores of Control Group at High School Level 6 before and after Studying CAI

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
1	18	18	0	0
2	16	17	1	1
3	12	13	1	1
4	15	17	2	4
5	15	16	1	1
6	17	17	0	0
7	15	13	-2	4
8	13	13	0	0
9	11	11	0	0
10	16	16	0	0
11	12	11	-1	1
12	16	12	-4	16
13	16	16	0	0
14	14	14	0	0
15	14	14	0	0
16	15	13	-2	4
17	14	13	-1	1
18	15	15	0	0
19	13	13	0	0
20	15	15	0	0
n = 20	$\Sigma X = 292$ $\overline{X} = 14.60$ $S_x^2 = 3.09$	$\Sigma Y = 287$ $\overline{Y} = 14.35$ $S_y^2 = 4.34$	$\Sigma D = -5$	$\Sigma D^2 = 33$

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The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(20x4201) - (287)^2}{20(20-1)}$$

$$= 4.34$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$$t = \frac{-5}{\sqrt{\frac{20(33) - (-5)^2}{20-1}}}$$

t = -0.87

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Table 25 Different Scores of Control Group at Youth before and after Studying CAI

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
1	10	10	0	0
2	15	14	-1	1
3	13	14	1	1
4	15	14	-1	1
5	13	14	1	1
6	15	15	0	0
7	14	14	0	0
8	12	12	0	0
9	16	15	-1	1
10	14	15	1	1
11	8	15	0	0
12	18	8	-1	1
13	12	17	1	1
14	15	13	1	1
15	14	16	0	0
16	18	14	0	0
17	18	18	-1	1
18	14	17	0	0
19	17	14	-1	1
20	15	16	-1	1
21	18	14	-2	4
22	16	16	0	0
23	15	16	2	4
24	12	17	0	0
25	12	12	0	0
26	15	12	0	0
27	19	15	-3	9

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Table 25 Different Scores of Control Group at Youth before and after Studying CAI (Continued)

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
28	17	17	0	0
29	17	17	0	0
30	17	17	0	0
31	15	18	-3	9
32	11	10	1	1
33	11	11	0	0
34	13	13	0	0
35	13	13	0	0
36	12	13	-1	1
37	16	16	0	0
38	15	15	0	0
39	11	10	1	1
40	12	12	0	0
41	18	18	0	0
42	16	17	-1	1
43	12	13	-1	1
44	15	17	-2	4
45	15	16	-1	1
46	17	17	0	0
47	15	13	2	4
48	13	13	0	0
49	11	11	0	0
50	16	16	0	0
51	12	11	1	1
52	16	12	-4	16
53	16	16	0	0
54	14	14	0	0

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Table 25 Different Scores of Experimental Group at Youth before and after Studying CAI (Continued)

Person Number	X (Pre-test)	Y (Post-test)	D (Y-X)	D^2 $(Y-X)^2$
55	14	14	0	0
56	15	13	2	4
57	14	13	1	1
58	15	15	0	0
59	13	13	0	0
60	15	15	0	0
n = 60	$\Sigma X = 865$ $\overline{X} = 14.42$ $S_x^2 = 5.25$	$\Sigma Y = 857$ $\overline{Y} = 14.28$ $S_y^2 = 5.37$	$\Sigma D = -8$	$\Sigma D^2 = 74$

The Variance of Total Scores after Experiment

$$S^2 = \frac{n\sum Y^2 - (\sum Y)^2}{n(n-1)}$$

$$S_1^2 = \frac{(60x12558) - (857)^2}{60(60-1)}$$

$$= 5.37$$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - \left(\sum D\right)^2}{n-1}}}$$

$$t = \frac{-8}{\sqrt{\frac{60(74) - (-8)^2}{60-1}}}$$

$$t = -0.93$$

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Analysis of Learning Achievement Test of the Experimental Group and Control Group after Studying CAI

Table 26 Scores of Experimental Group and Control Group at High School Level 4 after Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	18	324	10	100
2	21	441	14	196
3	18	324	14	196
4	21	441	14	196
5	21	441	14	196
6	21	441	15	225
7	19	361	14	196
8	21	441	12	144
9	19	361	15	225
10	21	441	15	22
11	21	441	8	64
12	19	361	17	289
13	20	400	13	169
14	17	289	16	256
15	18	324	14	196
16	19	361	18	324
17	20	400	17	289
18	21	441	14	196
19	20	400	16	256
20	22	484	14	196
n = 20	$\Sigma x_1 = 397$ $\overline{x_1} = 19.85$	$\Sigma x_1^2 = 7917$ $S_1^2 = 1.92$	$\Sigma x_2 = 284$ $\overline{x_2} = 14.20$	$\Sigma x_1^2 = 4134$ $S_2^2 = 5.33$

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The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1 - 1)S_1^{\,2} + (n_2 - 1)S_2^{\,2}}{n_1 + n_2 - 2}(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$t = \frac{19.85 - 14.20}{\sqrt{\frac{(19(1.92) + (19)(5.33)}{20 + 20 - 2}(\frac{1}{20} + \frac{1}{20})}}$$

$$t = 9.42$$

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Table 27 Scores of Experimental Group and Control Group at High School Level 5 after Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	19	361	16	256
2	19	361	16	256
3	20	400	17	289
4	22	484	12	144
5	20	400	12	144
6	20	400	15	225
7	20	400	16	256
8	20	400	17	289
9	20	400	17	289
10	19	361	17	289
11	19	361	18	324
12	18	324	10	100
13	19	361	11	121
14	20	400	13	169
15	20	400	13	169
16	21	441	13	169
17	20	400	16	256
18	19	361	15	225
19	19	361	10	100
20	21	441	12	144
n = 20	$\Sigma x_1 = 395$ $\overline{x_1} = 19.75$	$\Sigma x_1^2 = 7817$ $S_1^2 = 0.83$	$\Sigma x_2 = 287$ $\overline{x_2} = 14.30$	$\Sigma x_1^2 = 4241$ $S_2^2 = 6.54$

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The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1 - 1)S_1^{\,2} + (n_2 - 1)S_2^{\,2}}{n_1 + n_2 - 2}(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$t = \frac{19.75 - 14.30}{\sqrt{\frac{(19(0.83) + (19)(6.45)}{20 + 20 - 2}(\frac{1}{20} + \frac{1}{20})}}$$

$$t = 8.93$$

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Table 28 Scores of Experimental Group and Control Group at High School Level 6 before Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	18	324	18	324
2	19	361	17	289
3	19	361	13	169
4	20	400	17	289
5	19	361	16	256
6	21	441	17	289
7	21	441	13	169
8	19	361	13	169
9	20	400	11	121
10	22	484	16	256
11	22	484	11	121
12	21	441	12	144
13	21	441	16	256
14	21	441	14	196
15	19	361	14	196
16	20	400	13	169
17	19	361	13	169
18	19	361	15	225
19	20	400	13	169
20	21	440	15	225
n = 20	$\Sigma x_1 = 401$ $\overline{x_1} = 20.05$	$\Sigma x_1^2 = 8065$ $S_1^2 = 1.31$	$\Sigma x_2 = 287$ $\overline{x_2} = 14.35$	$\Sigma x_1^2 = 4201$ $S_2^2 = 4.34$

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The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1 - 1)S_1^{\,2} + (n_2 - 1)S_2^{\,2}}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{14.75 - 14.60}{\sqrt{\frac{(19(1.31) + (19)(4.34)}{20 + 20 - 2}\left(\frac{1}{20} + \frac{1}{20}\right)}}$$

$$t = 10.75$$

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Table 29 Scores of Experimental Group and Control Group at Youth after Studying CAI

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
1	18	324	10	100
2	21	441	14	196
3	18	324	14	196
4	21	441	14	196
5	21	441	14	196
6	21	441	15	225
7	19	361	14	196
8	21	441	12	144
9	19	361	15	225
10	21	441	15	225
11	21	441	8	64
12	19	361	17	289
13	20	400	13	169
14	17	289	16	256
15	18	324	14	196
16	19	361	18	324
17	20	400	17	289
18	21	441	14	196
19	20	400	16	256
20	22	484	14	196
21	19	361	16	256
22	19	361	16	256
23	20	400	17	289
24	22	484	12	144
25	20	400	12	144
26	20	400	15	225
27	20	400	16	256

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Table 29 Scores of Experimental Group and Control Group at Youth after Studying CAI (Continued)

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
28	20	400	17	289
29	20	400	17	289
30	19	361	17	289
31	19	361	18	324
32	18	324	10	100
33	19	361	11	121
34	20	400	13	169
35	20	400	13	169
36	21	441	13	169
37	20	400	16	256
38	19	361	15	225
39	19	361	10	100
40	21	441	12	144
41	18	324	18	324
42	19	361	17	289
43	19	361	13	169
44	20	400	17	289
45	19	361	16	256
46	21	441	17	289
47	21	441	13	169
48	19	361	13	169
49	20	400	11	121
50	22	484	16	256
51	22	484	11	121
52	21	441	12	144
53	21	441	16	256
54	21	441	14	196

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Table 29 Scores of Experimental Group and Control Group at Youth after Studying CAI (Continued)

Person Number	Experimental Group		Control Group	
	X_1	X_1^2	X_2	X_2^2
55	19	361	14	196
56	20	400	13	169
57	19	361	13	169
58	19	361	15	225
59	20	400	13	169
60	21	441	15	225
n = 60	$\Sigma x_1 = 1193$ $\overline{x_2} = 19.88$	$\Sigma x_1^2 = 23799$ $S_1^2 = 1.33$	$\Sigma x_2 = 857$ $\overline{x_2} = 14.28$	$\Sigma x_1^2 = 12779$ $S_2^2 = 5.37$

The Statistical Value and the calculated variance values were determined the t-test as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$t = \frac{19.88 - 14.28}{\sqrt{\frac{(59(1.331) + (59)(5.37)}{60 + 60 - 2}(\frac{1}{60} + \frac{1}{60})}}$$

$$t = 16.97$$

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APPENDIX B
NAME LIST OF EXPERTS
QUALITY EVALUATION OF CAI BY EXPERTS

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Expert Name List for Quality Evaluation
Multimedia Computer Assisted Instructions on "Ecotourism"

1. Expert of Educational Measurement and Evaluation Aspect

Mr. Wuthipong Thong Kon	Head of Department Educational Curriculum and Standard Office of Academic Development Huashew University

2. Expert of Content Aspect

Miss Yuwadee Niruntakool	Head of Development work, North Region Tourism Authority of Thailand (TAT)
Mr. Nithi Sipae	Head of training work Tourism Authority of Thailand (TAT)
Mr. Thaweedej Thong-On	Project Planning Work Tourism Authority of Thailand (TAT)

3. Expert of Educational Technology

Mr. Sathaporn Punthuprayoon	Head of Work Plan Wilaikiat-Uppatham School Department General Education
Mr. Suwatchai Somnuek	Head of Educational Audio-visual Wilaikiat-Uppatham School Department General Education
Ms. Nittaya Thiengthong	Educational Audio-visual Piriyalai School Department General Education
Ms.Paveena Naewwong	Information technology and teaching media production, Nareerat School Department General Education

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Mr. Punya Somjit

Information technology and teaching media production, Soongmen Chanupathu, School Department General Education

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APPENDIX C
TEST FOR LEARNING ACHIEVEMENT
QUALITY EVALUATION FORM OF CAI BY EXPERTS
SATISFACTION FORM WAS EVALUATED BY YOUTH

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Test for Learning Achievement

Directions: Please place the mark X in the 'Correct' answer only one answer for each question in the answer sheet.

1. Which statement that referred about "Ecotourism" incorrectly?
    a. To receive the knowledge and ecosystem of tourism sites.
    b. To promote the tourists to live in the area that had the enrich ecosystem.
    c. Regard to the community participation for tourism site maintenance.
    d. Tourism does not degrade the natural resources and environment.

2. Which one is the most important for ecotourism activity?
    a. Tourist guide
    b. Radio communication
    c. Bicycle
    d. Handbook for tourism site

3. Which one is not the components of ecotourism?.
    a. Development plan of ecotourism of Tourism Authority of Thailand
    b. The process of learning about ecotourism
    c. Management of tourism site by community
    d. Natural tourism sites

4. Which statement is incorrect ?
    a. Ecotourism is a part of conservation tourism.
    b. Ecotourism is not cultural tourism
    c. Ecotourism is not differ from sustainable tourism
    d. All natural tourism type is not ecotourism.

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5. Ecotourism cause the following effects:
    a. Local people have income from selling the forest products to tourists.
    b. The tourists search for the endanger species of plants and animal species.
    c. The tourists had pioneered and touch to the hardness in the new trail
    d. Local people participated in the tourism site development in their own community.

6. Which following impacts are not caused by ecotourism?
    a. Destroy the scenic beauty
    b. Step on the plants
    c. Soil degradation
    d. Loud noise

7. Which one should be done for trekking?
    a. have garbage bag for keeping it during trekking
    b. Select the new trail in order to find the endanger species of plants and animal
    c. To inform the involved officers
    d. Wear the dress harmonized with natural color.

8. Which feature of shelters that the good ecotourism should not select?
    a. Have the garbage management did not degrade the environment
    b. Do not encroach to destroy the surrounding environment
    c. Harmonize with the environment and reflect to the local culture
    d. Locate far from community in order to avoid to disturb the local people

9. The feature of activity of boat sightseeing in which one is the ecotourism
    a. Tourists go to have a sightseeing the mangrove by having local people to give knowledge
    b. Tourists go to have a sightseeing at Dumnernsaduek Floating market, Ratchaburi Pprovince

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c. Tourists go to have a sightseeing at Kao Kred Nonthaburi Province for natural touch.
d. Tourists go to have a sightseeing at Mekhong River to watch the Bongfai Prayanak.

10. To have boat sightseeing to study nature, how does tourists decrease the impact to ecosystem?
    a. Not go into the danger areas.
    b. Not go into the dept area
    c. Not go into brackish water
    d. Avoid to disturb the season of egg laying of aquatic animal

11. Which activity that give knowledge about nature through the interpreted sign?
    a. Trekking for long distance activity
    b. Activity of natural study
    c. Activity of study/visit the cave
    d. Activity of photograph taking nature

12. Impacts may occur in the tourism sites, there is any causes as follows:
    a. Tourism activity
    b. To serve the shelter and food
    c. Answer a and b are right
    d. Answer a and b are wrong

13. What is the important reason of tourist limitation for ecotourism?
    a. The limited number of corporative officers
    b. Culture of tourist affected to the lifestyle of local community
    c. The tourism site is fragile and it is essential for living thing that has habitat over there.
    d. There is policy about limitation of tourist number from the central government.

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14. Which on e is the activity of study about sky interpretation and astronomy in the meaning of ecotourism?
    a. The ITV television station recorded the documentary about meteor at Mae Khong River bank
    b. Tuk participated in the activity of astronomic watching which was helh by the officers of the Scientific Park of Pra Com Klao at Wakao, Prajuabkirikhun Province.
    c. Student party entered to have study tour at planetarium
    d. Moth and friends climbed and star watching at Pukadueng

15. Which behavior gives the least impact to nature and environment?
    a. Make a loud noise
    b. Take picture of animal
    c. Anchored at the shallow coral reef
    d. Watch the animal at the night time

16. To dive for coral reef seeing, what should the tourist to as follows:
    a. Collect the coral reef
    b. Wear the snorkel
    c. Study the handbook of coral reef resources
    d. Give the food to aquatic animal

17. Which following activity is classified as ecotourism ?
    a. Chatchai brought his family to visit limestone cave with suspended and grew of different figure of limestone at Pang-Nga Province
    b. Brother Willy and Sister Mam went to dive to see coral reef at Krabi Province.
    c. J Family went to rafting, and canoeing at Nakorn Nayok Province.
    d. Fluk and sister Bow went to watch bird by the leading of guide at Sam Roi Yod Moutain.

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18. The interpreted sign is a part of which main component of ecotourism
    a. Sustainable management
    b. Community participation
    c. Natural tourism sites
    d. Learning process

19. Which one is not the impact that occurs from the trekking activity?
    a. Loud noise
    b. Disturb the ecological state
    c. Step on and cut tree/branch
    d. Disturb the morphological state

20. According to you thought, the ecotourism in Thailand faces what problems
    a. The principle of ecotourism is still not implemented seriously
    b. The local people do not want to change their way of life
    c. The private sector is not interested in ecotourism business
    d. There is not enough tourism site to support the tourists

21. How do the tourists take parts to cause impact due to the animal/bird watching?
    a. Waste
    b. Disturb the reproduction
    c. Destroy the scenic beauty
    d. Excretion

22. Which kind of activity gives the least impacts to ecosystem of tourism?
    a. Visit cave and waterfall
    b. Diving for coral reef seeing
    c. Study the astronomy
    d. Trekking

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23. What advantages that the tourist receives from ecotourism?
    a. Participate in planning for tourism
    b. Understand the problem of change in community
    c. Understand the relation of living thing and environment
    d. Have an adventure in the risk tourism site

24. Which one is not the benefit that the community receives from ecotourism?
    a. Distribute the income
    b. Raise the level of life quality
    c. Participate in tourism site maintenance
    d. Change the local culture

…….

Answered Question

1. b is a right answer
2. a is a right answer
3. a is a right answer
4. c is a right answer
5. d is a right answer
6. c is a right answer
7. b is a right answer
8. d is a right answer
9. a is a right answer
10. d is a right answer
11. b is a right answer
12. c is a right answer
13. c is a right answer
14. b is a right answer
15. b is a right answer
16. a is a right answer
17. d is a right answer
18. d is a right answer
19. d is a right answer
20. a is a right answer
21. b is a right answer
22 c is a right answer
23. c is a right answer
24. d is a right answer

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Quality Evaluation Form of CAI by Experts in the content of Topic of "Ecotourism"

Name and Surname of evaluator…….

Position…….Work Place……

Description Please mark / on the table that is pertinent to your opinion

Items	Level of Evaluation			
	Very Good	Good	moderate	Should improve
Story Flow				
1. Content was relevant to Objectives				
2. The appropriateness of introduction to content				
3. The appropriateness of story sequences				
4. The clearness of content explanation				
5. The congruence of content in each step				
6. The exercise was relevant to content				
7. The appropriateness of content to learner level				
The characteristics of Pictures				
1. The ability to interpretation				
2. The continuity of pictures				
3. The pictures related to content				
4. The appropriateness to learner level				
Language use				
1. Correctness				
2. Good interpretation, clearness				
3. To be appropriate to age and class level				

Other Recommendations……

…….

Signature…….Evaluator

( )

Date…….

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Quality Evaluation Form of CAI by Experts in the educational Technology on "Ecotourism"

Name and Surname of evaluator…….

Position…….Work Place……

Description Please mark / on the table that is pertinent to your opinion

Evaluated Items	Level of Evaluation			
	Very Good	Good	moderate	Should improve
Content				
1. The appropriateness of introduction to content				
2. The continuity of story flow				
3. The appropriateness of form and presentation				
The characteristics of Pictures				
1. Picture size				
2. Beautiful color				
3. The sharpness of picture				
4. The continuity of pictures				
5. The pictures related to content				
6. The ability to interpretation				
7. Picture arrangement				
8. The presentation styles				
Letter complementary				
1. The appropriate size				
2. The Beauty				
3. Clearness, easier to read				
4. Position arrangement				
5. The presentation styles				
Language use for Explanation				
1. Correctness				
2. Good interpretation, comprehension				
3. To be appropriate to age and class level				

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Evaluated Items	Level of Evaluation			
	Very Good	**Good**	**moderate**	**Should improve**
Sound use 1. The clearness and appropriateness of supplementary sound 2. The correctness and clearness of explained sound				

Other Recommendations……
……..
……
……

Signature…….Evaluator
( )
Date…….

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Satisfaction Form was evaluated by youth

on "Ecotourism"

Description Please mark / on the table that is pertinent to your opinion

Evaluated Items	Level of Evaluation			
	Very Good	Good	moderate	Should improve
1. Students like to study with CAI 2. Students gain more knowledge on ecotourism 3. This lesson help the students to have more content comprehension 4. Instruction help the student to realize about the importance of ecotourism 5. Students wanted to learn with CAI in other subjects 6. The students' opinion about the appropriateness of the following issues were in which levels - Content arrangement to give knowledge - The interpretation of picture use, sharpness, and picture position arrangement - The continuity of picture sequence - The beauty, sharpness and the letter position arrange - The musical sound harmonized to pictures, and sound presentation - The clearness of explanation				

Other Recommendations……
…….

Signature…….Evaluator
( )
Date…….

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APPENDIX D

FLOWCHART OF “ ECOTOURISM ” INSTRUCTION

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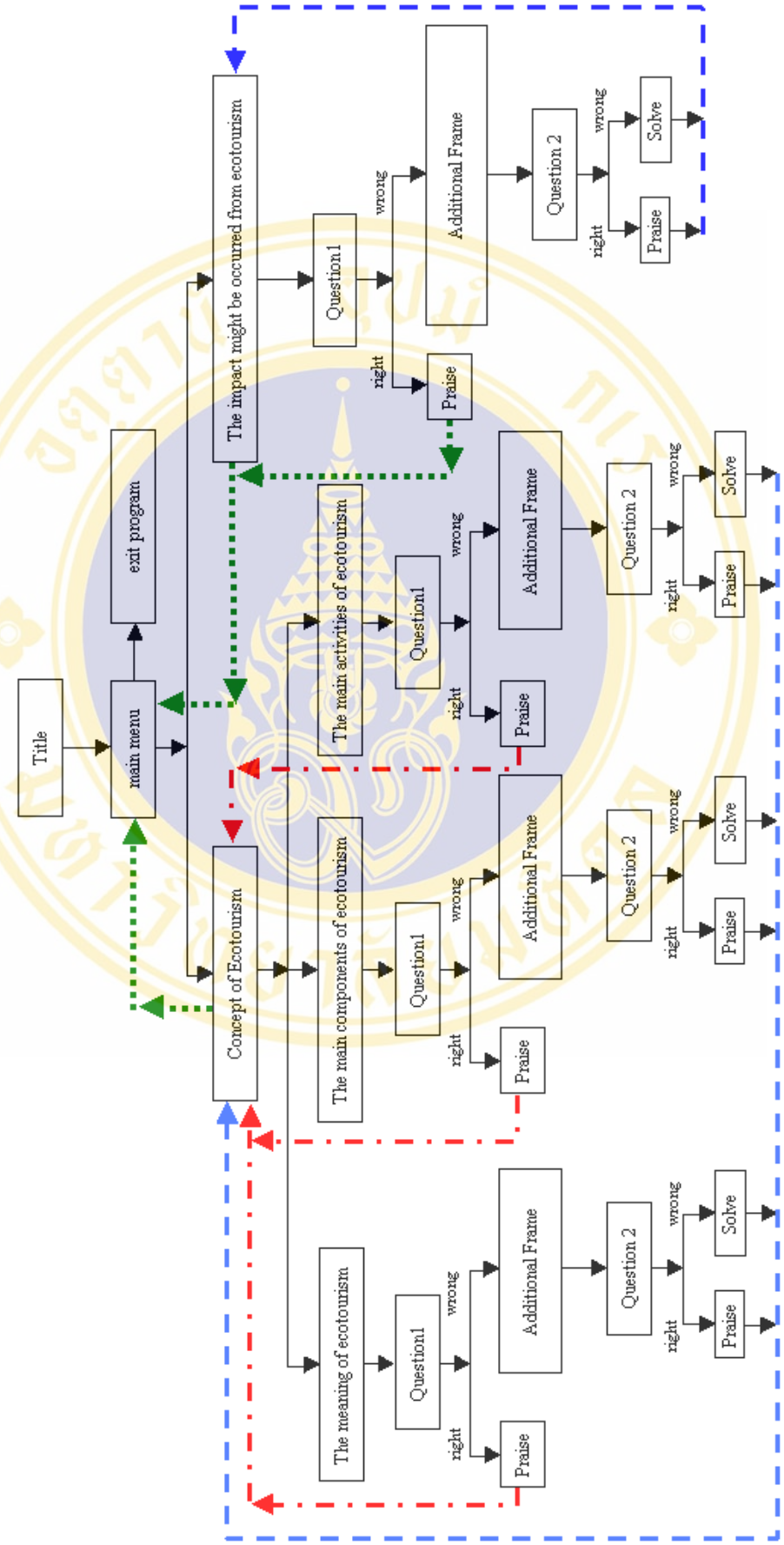
Flowchart of The multimedia CAI on " Ecotourism "



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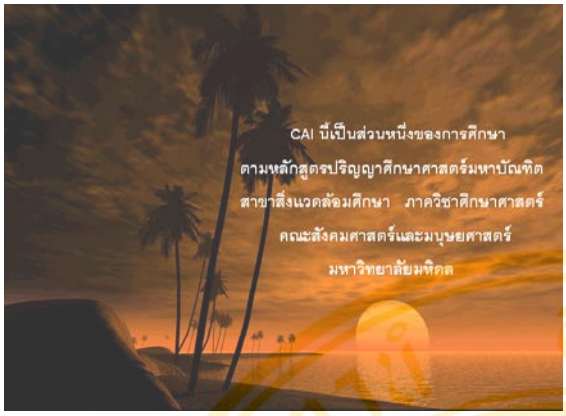

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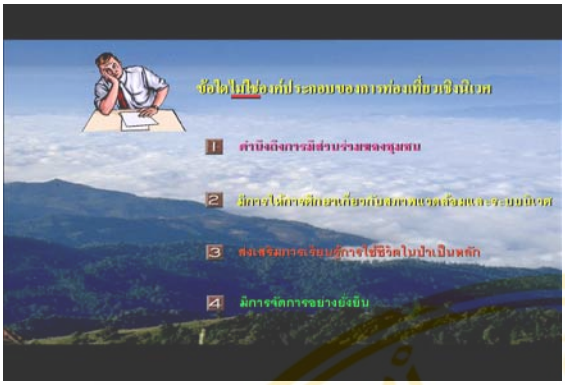

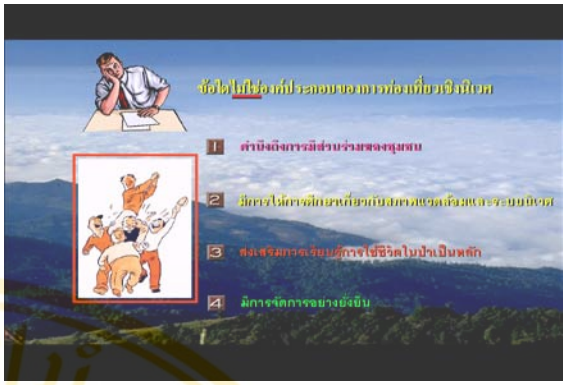

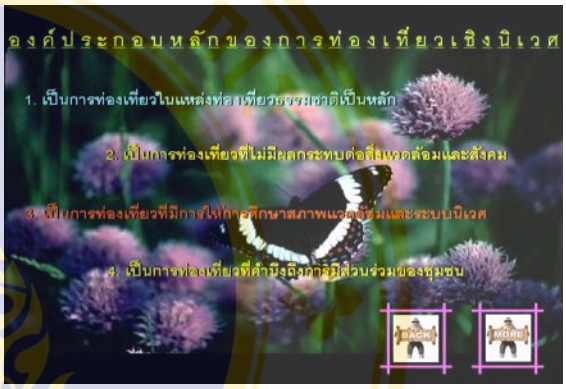

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BIOGRAPHY

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