YOUTH PARTICIPATORY LEARNING REGARDING WASTE SEPARATION AND RECYCLING IN COLLEGE: A CASE STUDY OF SAMUTSONGKHRAM TECHNICAL COLLEGE

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ABSTRACT

This thesis was an action research regarding environmental education about waste and waste management among member of the Business Computer Club of Samutsongkhram Technical College. The objectives of this research were to study waste separation and recycling in college and develop a youth participatory learning plan on this topic. The study was divided into three steps as follows: 1) Preparation for the participatory learning. 2) Operation of the participatory learning. 3) Evaluation. The research design used one group pre-test and post-test on the 27- member sample group.

In this research, the researcher used the CIPPA MODEL. This model has five components:1) construction and seeking of knowledge by the students themselves (C), 2) interaction with members of the same and different groups (I), 3) physical and mental participation (P), 4) process learning and development of a product (P), and 5) application of the knowledge (A).

The sample students were found to have significantly increased their knowledge, attitude and participatory behaviour. In addition, the sample students also reported they were satisfied with the CIPPA MODEL. Thus this model was suitable and appropriate for these students. They constructed their own knowledge about waste and waste management by using the group process, involving interaction with members of the same and different groups, participation, process learning and product development, and application on waste minimization in the college. This was achieved through waste separation, selling recycled waste and reusing as compost created by means of effective micro-organisms and molasses, producing a liquid fertilizer. This study indicates the potential of this model for use among students in colleges under the Vocational Education Commission, Ministry of Education. It is recommended this learning process should be arranged for those other students in order to increase participation in waste minimization.

KEY WORDS: PARTICIPATORY LEARNING / WASTE SEPARATION / WASTE RECYCLING / SAMUTSONGKHRAM TECHNICAL COLLEGE

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การเรียนรู้แบบมีส่วนร่วมของเยาวชนในการคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่ ในสถานศึกษา: กรณีศึกษาวิทยาลัยเทคนิคสมุทรสงคราม. (YOUTH PARTICIPATORY LEARNING REGARDING WASTE SEPARATION AND RECYCLING IN COLLEGE: A CASE STUDY OF SAMUTSONGKHRAM TECHNICAL COLLEGE).

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ศษ.ม. (สิ่งแวดล้อมศึกษา)

คณะกรรมการควบคุมวิทยานิพนธ์: รัชชานนท์ ศุภพงศ์พิเชฐ, พบ.ด., มณทิพย์ ศรีรัตนา ทาบูกานอน, Ph.D., ไพรัช ถิตย์ผาด, ศษ.ด.

บทคัดย่อ

การวิจัยครั้งนี้ เป็นการวิจัยเชิงปฏิบัติการ เพื่อสอดแทรกสิ่งแวดล้อมศึกษา เรื่องมูลฝอยและการจัดการมูลฝอย ให้แก่สมาชิกชมรมคอมพิวเตอร์ธุรกิจ วิทยาลัยเทคนิคสมุทรสงคราม มีวัตถุประสงค์เพื่อจัดทำแผนการเรียนรู้แบบมีส่วนร่วมขึ้น และทดลองใช้หาประสิทธิผลของแผนการเรียนรู้ โดยมีวิธีดำเนินการวิจัย 3 ขั้นตอน ได้แก่ 1) การเตรียมการเรียนรู้แบบมีส่วนร่วม 2) การเรียนรู้แบบมีส่วนร่วม โดยใช้ CIPPA MODEL 3) การประเมินผล รูปแบบการวิจัยเป็นแบบทดสอบก่อนและหลัง กลุ่มเดียว สำหรับนักศึกษากลุ่มตัวอย่าง จำนวน 27 คน

ในการวิจัย ผู้วิจัยใช้ CIPPA MODEL ซึ่งมีองค์ประกอบ 5 ประการ ได้แก่ 1) ผู้เรียนสร้างและค้นพบความรู้ด้วยตนเอง (Construct: C) 2) มีปฏิสัมพันธ์กับเพื่อน (Interaction: I) 3) มีส่วนร่วมทั้งทางร่างกายและจิตใจ (Participation: P) 4) เรียนรู้กระบวนการและมีผลงาน (Process/Product: P) และ 5) นำความรู้ไปประยุกต์ใช้ (Application: A)

ผลการวิจัยพบว่า นักศึกษากลุ่มตัวอย่างมีคะแนนเฉลี่ยด้านความรู้ เจตคติ และพฤติกรรมการมีส่วนร่วมสูงขึ้นอย่างมีนัยสำคัญทางสถิติ นอกจากนี้ ยังพบว่านักศึกษากลุ่มตัวอย่างมีความพึงพอใจในกระบวนการเรียนรู้ด้วย CIPPA MODEL ดังนั้น รูปแบบการเรียนรู้นี้ จึงมีความเหมาะสม และใช้ได้ดีกับนักศึกษากลุ่มนี้ โดยนักศึกษากลุ่มตัวอย่างสามารถสร้างองค์ความรู้ในเรื่อง มูลฝอยและการจัดการมูลฝอยได้ด้วยตนเอง โดยใช้กระบวนการกลุ่มที่มีการสร้างปฏิสัมพันธ์ขึ้นภายในกลุ่ม และระหว่างกลุ่ม เกิดการมีส่วนร่วม ได้เรียนรู้กระบวนการ มีผลงานจากการเรียนรู้ สามารถนำไปประยุกต์ใช้โดยการปฏิบัติจริงด้านการลดปริมาณมูลฝอยในวิทยาลัยด้วยการคัดแยกมูลฝอย การจัดจำหน่ายมูลฝอยรีไซเคิล และการทำปุ๋ยน้ำหมักชีวภาพ การศึกษาครั้งนี้บ่งชี้ให้เห็นศักยภาพของรูปแบบการเรียนรู้ที่ใช้จัดการเรียนรู้ให้กับนักศึกษา ในสถานศึกษา ในสังกัดสำนักงานคณะกรรมการการอาชีวศึกษา กระทรวงศึกษาธิการ จึงมีข้อเสนอแนะให้มีการพิจารณานำกระบวนการเรียนรู้นี้ไปใช้จัดการมูลฝอยสำหรับนักศึกษาอื่นๆเพื่อสร้างการ มีส่วนร่วมในการลดปริมาณมูลฝอยได้กว้างขวางมากยิ่งขึ้น

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CHAPTER I
INTRODUCTION

1.1 Background and Significance of the Problem

Solid waste problem has been an important environmental problem. The amount of it from communities has been increased with increasing population, including with the changing of consumption behaviour and package' s development, which are the factors stimulated to bring the chronicle problem seriously and more widely. This is effected to the environment and society, which caused pollution problem to hygiene health, economic, and society as a whole. However, it is hardly to dispose of total solid waste. There still remains a problem of uncollected wastes and cannot degrade because some types of waste which recyclable potential for the production of new materials are disposed of without necessity. Some of them could be reused as well but are mixed other waste without any separation. This leads to a high cost of collection, transportation and disposal. This situation has an impact high cost relevant to imported raw materials and also lead to increase on raw materials consumption, which are natural resources. This causes the declining and unsustainable use of natural resources.

The amount of solid waste from communities all over the countries in 2000 was approximately 38,170 tons per day or 13.9 million tons per year. That was a few increased from 1999. By area, 9,130 tons per day was from Bangkok or 24% of total municipalities, and Pattaya City (totally 1,131 municipalities) 11,785 tons per day or 31%, and outside the municipalities 17,255 tons per day, or 45%. (The Office of Environmental Policy and Planning, 2002: 61-63) The daily waste production rate of the Bangkok Metropolitan Area and its perimeter provinces was 1 kilogram/day/person compared with 0.7 kilogram/day/person for municipalities in other regions of the country.

For solid waste management, the Thai government has adopted the supply side approach in managing solid waste, that is, by focusing on providing of facilities and infrastructure (The Office of Environmental Policy and Planning, 2002: 147), namely, sanitary landfill, composting, and incineration. Each method has more highly cost advantages and disadvantages as Table1.

Table1 Advantages and Disadvantages of Solid Waste Management in Different Types

Solid Waste Management System	Advantages	Disadvantages
1. Sanitary landfill	- Low cost per unit	- Requires large land area - Have the pollution from odour and leachate - Public protests in the area
2. Composting	- Separate the all fresh waste to make fertilizer - Make money from selling fertilizer	-Have the cost of separation and waste management - Have the environmental problems together with odour and leachate from waste
3. Incineration	- Be able to dispose of waste about 90 % of the total waste	- Highly cost per unit in high management -Must get rid of the ash and the residue properly - Make the environmental problem from smoke and smog

Source: The Office of Environmental Policy and Planning, 2002

Waste management at source was another guideline in waste management that came in 1987, namely, reducing the amount of waste, persuading people in community to participate in waste management, namely, the 5R methods (reuse, refill, repair, reduce, and recycle), and waste separation before discard. All of these methods could reduced waste into lowest disposal that was the principle of waste management which were called "Sustainable Development" (Energy and Environmental Development Foundation, 2002: 1-1)

Therefore, the government analyzed problems and difficulties of waste management in order to provide a policy for waste management by integrating waste management at source and at the end together (The Office of Environmental Policy and Planning, 2002: 150-152). With managing waste in a hygienic principle, controlling waste generation and waste recycling; moreover; supporting private sector to invest in waste management system and promote community to participate in solving waste problems by providing two targets in waste management as follows:

Target 1: Waste management at source emphasized on solving source of problem which is consumer and producer.

The target was to reduce waste generation from people to 1 kilogram/day/person and reduce the amount of waste to only non-recycling to dispose by using the 5R project and waste separation.

The 5R project is to reduce product using which would create waste, use refilled products, repair old materials, reuse used products and recycle usable products. This method will help to reduce the amount of waste and turn waste to money by reusing it as raw materials in product process. For the 5R project, government, private sectors and communities held the supplementary projects in practical ways in order to promote and support the 5R project successful. The supplement projects were, namely, Recycling the Community and School Bank, Waste-for-Egg, and Waste Donation Project.

Target 2: Solving problems at the end by developing and improving waste disposal in order to bring the leftover waste from the 5R project to dispose.

The target was to have sanitary waste disposal system in every urban city. Waste collection in the cities has to complete 100% and outside cities to collect of leftover waste is not more than 10% of total amount of waste, moreover, the city has to

reuse waste at least 15% of total amount of waste. (The Office of Environmental Policy and Planning, 2002: 150-152)

At the present government invests on improving solid waste disposal system in some areas and builds new waste disposal system. Most of waste disposal systems are sanitary dump sites while incinerators can only find in 3 areas, namely, Muang Phuket Municipality, Tambon Samui Island Municipality, and Muang Lumpoon Municipality. (Department of Pollution Control, 2000)

On the other hand, from 1996 to 2000, recycled waste had been increased from 1.4 to 2.0 million tons per year. Average rate of increase recycled waste was 8.9% per year. Proportion of recycled waste was about 40-60% of total amount of waste which compared about amount of recycled waste in the year 2000 was about 14.4%. Thus, recycled rate could been increased more than 25-45% of total amount of waste. (The Office of Environmental Policy and Planning, 2002: 148)

Department of Pollution Control (1998: 1-14) had developed and promoted the effective and complete cycle of recycling scheme that needed to provide various mechanism, which would facilitated separation and recovery of used materials for recycling, namely, providing technology of reducing waste amount and recovery of waste, establishment of factories and markets for products which already separated and recovered, recovery plants for waste recycle, arranging for expanding the final waste disposal site, and providing strategies which government related with agencies, private sectors and industries had to follow in practical, in order to achieve feasible implementation of the proposed plans and strategies. These solutions would be supported by campaigning for the conservation of environment, natural resources and energies. In addition, pollution mitigation by means of reuse/recycling will contribute benefits to economics and society, namely, leading to various kinds of job, namely, waste separator in the recovery plants, manufacturer of recycled products, waste agent or waste shop and saleng. In addition, reuse/recycling technology can help the rate of natural resources destruction, waste amount, and the problem of finding future landfill site, making income and increasing value of waste.

Samutsongkhram is one of the communities of solving this problem because it is the small province covered an area about 416,707 squarekilometers or 260,441.87 rais. From the data of the Provincial Environmental Management Action Plan in 2003

(The Office of Samutsongkhram, 2002: 1-2) was found that there are 205,696 population in Muang Samutsongkhram Municipality, covered an area about 8 squarekilometers with the total population 35,481, rate of waste generation 0.8 kilogram/person/day, the amount of solid waste in this area will be about 32 tons per day. This make the municipality dispose of it 30 tons per day so the problem that the leftover waste will be about 2 tons as well as the study of composition waste in this area which was found that the waste which has potential for recycle are about 48.36% by the paper 22.29%, plastic 10.06%, rubber 7.03%, metal 6.31% and others 2.67%. At present there is the waste separation by the municipality' s waste collectors is about 769 kilograms per day. (Muang Samutsongkhram Municipality, 2002), whereas Tumbon Amphawa Municipality is about 12 tons per day but can be dispose of 8 tons, so the leftover waste 4 tons per day. Other municipalities and many Sub-district Administrative Organizations have increasing the amount of waste and they have the leftover waste that is caused adverse impacts on the environment and public health.

Samutsongkhram has used the waste disposal center management system (Muang Samutsongkhram Municipality, cited in The Office of Samutsongkhram, 2002: 1-2) By using sanitary landfill covered an area about 18 rais which waste disposal is about 70-75 tons per day, situated at Ban Tawanchak, Lardyai, Muang, Samutsongkhram. It had been started since 1998 and now which is the last step. In 2001, the Muang Samutsongkhram Municipality had bought more 22 rais of land and asked the public land which was near the disposal places 20 rais and gave March Utilities Co., Ltd. to study the feasibility and detail designs for construction of waste disposal center with integrated management systems for managing solid waste, that was, waste disposal centers together by each local collected and sent to the place including waste collection fees in local with the Polluter Pays Principle, moreover, it provided to make in-cycle solid waste project of Samutsongkhram for offering the budget allocation through the Provincial Environmental Management Action Plan from the Ministry of Science, Technology and Environment. In mid year of 2002, there was obviously the conflict problem in the waste disposal area, because of people who lived at Ban Tawanchak, they did not allow to dispose of the solid waste here. When it rained, the leftover waste had many amount which gave bad odour around that community. So it was the interesting problem and should be solved the ways to carry out quickly which now many municipalities in the province managed to only

face problem by moving the waste disposal places in the temporary place and the payment 20,000 baht per day 600,000 baht per month or about 7 millions baht per year (Muang Samutsongkhram Municipality, 2002) which could not be stopped.

From this situation which had happened in Samutsongkhram is the clearly confirmation that it is time for everyone to participate in waste generation and must be responsible for waste management together. One way to solve the problem is to bring the way of raising the general public awareness of negative impacts from waste and support the people and youth in this area to take part in the management of it together which is concerned with the solid waste management' s guideline as a whole, of the country by giving the information' s study of solid waste situation, solid waste knowledge and reducing the amount of solid waste' s guideline by waste separation and recycling into other forms for real practical concrete form, make examples as well as see the practical steps and participate in solid waste management obviously. It can be brought in more extension for the same main purpose is to reduce the amount of solid waste through the least in waste disposal and suggest to raise the awareness for everyone to realize the solid waste problem, reduce the waste management cost, reduce the loss of solid waste management and extend the long life of world resources.

Accordingly, the beginning with managing study for youth who take part in solving the environmental problems about solid waste through education which is the important mechanics to help the solid waste management' s guideline by public participation in actual practice which can receive the sustainable goal, solve the problem in the long life. It is the beginning and original of creating the participation in waste management by using the participatory learning plan regarding waste separation and recycling in college, solving the solid waste problems which lead to manage the people in the provincial level' s solid waste management in the other time.

Samutsongkhram Technical College is a large college, Vocational Education Commission, Ministry of Education, situated on Ekachai Road, Tambon Lardyai, Muang, Samutsongkhram, its total area 54 rais 1 ngan 84 squarewa, divided into 2 parts were the site of the college 42 rais 1 ngan 25 squarewa and another was the site of teacher' s houses 12 rais 59 squarewa. (Samutsongkhram Technical College, 2002: 2) which the site was on the way between municipality area (the solid waste' s source of community) and the waste disposal of the province at Ban Tawanchak, Lardyai, Muang, Samutsongkhram seen Appendix A.

Samutsongkhram Technical College is consisted of 8 permanent learning buildings (divided into 43 classrooms and 65 laboratory rooms), 4 units of workshop buildings and operation, 28 boarding houses and 4 block boarding houses (21 units) 1 flat (14 units), 1 central material, 1 business building, 1 hall and canteen (Samutsongkhram Technical College, 2002: 31) seen Appendix B.

The Educational Management of this college has been taught 2 systems. They are: 1) Normal System, the Certificate level (CERT.), Industrial Trades, Home-Sciences and Commerce Programs and the Diploma level (Dip.) Industrial Trades and Commerce Programs, apply the two types (morning and afternoon) and 2) Dual Vocational Technique, the Certificate level (CERT.) only Industrial Trades 2 majors, auto-mechanics and machine shop. The total of students classified by the program and class levels in the academic year 2002 was 3,362 persons as Table 2.

Table 2 Number of the Students Classified by the Subject Types and Level Types, the Academic Year 2002

System	Program	Certificate				Diploma				Total
		1	2	3	Total	1	2	3	Total	
Normal	Industrial Trades	398	410	317	**1,125**	298	334	76	**708**	**1,833**
	Home-Sciences	48	60	50	**158**	-	-	-	**-**	**158**
	Commerce	293	246	255	**794**	213	230	28	**471**	**1,265**
DVT	Industrial Trades	49	33	24	**106**	-	-	-	**-**	**106**
Total		**788**	**749**	**646**	**2,183**	**511**	**564**	**104**	**1,179**	**3,362**

Source: Samutsongkhram Technical College, 2002

However, there are teacher officials, civil officials, permanent employees, temporary employees and employed-teachers totally 204 persons, including with management the graduate level of Muban Chombung Rajabhat Institute which had opened Saturdays and Sundays. A lot of students have studied and used the services here.

It is found that Samutsongkhram Technical College is the place where is gathered a lot of people in the community, learning activities, job practice, and the

consumption service within the college happened everyday all the weeks which has been made the bulk of solid waste.

The solid waste composition within this college are 2 types: 1) Solid waste from the consumption, namely, food and vegetable scraps, fruit peel, plastic bottles, milk packages, aluminium cans of drinks, sweets scraps and packages, plastic bags, and plastic glasses. 2) Solid waste from the learning activities, namely, paper, used books, paper boxes, office supplies, media instruction and the scrap of practical materials in each department' s workshop of the college, mostly, was the wood bark and metal scraps (Mayuree Kongdoung, 1999).

From the above factors, Samutsongkhram Technical College had managed waste management by collecting them to gather heap in each place within the college for 6 places, which were separated the types to wet solid waste, namely, food and vegetable scraps and fruit peel by using the yellow bins at the hall and canteen. Whereas, others solid waste' s leftovers are around 5 places of college by using the green or blue bins and ready for collecting from Lardyai Sub-district Administrative Organization which is responsible for the waste collection in the college area, 3 days a week, about 1.5 tons each times or about a half of the container, It was the solid waste which not only be separated and recycled a lot but also separated valued solid waste, namely, paper and plastic bottles which the permanent building' s janitors and cleaners which are responsible for the canteen who can get the special income while the students who make a bulk of solid waste' s amount, however, they are not interested or have participation in. By this reason, the college which is the proper place for youth participatory learning regarding waste separation and recycling to raise awareness and participate with the youths in reducing the amount of solid waste at sources into the least for waste disposal.

Therefore, the researcher is interested in bringing the environmental education to the student youths in Samutsongkhram Technical College through participatory learning regarding waste separation and recycling in college, by CIPPA MODEL (One of the models in learning process management which is learner-centred approach by the National Education Commission, 2002). It is the co-operation between the teachers and students. The teachers provide the learning by applying the interesting students of the college to take part in learning for 27 sample students of Business Computer Club of Samutsongkhram Technical College who are interested in

the environmental problems and divided into 5 sub-groups, may have 5-6 members. They use the opinion exchange learning together in group process, construct knowledge from the original experience to develop body of knowledge through participation, survey, research the problem to provide in solving the problem, decide to choose activity, begin to manage, evaluate, conclude the lesson for the data on solving solid waste problem in college. By using the crisis on solid waste problem in the community as stimulator, outside situation which is controlled to have needed for creating the participatory learning in solid waste management to be happened actually. By the beginning from the youths in college to be success on extension through the local public participation for practice solving the solid waste problem in the future and expect when learning process of youth participatory learning regarding waste separation and recycling in college. The activities which can be managed in this research will have stimulated the students and adapt to develop in solid waste management of college which may be useful for other students in colleges under the Vocational Education Commission, Ministry of Education in applying for participation in solid waste management more widely.

1.2 Objectives of the Research

The objectives of this research were as follows:

1.2.1 To study and develop the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL.

1.2.2 To try out and evaluate the effectiveness of the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL.

1.3 Research Questions

In this study, there are questions from the research as follows:

1.3.1 The youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL, should have concept, objective, content for learning, learning activities, measuring and evaluating, and what each are.

1.3.2 When the youth participatory learning plan is implemented on a trial basic, is it possible to proceed effectively or achieve goals according to provide targets?

1.3.3 Are the sample students who participated can be satisfied with participatory learning process?

1.4 Research Hypotheses

The hypotheses of this research were as follows:

1.4.1 After the participatory learning, the sample students' average score of knowledge was statistically higher than before the participatory learning.

1.4.2 After the participatory learning, the sample students' average score of attitude was statistically higher than before the participatory learning.

1.4.3 After the participatory learning, the sample students' average score of participatory behaviour was statistically higher than before the participatory learning.

1.4.4 During the implementation of the participatory learning, the sample students were satisfied with the participatory learning plan, by CIPPA MODEL.

1.5 Scope of the Studies

This research is a practical-based case study research in Samutsongkhram Technical College, Muang, Samutsongkhram, with 27 sample students of Business Computer Club of Samutsongkhram Technical College who are interested in environmental problems. The content for this study is emphasized on only waste separation and recycling. Solid waste in this study has the same meaning of "*Refuse*" which means remained products, used products, scrap of used products, and undesirable products or all things that people do not want and dispose.

1.6 Definitions of the Research

Participatory Learning means the organizing of experience learning that opportunity has been given to student to participate in seeking knowledge, analytical

thinking, and actual working from variety knowledge sources related with real life, learning exchange with others to solve planning problem altogether, to practice and evaluate on something that was happened from practice.

Group Process means personnel learning together with group by carrying out activities together, knowledge exchange, experience, making decision, and taking responsibility for group, realizing themselves and how to work with others.

Youth means students in Samutsongkhram Technical College, Muang, Samutsongkhram.

Waste Separation means sorting waste that is from other wastes before disposing.

Waste Recycling means collection of recycled waste that is considered to be useful, sorting, processing to be raw materials, and transforming into new products by their types and characteristics.

1.7 Contribution of the Studies

This result on this research is to receive the youth participatory learning plan regarding waste separation and recycling in college, which can give knowledge, understanding variety patterns of waste separation and recycling for youths and have skills for practice in waste management planning to separate and recycle waste of participate in reducing the amount of solid waste in communities including reducing the amount of solid waste to dispose at least and providing youth awareness for realizing to waste problem, reducing disposal costs, reducing waste management costs, saving and extending the last long life of natural resources.

CHAPTER II
LITERATURE REVIEW

This chapter concerns with the developing the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL: A case study of Samutsongkhram Technical College, Muang, Samutsongkhram, Vocational Education Commission, Ministry of Education. The researcher has been studied from the relevant texts, documents and researches as the guidelines as follows:

2.1 Concept of Environmental Management in Public Participation

Nowadays, Thailand has been changed the economic structure from agricultural to industrial. (The Office of Environmental Policy and Planning, 2002: 69) There have been increased population extending the city are rapidly and the progress on technology to development the economic and society of the country for responding the human needs which have made environmental and pollution problems in many ways, namely, air pollution, hazardous waste from industry, increasing the amount of waste by increasing population, water pollution' s problem from wastewater of community and industry etc. These problems become more severely and extensively which have impacts on health and people' s life quality both directly and indirectly very rapidly and chronically.

The government has been adjusted the way to the administration of natural resources and environment from emphasis on solving each aspect to have the importance of improving the administration, promote the people, government sector, and local organization to participate in responsibility for solving the problem seriously, as you can find from Nation Economic and Social Development VI continuously to nowadays when is the period of this Nation Economic and Social Development IX (2002-2006) has provided to have the strategy on linking the urban to the city together and balancing both economic, society and environment by using strengthen community and civil body to participate in area management for

sustainable development which “Man as a center of development” actually and forever (The Office of the National Economic and Social Development Board, 2001).

Having the importance in “Public Participation” in protection, caring and preserving the natural resources and environment. It began the result obviously after participatory signing and recommendation “Agenda 21” which had approved from top conference or “Earth Summit”: the United Nations Conference on Environment and Development: at Rio De Janeiro, Brazil in 1992, including the Constitution of the Kingdom of Thailand A.D.1997. It provided the rights to public which owned the natural resources and environment together with the government for managing and preserving the natural resources and environment in the section 46 which recommended the personnel rights to be the local community of conserving, restoring the culture, local wisdom, good art-culture in local and national as well as participation in managing, maintaining and using the sustainable natural resources and environment in balance.(The Office of Environmental Policy and Planning, 2002: 173)

Although, the government, nowadays, has given the community to more participate in natural resources and environment management, the concrete management has been limited because of the guideline “Public Participation” in natural resources and environmental management. For Thailand, it is quite new which has to take time to stimulate, create the interest, give knowledge and understanding, give public to accept the necessity and aim the usage in participating many activities for solving actual natural resources and environmental problem. It has been participated with own need including begin to search data, search the reason, consult to the way of solving problem, decide, plan, operate together with following the result to the maintaining step in the long time (Department of Public Cleansing, 2001: 2 – 21) so it should be not only supported but promoted the community to have participated in concrete management as well as continuously. Another form of supporting this guideline, namely, providing the education for every level, every age of public, especially for the knowledge about environment and management which can help the public to have awareness in conservation the natural resources, participating in controlling and solving the environmental problem by step. It was the method of solving the original environmental problem which public made their own, including made the strength with the local organization in environmental management to sustainable development.

For this reason, environmental education management for student youths to participate in solving the natural resources and environmental problems through learner-centred approach, providing the learning atmosphere by stimulating, supporting for thought, action, mental altogether as well as adding the potential of local, giving the opportunity for learners to participate in activities as much as possible, exchanging the opinions each other in group process. The learners had constructed the knowledge from original experience to develop their own body of knowledge, through the survey for seeking the problem, providing the guideline for solving the problem which choosing the activities to evaluate, conclude the lesson for data which solves problem in college. It leads for managing the natural resources and environment in network of public as well as the important mechanic which gives the concept of public participation. It can be happened actually as well as achieved the needed goal in the long run in *Participatory Learning.*

2.2 The Learning Process through the Learner-Centred Approach

The National Education Commission (2000: 15-22: 62-65) had involved identification of objectives, activities, learning sources, instructional media and evaluation aimed at development of the " person " and the enrichment of their " lives " learner should therefore be allowed learning experiences to their highest potential and in line with their aptitude, interests and needs.

The organization of the learning process through the learner-centred approach meant " to give interesting in learner " or " learner has important role " for learning (Tisana Khemmani, 2000) by participation in learning activities in all aspects-physical, intellectual, society and emotion including to practice for application in variety different situations. To help learners for transferring the knowledge which can be adopted to their actual lives and other situations.

Learning with focus on learner-centred approach based on: Learning by doing by John Dewey (Dewey, 1963). His concept was about the organization of teaching and learning by learners' practical work themselves. Learning process change in the students' role from " recipients " as " learners " and change in the teachers' role, that was to say, from " instructors " or " transmitters of knowledge " as " learning

experience organizer ” for learners to learn by themselves. Emphasis was therefore given to the important of learning was learners must be recognized as being important more than instructors.

The organization of the learning process through learner-centred approach or learners was the most important had been regarded as the heart of the educational reform in the National Education Act, 1999. (The National Education Commission, 2000) and would be base on the principle that the learning could take place at any time with world and environment changing. Learning begins from family which parents as children' s the first teacher and learn from member of families, educational institutions, communities, neighbours, friends, community leaders, local wisemen, artists, and holders of different occupations including in local wisdom. Learning from direct experience, learning according to Buddhist Philosophy, focusing on learners' lives. Human beings eager to learn about themselves nature and all around them, learned through the brain nervous system. Education would be based on the principle that all learners were capable of learning and self-development, and were regarded as being the most important.

In organizing the learning process, the ultimate goal would be the attainment of maximum benefits for learners. Learning activities consideration should be given to individual differences, thus learners would be given opportunities to participate in activities as much as possible, so that were allowed to develop to the best of their potential in various aspects-knowledge, mental, emotion, and different skills, independently thought, have experiment and actual practices, learn from authentic experiences which were useful and related to actual life from a variety of learning sources to such an extension that they were capable of constructing knowledge for themselves, which could be applied to actual lives. Teachers should be decreased transmission of subject matters and should join efforts with learners in using scientific methods to acquire knowledge. Teachers would make plans together with learners, provide an ambiance conducive to learning, motivate learners to learn effectively. The teachers' role are hence confined to preparatory work, stimulation, giving advice and guidance on activities and evaluation.

Therefore, curriculum for the organization learning process through the learner-centred approach must be related with needs of community and society, local wisdom. Subject matter would thus become more flexible and not so rigid. Learning

through authentic experiences and emphasized on the learner-centred approach, would be actual benefits to learners. Teachers are required to analytically subject materials and learning objectives, planning the learning process, which was meaningfully linked. Learning activities organized were linked with real life. Learners were able to learn from authentic experiences as much as possible. Teachers must provide learners with opportunities to participate in designing activities and do actual work, synthesize the knowledge themselves, and interact with members of the same and different groups. Having allowed learners to learn how to seek knowledge, teachers prepare data sources in terms of learning media, techniques, data sheets as well as materials and other equipments. They were also required to suggest various learning sources for learners' research and study to meet their needs.

Evaluation on learners through learner-centred approach by assessment of learners' learning development, personal conduct, learning behaviour, participation in learning activities and test between teaching process, Hence, the measurement and assessment of the learning process through learner-centred approach would necessarily have to be all embracing and cover all aspects of the process and output, namely, knowledge, emotion, and skills in self-expression in all respects. The evaluation, both formative and summative, which are based on actual situation.

By conclusion, the organization of the learning process through learner-centred approach, importance is at all attached to learners, on the contrary, not to subject matter. As a result, learners acquire knowledge through analytical thought instead of rote learning. Teachers taught by guidance and stimulation of thought rather than providing information and giving instruction, through a learners' participation in perception, thought, action, and evaluation. Such a process would be resulted on happiness among learners, teachers and all concerned parties, which continuously interact in accordance with their respective roles, teachers on their parts, would provide encouragement, design activities and experiences, as facilitators and advisers, helped learning in playing their roles and searching their own capabilities, and developing their intellectuals and emotions.

2.3 Participatory Learning

2.3.1 The Meanings of the Participatory Learning

The meanings of the participatory learning has been given from many educators:

Preamjit Tanstit and Reawat Watthananukulkit (1997) said that participatory learning meant teaching method that interacted with authentic experience in real life, participation between teacher and student and capable to analyze the cause of problem systematically.

Sumontha Promboon et al. (1997) said that participatory learning meant children participated in learning with their mental to learn something that the teacher provided both direct or indirect, learner-centred approach, and the teacher organized the learning.

The National Education Commission (1999) said that participatory learning meant the organization of the learning process, emphasized on giving learners to learn from authentic experiences, practice skill for seeking knowledge, skill for recording knowledge, skill for thinking, knowledge management, skill for express, skill for construct new knowledge, and skill for group process which emphasized on morality.

Alisara Chuchat (2000) said that participatory learning meant that the organization of the learning process through learner-centred approach which had purpose for learners to realize own role for controlling actual lives, environment, and lifestyles, emphasized on developing the solving problem skills of people and community, skills for environmental management for the organization of learning development and promoted personal potential for evaluate situations, situations analyst, cause of problem, and capable to make decision including to create direction for problem solving and conducive to encouraging learners to express feeling for realize their own values would contribute to development of more life and society.

Rojer (1987 refer to Phatai Sittisamuth, 2000) said that participatory learning meant that teaching for learners fully participation in learning process, in facing problem from authentic experience and participation in self-evaluation.

Middle Education Supervision Center (n.d.) said that participatory learning meant that experiential learning had been emphasized learners on construct knowledge from original experience of learners to new learning which work continuously, had good interaction to extend of knowledge network of everybody, use talking and writing for communication instrument in exchanging, analytical and synthetic knowledge.

Therefore, in conclusion, participatory learning meant learning process that emphasized on interaction between teachers and learners. Teachers provided learning, opportunities, atmosphere, environment and knowledge sources to motivate for learning. Learners learned to construct a meaningful experience for themselves, interact with environment, thinking process and seeking for knowledge together with actual practice for their acquire knowledge themselves and capable of constructing for knowledge by themselves, which could be applied for further useful.

2.3.2 Components of Participatory Learning

Participatory learning had 4 components. There were experience, reflection and discussion, understanding and conceptualization and experiment or application that can be shown as Chart 1. (Middle Education Supervision Center, n.d.)

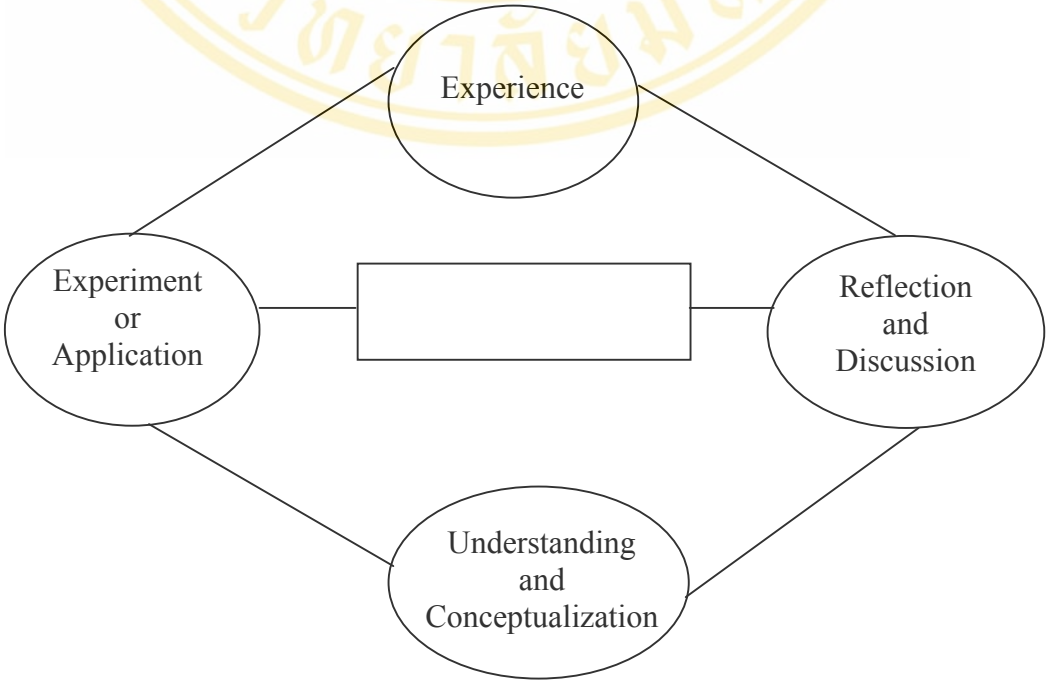

Chart 1 The Components of Participatory Learning

1) Experience: The teacher helped his students in using their original experiences to develop new knowledge.

2) Reflection and Discussion: The teacher helped his students in expressing their ideas in order to these students, exchange opinions and learning from each other.

3) Understanding and Conceptualization: The students understood and led to the conceptualization. This way had happened in two ways, the students initiated the idea which would be fulfilled by the teacher, or the teacher initiated and fulfilled to conceptualization by the students.

4) Experiment or Application: The students applied new knowledge to different life situations.

The interaction among these four components is dynamic. Teaching could begin at any point. The important thing was the basic not only for teaching knowledge domain focusing on building creative and critical thinking but also for other life skill teaching, namely, attitude and skill domain.

2.3.3 Principle and Theory of Participatory Learning

Participatory learning was the important learning instrument that learners constructed the own body of knowledge themselves, using the constructing own knowledge theory by constructionism which was developed from theory of Knowledge (Jean Piaget). It was believed that learning was happened well when the students had participated in creating the meaning products to them by using thinking process, participating in learning, learning from the interesting thing by themselves, experiences and knowledge which the students both got and had the meaning for themselves including the sustainable knowledge continuously. (The National Education Commission, 1999).

Tisana Khemmani (2002: 90-96) said that constructivism theory was came from the intellectual theory of Piaget. He explained that human's learning which was the experience as well as the students had to act on the received data not only taking in, However, development from intellectual of people had been happened when they received and understood well or new experience related with knowledge or own intellectual structure as well as new own body of knowledge or people group.

Participatory learning was the experiential learning which had aimed to the learners constructing knowledge from original experience, interaction between learners, learners to teachers are the interaction continuously and extending widely by communicating every form which lead to exchange learning, learning with group process which learners had the opportunities for exchanging the experiences, reflecting the opinions and concluding the conceptualization. It made the learners participate highly and achieve the work as well.(Umpha Buisiriruk, 2001: 18-19).

Sumontha Prombun et al. (1997) said that participatory learning was the teacher manages to create learning, learner-centred approach. Individual children has participated in learning by co-ordinating mental. It made him learn, teacher would like to know either direct or indirect, as follows Chart 2.

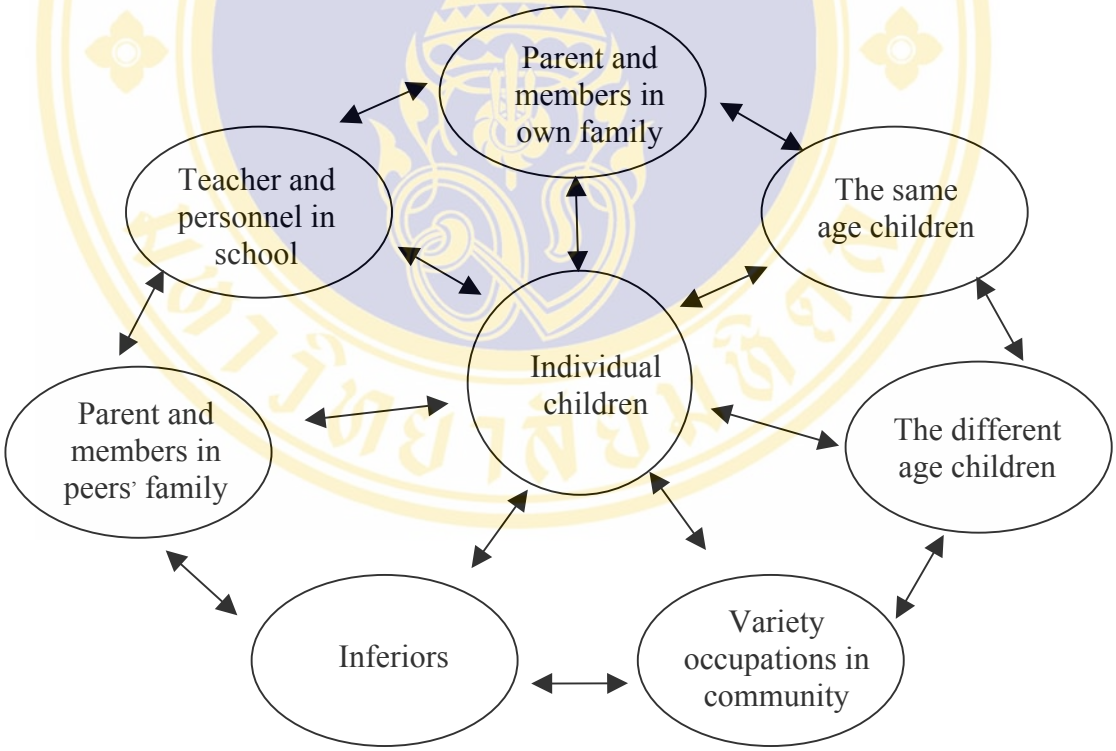

Chart 2 Participatory Learning

Participatory learning was the learning which happened inner of learners. Learners constructed the knowledge in active, learning by themselves and using group process method which they had learning by doing. Their group was the important knowledge source which practiced the learners to understand, adapted and worked

together with others by tending the seeking and creating the own knowledge which the teachers managed the learning. It had been promoted as well as found the answers by themselves including having the importance of learning process which was the necessary instrument for seeking knowledge, many answers as well as the importance of many process especially seeking the answers not the answers which they do not reveal to process and method. (Middle Education Supervision Center, n.d.)

Whereas, evaluation on teaching through the guideline of theory of constructing knowledge itself which emphasized on learning process as well as awareness of that process. It may be evaluated from peers, portfolio, including the self-evaluation and observation of learning behaviour among teaching.

Therefore, it may be concluded that the teaching through guideline of theory of constructing knowledge itself would provide the role of learners and teachers in the form of the learners had the role on learning activity together with providing the data on different interesting experience by group process, then constructing the own body of knowledge and group. Whereas, the role of teachers are transformed from transferring knowledge and controlling to act as facilitators and assisting learners in learning process. Teachers confined to motivate and support in all activities which learners' interesting for helping learners to construct knowledge.

2.3.4 Guidelines for Participatory Learning Activities with CIPPA MODEL

Guidelines for participatory learning activities by CIPPA MODEL through learner-centred approach, participation learning activities through group process: learners' practiced work for themselves. The emphasis on learning was learners more than teachers. (Tisana Khemmani, 2000).

Organization of activities enabling learners to:

1) Construct and seek knowledge themselves (Construct: C) refers to the organizing activities for learners to seek information, make understanding, analyze thinking, interpret, translate, link knowledge, construct concept and summarize the body of knowledge themselves, make them understanding and participate in intellectual and have a meaningful learning.

2) Interact with members of the same and different groups (Interaction: I) refers to the organizing activities for learners to have an opportunities for learning exchanges in all aspects: information, thought and each experience.

3) Have physical and mental participation (Participation: P) refers to the organizing activities for learners to have a role and participation in maximum learning in all aspects- physical, emotion, society and intellectual.

4) Acquire process learning and product development (Process / Product: P) refers to the organizing activities for learners to learn the appropriate learning process, namely, group process, seeking for knowledge with product development that effect from process learning.

5) Apply the knowledge (Application: A) refers to the organizing activities for learners to apply new knowledge in daily life and different situation.

2.3.5 Steps of Participatory Learning Process

There were 7 steps (Tisana Khemmani, 2000)

1) Revision the original knowledge

This step was to bring the subject matter from the learners to have preparation on linking the new to old knowledge.

2) Seek the new knowledge

This step was to seek the new knowledge from variety knowledge sources, may be provide by the teachers or the various information sources' advice for seeking.

3) Study the new and linked knowledge understanding.

This step was to study and understand the information/own knowledge. The learners must build the meaning of information/new experiences by using variety process with themselves, namely, using the thinking and group process in explanation and conclusion the information understanding which depended on the original knowledge's linking.

4) Exchange the understanding with group

This step was that the learners use the tool in checking the extensive understanding which the learners shared the knowledge, understanding with others as well as got the useful knowledge.

5) Conclude and Organize the knowledge

This step was to conclude all knowledge, either old or new knowledge as well as provide the learning matters to have system for learners' memory easily.

6) Presentation the work

This step was to help the learners present their creative learning to others for they realize or prove the understanding as well as promote them to think creative.

7) Application the knowledge

This step was to promote the learners practice and bring their own knowledge in various situations to get more skillful, understanding, ability in solving the problems as well as the necessities.

2.4 Participatory Learning with Group Process

Participatory learning with group process was learning experience that student acquired from carrying out group activities. Its influence to individual learning, and interaction each others. (The National Education Commission, 1997: 30) The organization of teaching should be based on the principle that all learners would be given opportunities to participate in activities as much as possible, learn from group as much as possible because it was important knowledge sources to practice learners understanding of knowledge, be self-adjustment and get on with others. Learners had practiced in seeking and constructing knowledge themselves. Learners received encouragement and supported in finding answers by themselves, to receive the memory as well and long time. Importance had been given to learning process which was a special instrument for seeking knowledge and many answers. Importance had been given to various processes for finding answers and method more than own answers.

Teachers and learners would take the role on learning by using group process which supported with others by the teachers' role. It was informal, sympathized the learners by the teachers not only spoke less but was the co-ordinators not to be led or persuaded the learners' idea, but encouraged to activate in working and presentation including supporting the learners to analyze, conclude and evaluate. While the learners' role would be the persons carrying out the seeking activities and performing

the self-knowledge, giving helping and exchanging the knowledge each other in group, having the feeling, free opinion, having responsibility for own duties in group including making understanding which was assigned and got well with working together.

The size of group in learning by group process, generally, was about 6-8 persons for the all members provided the opportunity to more participate.

2.5 Waste Management in Communities

2.5.1 Present Situation and Waste Management Problem

Solid waste generates in communities has caused the problems to environment and public health in many aspects, namely, dirt, untidiness, annoyance from foul smell, parasitic bleeding areas, causing fire and damaging water resources and making soil pollution.

Waste problem in community should be considered as an important problem concerned to the amount of waste which had been significant increasing following by economic growth and the number of population. Waste management become more a chronicle problem and got worse due to continuously increasing of waste year by year. As seen over the past five years since 1996-2000 the amount of waste in the year 2000 was 13.932 million tons increased from 1996 which had amount of waste about 13.140 million tons. Increasing average rate of amount of waste was 1.5% per year (Department of Pollution Control, 2000). Therefore, waste management was a necessary aspect to be much careful as well as more efficient waste management.

Waste management in many countries including Thailand often managed waste at collection point and disposal point. In order to collect dispose of waste in time with waste generation, main three methods were introduced (Department of Public Cleansing, 2001), namely, sanitary landfill, composting, and incineration. Each method still had problems in a practical way and affected to environment and people as follows:

Sanitary Landfill had impacts on environment in term of odours, bleeding areas of parasitic, namely, mouse, fly, cockroach, including toxin from waste spreads

to ground water. Moreover, sanitary landfill may cause opposition from people who live near by it. In the U.S.A., the word "NIMBY" which meant "Not In My Back Yards", was popular used due to nobody wants waste lay in his/her house. Thailand was also facing the same problem. Furthermore, sanitary landfill had high cost of construction because it needed big area, and increasing land price made the problem more severe including diminishing of areas to use as landfill (Miller, 1994 refer to Department of Public Cleansing, 2001: 2-10). In other countries, namely, the U.S.A., had estimated that within 10 years half of landfill would full and has to close, and within 20 years 80% of landfill would close as well. Whereas, Netherlands had no more landfill.

Composting would get the best result with organic waste and separate it before composting. However, problems would arise from animals which was carriers of diseases, namely, mouse, cockroach, and fly due to these animals came to dump site because it provided their food and home, besides it would occur odour pollution. Unlike landfill, composting was not complicated and used large area including got good benefits from organic fertilizer as well.

Incineration, it would have impacts on public health due to smoke from burning composed of toxin polluted to the air especially compound of metal, namely, lead and mercury as well as dioxin which made air pollution. In addition, price of each incineration was very high as well as the maintenance cost.

2.5.2 Guideline for Waste Management

Guideline for waste management in all three aspects: sanitary landfill, composting and incineration were waste management solving problems at the end. But in the present there are a lot of waste that increasing rapidly which these three methods cannot solve all waste management problem. Therefore, the government provides a guideline for waste management by integrating waste management at source and at the end all together (The Office of Environmental Policy and Planning, 2000: 150-151), namely, for waste management at source emphasized on solving source of problem which was producer and consumer, reducing amount of waste at source, persuading people in community to participate in waste management, to

reduce amount of waste to only non-recycling to dispose with the past solid waste disposal system.

Therefore, the government provided a policy for waste management from communities of Thailand in waste disposal centers that provided in the 8th National Economic and Social Development Plan, continuously to the 9th (2001-2006). Emphasizes on nearly communities should disposal solid waste together for solving waste problem in the long run, reducing investment and management costs, including supporting private sector to participate in the investment and management. The main target in 2001 must be controlled waste generate from people no more than 1 kilogram/day/person, controlled waste remaining in municipality no more than 10% and must reuse waste at least 15% and with the end of the 9th National Economic and Social Development Plan, in the year 2006 must be controlled remaining waste in municipalities no more than 5%, has to reuse waste at least 30% and provide waste disposal center at least 50% of total provinces 38 provinces.(Department of Pollution Control, 2000: 10).

In addition, the government developed and improved solid waste disposal system in some area and built new waste disposal system, at the present many constructions could be accomplished and 48 waste disposal systems in service. Another 30 systems had been under constructed and 10 systems had been during consideration project. Most of them were sanitary dump sites while incinerators could only find in 3 areas, namely, Muang Phuket Municipality, Tambon Samui Island Municipality and Muang Lumpoon Municipality. (Department of Pollution Control, 2000).

2.5.3 Waste Management Principle

1) Meanings of Solid Waste

Racha Bundityasatan Dictionary (National Thai Dictionary, 1982) gave the meaning of waste as follows:

Refuse meant scrap of used products that had been thrown away.

Office of National Environment Board (1981: 136) gave the meaning of various words that related to waste as follows:

Waste meant all undesirable items that people wanted to throw away including scrap of cloth, leftover food, animal manure, ash, dust, remains of animal and scrap of materials, objects were collected or swept from houses, buildings, roads, markets, farms, factories and other places.

Public Health Legislation Law 1992 (Health of Ministry, 1992: 38) defined waste as follows:

Waste meant scrap of paper, rags, food particles, fragments of plastic bags, ash, excrement or carcasses including refuse from roads, markets, farms or other places.

Department of Public Cleansing (2001: 2-1) gave the meaning of waste as follows:

Waste meant remained things from human being using, production process, activities from industrial, agricultural and other activities.

Therefore, waste meant remained things, used things, scrap of materials and unwanted products or remained things from using which people unwanted and threw away.

2) Waste Sources and Types of Waste

Important waste sources (Department of Public Cleansing, 2001: 2-1 – 2-2), namely, households, business, commercial shops, government offices, building places, public places, infrastructure places, factories and agricultural, etc. The quantity and characteristics of waste from other waste sources were different by character and type of activities that happened, which could be classified as follows:

(1) Community Waste that came from several activities for sustaining daily lives and commercial business, namely, waste from households, business, commercial, government places, infrastructure places, etc. that could be divided into 2 types as follows:

- General Waste, namely, *"Refuse"* that was not easily decomposed and may be either inflammable or non-inflammable, namely, paper, plastic, glass, cloth, metal, leather, rubber, wood including dust and particle etc. and "*Garbage"* which was organic compound that had high moisture, could be degraded by nature and used as natural fertilizer, namely, vegetable and fruit peels.

- Hazardous Waste that was came from two important sources; 1) from *Living houses*, namely, fluorescent, batteries, leftover chemical substances, (insecticide, clean liquid etc.) and 2) from *hospital*, namely, infectious waste.

(2) Industrial Waste which varied from industry to industry. Its composition is determined by the character, namely, raw materials, product process, and by-products of the industries that produced them. Some industrial waste contained dangerous substances which required special collection and disposal process, namely, toxic chemical substance, heavy metal, inflammable substances, expired products etc. and non-dangerous substances from offices and canteens.

(3) Agricultural Waste was discarded from agricultural process, namely, scraps of pesticide containers, scraps of plants and animals.

From this research, the researcher chose to study community waste from Educational Institution (College) about General Waste : *refuse and garbage*, namely, paper, plastic, glass, metal, scrap of vegetables and fruits.

3) Effective Waste Management

At present, the effective waste management was both interesting and giving importance for waste reduction at first, also known as "Waste Reduction at Source." People who generate waste have to participate in responsibility for basic management with waste separation and recycling. Maximum efficiency waste management can greatly reduce high amount of waste before disposal. Waste can have benefit for us when we reuse, recycle, and create by-products from disposal. Principle and guideline for practice as follows:

(1) Waste Minimization

Waste minimization was the principle of reducing amount of disposal waste to only non-recycling to dispose (Department of Public Cleansing, 2001: 2-3 – 2-5). Waste management at source emphasized on solving source of problem, avoid or reduce waste generate, not to have making waste, preventing to generate waste at least. This was the first and important step of effective waste management that was capable with public participation at source of problem. Both producer and consumer help

together in waste management. Producer changed production design, production process or proper raw materials including reuse scrap of materials which from production to material in production. Whereas, consumer used or bought products at least by buying a lot of products each time, no support product disposable, modified and used materials with efficiently including using 5R principle for reducing the amount of solid waste by reducing product consuming which would make waste, use refilled product, repair of materials, reuse used products and recycle usable products.

(2) Waste Separation

Waste separation before final disposal is another effective way of waste management. To have the best result, it should be separate from the source with creating the public participation in waste management due to each type of different waste and different methods depend on the characteristics and the composition. However, the discard waste and recycle to bring new useful waste are a lot. Therefore, waste separation at source can be reduced the amount of waste, especially the waste for only disposing. Then, it makes them recycle in good condition because it does not mix other waste, have the raw materials instead of the natural resource as well as reduce the use of natural resources.

In addition, bringing the waste separation to sell for increasing the income and create the occupation to the supplier of waste. It brings to reduce the amount of disposal waste, community' s environmental problem, spreading of diseases, time of officers' operation by not paying expenses in waste separation after collection, saving in waste management costs and the most important thing is to people have awareness for responsibility and participation in their own waste management.

Waste separation for creating the public participation of basic waste management can be divided into 4 types (Department of Public Cleansing, 2001: 3-1 – 3-2): 1) *Garbage* is the waste capable for degradable by nature, taking a little time, namely, vegetables, fruits and food scraps, then separating to feed the animals and make liquid fertilizer production. 2) *Recycled waste* is the waste which can transform in the new recycled products, namely, paper, plastic, glass, metal then separate for selling to the suppliers, namely, saleng, junk shops. After that, these are sent to the recycling factories to produce recycled products. 3) *Hazardous waste* is the waste

which may be toxic to living things and environment, namely, fluorescent, batteries, chemical containers etc., separate them for correct collecting of the officers which does not make pollution problem and 4) *General waste* is the waste which can not recycle and non-toxic to living things and environment, namely, ready-made food package, foam, plastic bag with food etc. then separate and wait for collection to dispose with proper method.

(3) Waste Recycling

Waste recycling is the process which brings waste or leftover materials passing separated to recycle into different forms following by the situation and characteristics of waste which will be resulted to decrease the amount of waste. These waste or leftover materials, namely, paper, plastic, glass and metal which can be classified with 3 types (Department of Public Cleansing, 2001: 2-6 – 2-7), namely, 1) Primary Recycling: recycled waste to new product like the original of it, namely, paper, newspaper, aluminium cans and glass bottles which have high value. 2) Secondary Recycling: recycled waste to new product which is different quality from original as well as passing the different product process from the beginning, namely, making ceiling from leftover paper, fiber and carpet from plastic bottle etc. and 3) Tertiary Recycling: it is the recycling of qualified materials for chemical substances or using energy from waste, namely, used batteries for leaded substances, fermented waste to biotic gas, which make the loss of original characteristics of raw materials as well as not being used to be raw materials in production.

Waste Recycling is the another way to manage the waste problem efficiently, linking the environment problem, solving the natural resources including the expenses which can be provided into many forms, namely, separation paper, plastic, glass and metal from the original source to recycle by selling to the junk shops and the recycling factories to transform the new products consequently including bringing waste which passed many processes for production of energy in the form of vapour, hot water, electric current, hard fuel, liquid fuel, fuel gas, biotic gas and alcohol etc. Bringing the waste scrap of food for food animal as well as composting the natural fertilizer for agriculture together with improving the areas by sanitary landfill which the areas, planting, not being high building as well as building the public parks etc.

2.5.4 Analysis the Physical Composition of Waste

1) Waste Sampling

Due to the waste which consisted of many materials, unmixed together and a lot of the amount of waste. It is necessary for sampling some waste from the whole to the same composition or the representation of whole waste. The first sampling of the amount of waste was 1 $m.^3$, test for bulk density, mixed altogether and divided into 4 parts (Quartering), chose 2 examples that opposite heap and mixed again for many spread composition and the rest for separating and disposing. After that, it was made quartering continuously and had the sampling of waste about 50 litres, then separated the composition (Department of Public Cleansing, 2001: 5-13 – 5-15)

2) Bulk Density

Bulk density is the ratio of waste weight per volume on waste within container.

Method of bulk density

- Weigh the free bin (This bin has volume)
- Record and try out
- Mix altogether and put into the full bin
- Lift it higher the ground about 30 cm., then drop on the floor. (If it was down, put it fully)
- When drop it 3 times and weigh continuously above many times.
- Finally bring the value to find bulk density.

3) Composition

Waste composition is the composition of waste which can be divide into many types, namely, paper, plastic, metals, glass, leftover food, fruit, leaves, wood and branches, cloth, rubber, leather, rock, tiles and so on, moreover, each type of waste may be the kinds of waste, namely, newspaper, paper, office paper, box paper, tissue paper etc.

Method of composition

Bring the waste from quartering to separate the types of composition, weight each type and then, calculate the percentage of each waste composition type.

2.6 Waste Management in College

2.6.1 Waste Management in Thailand' s Educational Institutions

Many educational institutions have solved the waste problems by using youth participation of the relevant projects about solving the waste problems, namely, "Waste Bank Project" which had operated about 30 provinces and more than 500 places in school and other offices which the students or members take the recycled waste to the waste bank and get the returned payment to money or things "Make Money Waste Project" by students bring the used waste from home to separate at school and collect for earning the school income "Recycled Waste Separation' s Member Card" is the project which the students get the star and collect for exchanging the stickers and get the certificate of the best environmental preservation, in the academic year, campaign on recycling the glass scraps project, exchanging and returning glass scraps in educational institution of Bangkok Glass Industry Co., Ltd. Pathumthani. Then bring the income to the foundation in providing many activities. In educational institutions, "The Best Creative School Project" by Thai creative society has chosen the best creative activities of school and recycled activities and given supporting money 10,000 – 40,000 baht each school. It is begun from the year 2000 "Liquid Fertilizer Production and Composting of Organic Waste Activities" by using organic waste for decomposition to liquid fertilizer production and organic fertilizer in school (Department of Environmental Quality Promotion, 2002: 98-100)

2.6.2 Waste Management in Samutsongkhram Technical College

Samutsongkhram Technical College has operated this waste management which happened from the source characteristics and different types of waste as follows:

Waste management from training materials in each workshop of Industrial Departments of Samutsongkhram Technical College (Mayuree Kongdaung, 1999: 66-68) the details as follows:

Construction Department: Training material scraps from wood work, mason work and concrete work, namely, wood scraps, wood carvings, saw dust, lime, sand brick, rock and cement. Bringing the wood scraps to make saucer, washing bowl racks, whereas, wood carvings for fuel, sawdust for disposing, as well as lime, sand and brick will be recycled.

Electric-power Department: Training material scraps, namely, many sizes of power cords, fluorescent, copper wire, metal pipes (copper pipe, EMT pipe, PVC pipe, IMC pipe, cool substances and old refrigerators). These materials can be recycled by bringing the rest power cords to link training wire with tubes, whereas, the fluorescent, copper wire and many metal pipes are melt for selling; however, cool substances will be recycled and the old refrigerators will be repaired by the students and sold at the cheap price.

Electronics Department: training material scraps, namely, transistor, resister, capasister, T.V., video, out-of-order telephone, telephone lines, sizes of electrical wire, print sheet, out-of-order computer and out-of-order electrical appliances which have different management:

- Transistor, resister, capasister and print sheet will throw away or sold to junk dealers.

- T.V., video, out-of-order telephones will be kept the good equipments for other repairing equipments, whereas, telephone lines will be made the necklaces, rings, baskets as well as electrical wires will be peeled for selling, together the copper wire, out-of-order computers and electrical appliances will be sent to the material department for next selling.

Auto-Department: training material scraps, namely, used lubricating oil, plates, motor-cycles' chain, out-of-order engines, belts, boilers, water-pumps and old tyres. Bring the used lubricating oil to paint the wood and steel models for easily peeling, whereas, plates and motor-cycles' chain including belts, boilers, water pumps are invented not only the ceiling clocks but invented objects in Project Subject. For out-of-order engines will be brought the good ones to use others and old tyres to support the engine while it laid on the floor preventing the basin bottom.

Machine-Shop Department: training material scraps, namely, iron, stainless, aluminium, copper, bronze etc. To bring iron to make mechanic parts, book weight, many souvenirs (key chain, hammer' s head, candle stick post, practicing to make bolt, core bolt as well as stainless is brought to make mail boxes, aluminium is brought to make paper-weight, whereas, copper and bronze will be returned to the material department but lathed puff will be thrown away.

Welding Department: training material scraps, namely, iron, steel cord, aluminium, stainless and zinc. To bring iron to product composition, aluminium making paper-weight, stainless making lady-jeweled box and zinc collecting for selling and practice.

Drafting Department: Survey from 2003 data, it is found that paper scraps came from most teaching which the department had collected to separated bin for next selling.

For Commercial and Home-Sciences Departments: training material scraps came from most of teaching and they are paper and some wet waste (food scraps, vegetable and fruit peels, banana leaves and flowers which students' practice. Paper separation is for selling but others will be thrown away.

Moreover, most of waste which came from the students' consumption in the college are plastic bottles, leftover food, vegetable and fruit scraps, fruit peels, milk packages, candy paper, ice-cream packages and plastic bags which are managed by separating plastic bottles for selling from janitors and college' s cleaners, leftover food for feeding animals and the rest will be thrown away in the bins of the college waiting for the collecting waste container of Lardyai Sub-district Administrative Organization. It will take about 2-3 times per week.

In this research, using waste management principle and guideline for practice in reducing the amount of waste in Samutsongkhram Technical College for waste minimization by youth participatory learning regarding waste separation and recycling in college. Waste can be separated into 4 types: garbage, recycled waste, hazardous waste and general waste and collect the separated waste to recycle into 2 forms, namely, separating the recycled waste (paper, plastic glass and metal) for selling and making liquid fertilizer production from food scrap waste, namely, vegetable scraps and fruit peels, then used as natural fertilizer in college. It can reduce the amount of

disposal waste. For the remaining, namely, general waste and hazardous waste, using the proper method to dispose.

It can be seen that the creating of public participation in waste management efficiently by managing the original problem. It makes the amount of waste deposal actually and if it can practice successfully in the actually concrete form.

2.7 Waste Management for Recycling in Thailand and Abroad

For recycling in Thailand, there is implement process through informal and formal sectors as follows: (Environmental Thailand Foundation, 2001: 3-13 – 3-24)

1) Informal sector operates by saleng, scavengers and junk shops. They will buy valuable packages and undesirable materials, namely, paper, plastic, glass and metal. The recycled waste is bought or sold from waste picker, saleng, small junk shops, and big junk shops through recycling factories where will separate and collect waste for recycling. This procedure caused the environmental problems which derive from dirtiness of searching valuable waste at dump site or waste bins, contaminated soil and water resources from cleaning up packages and undesirable materials, odour and scenery, breeding place of parasites and outbreak of germs.

2) Formal sector operates by government sector, private sector, business and people with local organizations, namely, Provincial Administration, BMA (Bangkok Metropolitan Administration), Pattaya City and Sub-district Administrative Organization. These organizations manage packaging waste and undesirable materials altogether with general waste management from public dump sites. Each organization will define different operation methods in different details in collection waste. The examples are municipalities in Bangkok and big provinces will promote and arrange activities for encouraging people participating in waste separation before disposing, establishing recycling centers to buy recycled waste and link to waste separation and buying of informal sector. Problems which happen in this part mainly came from most of people do not separate waste before disposing and poor management of local organizations in terms of shortage of budget, personnel and equipment. In addition, some private organizations operate by using a deposit system for their packaging

waste or hiring private companies to collect the recycled waste, namely, glass bottles, beverage cans, beer and soda bottles in order to reduce new package usage.

In year 2000, waste separation implementation for recycling in both sectors could separate waste totally 2 million tons or 14.4% of total waste generation across country (The Office of Environmental Policy and Planning, 2002: 148). Most of packaging waste and undesirable materials would arranged only high value packages that could still increased ability in recycling.

For recycling in Abroad, although many agencies in Thailand had paid attention to waste problems and initiated various projects for solving the problems, agencies in other countries also interested in waste problems as well. The examples of waste management implementation in other countries were: (Ministry of Housing Physical Planning and Environments) (Neal and Schubel, 1987: 11-12).

The United States experimented to use waste separation program for recycling in Buffalo Group, Suburban of Chicago, Illinois. Beginning with arranging Educational project to community by attempting to convince many people participating in (Ministry of Housing Physical Planning and Environments) this program. Implementation was to meet with people by using big truck with giant advertisement boards parked in crowed places, namely, department stores etc., arranged program officers to talk or present in many places, mailed documents for suggesting on how to sort waste from mayor to households, provide three categories of waste bins. (waste bin for organic waste, waste bin for hazardous waste and waste bin for recycled waste) in various places in the community. While variety of advertisements were designed and used in this project, namely, billboards, posters, news and columns in local newspaper including interviews and proposed various related articles to broadcast on television and radio. Result on this implementation had shown that the recycled waste could sort from garbage about 12-14% and the recycled waste was sold and income went back to community for doing further waste separation activities.

After that, in many cities became more alert in waste separation for recycling, namely, Retale City, Washington D.C. Retale City implemented waste separation by promoting in the name of " Recycling Waste for Retale City ". The city asked for

cooperation from household to use three main types of waste bins for waste separation into three categories that were old newspaper, general paper and beverage cans and glass bottles which received good cooperation from household. Retale City provided a target for waste separation for recycling to 65% to total waste in the year 2000.

Seattle City, Washington D.C., accelerated community participating in waste separation by reducing collection charge depending on amount of waste which had been separated into a variety of categories.

For other countries in Europe such as Netherlands, it planned and provided a target in waste separation for recycling with using integrated measurement for reaching plans and targets, namely, promoted people to join hands in waste separation, provided different kinds of waste bins depending on types of waste within community, collected fee charge from household that neglected to separate waste, erected laws, namely, provided regulations for people to comply with it.

For South East Asia countries near Thailand also was interested in this topic. For example, Manila City, Philippines, has a special agency to take the responsibility for waste separation for recycling called " Eco Aids (Ecology Aids)". This agency provided a special team and provided carts for carrying usable waste from households, factories and various shops. Furthermore, team members would receive money from the agency in order to buy recycled waste and when members got recycled waste from various places, they would sell to center of Eco Aids with price depending on type of waste. Outcome had shown that members earned about 20 US dollars per day. (Jaruwan Tubtieng, 1993: 30).

2.8 Related Researches

Related researches pertaining to youth participatory learning regarding waste separation and recycling in college is divided into 2 topics, namely, 1) research relating to participatory learning and 2) research relating to waste management as follows:

2.8.1 Research Relating to Participatory Learning

Prapaipun Boonkong (1997) studied the development of participatory learning form in teaching Buddhism (S. 018) for Mattayom Suksa 1 students in Narasikhalai School, Narathiwas. (100 students), divided into sample group and controlled group by 50 students per group. By the objective for comparison the achievement study, attitude as well as develop the basic skills on living together with the students who studied of participatory learning form together the students who studied normally. It was found that the students who studied of participatory learning form had higher the achievement result than the students who studied normally. Whereas, in the sample group, it had the achievement result after trying out higher than before. There was high level every items as well as the sample group students, having the development of basic skills in living together of society before among the after the developing teaching orderly.

Daojai Injun (2000: 95-96) studied the development of a program for enhancing knowledge, attitudes, and behaviour in waste management by using participatory approach for Prathom Suksa 6 students, academic year 2000 at Vatmaegadnoi School, Chiangmai. The sample group was 20 students, by trying out and developing a program. It was found that after using the program the students having knowledge, attitude and behaviour on waste management higher than before, at the statistically significant different 0.05 level and higher than the evaluated criteria on the program at the statistically significant different 0.05 level.

Ward, F.P., JR. (1993: 0398-A) studied an investigation of the effects instructional strategies have on students' attitude among the students who got the participatory learning which were the sample group and controlled group which did not get the participatory learning, using the questionnaires for measuring the attitude to subject. It was found that the students who got the participatory learning had the optimistic attitude, which agreed or most agreed more than the students who did not get the participatory learning.

Kim., Parks, B.S., & Beckerman, M. (1996: 171-176) studied the development of participatory learning program in Right and Duty of citizen for final Matayom Suksa using in the academic year 1994 – 1995 in Missuri, U.S.A. The objective was for studying the critical thinking, communication skills, including

making project. It was composed of 3 programs, namely, election, Missuri government and ruling programs. The total of participatory activities was 3,200 students and 59 teachers, evaluated by observation, inquiry and interview forms. It was found that this program helped the students have the realization on community problem point. Most teachers had agreed with it which was valuable, in addition to find that the students thought about analysis the experience as well as the participatory activities of the students with the community.

Roselli, M..J. (1998: 4101-A) studied the comparison: skill for moral reasons of students using participatory learning form with non-participatory learning. It was found that the students who learnt the participatory learning have the moral reasons more than non-participatory learning as well as they could bring this skill to daily lives as well.

2.8.2 Research Relating to Waste Management

Wipapen Jiasakul (1993: 95) studied the solid waste management behaviour of population in the middle zone of Bangkok Metropolis, the sample of 200 households by using questionnaires. It was found that 39.5% of studied samples had behaviour on solid waste littering by separating wet and dry solid waste and this behaviour relates with education, income, situation' s perception of solid waste and occupation. It was revealed that population with higher level of education, had more income and perception on situation of solid waste problem and being in government service would have better behaviour on solid waste management than other groups.

Narit Kovasupath (1997: 75) studied the acceptance in solid waste reduction by separating of solid waste for recycling in Pathumthani Municipality, totally 400 persons from 400 households, using interview forms in collecting data. It was found that the majority (68%) accepted solid waste separation and suggested that Pathumtani Municipality should provide three types of solid waste bins: yellow bins for paper and plastic; blue bins for metal and glass and green bins for general waste. Organizations, namely, schools, government offices, many department stores, etc. should participate in this activity. The people expected bags for solid waste separation as their rewards from participation in the activity and the remaining (32.0%) did not accept.

Mancharat Wiratchawong (1999: 194) studied the evaluation of the waste separation and recycling project of Phanatnikhom Municipality, Chonburi. It was found that this project have the existing situation (context), the input factors and the operating procedures appropriately and high efficiency. The local population had information, knowledge and behaviour concerning waste separation for recycling at the moderate level. It made the amount of waste which the municipality collected and less dispose as well as saved the budget.

Mayuree Kongdoung (1999: 147-157) studied and surveyed the process which made waste from training materials in the workshops of many departments including the knowledge, attitude about waste from training materials and recycle for collecting the all data to make waste management plan from them. By recycling the least waste. It was found that it is recycled the waste from training materials which came from practicing the pieces of work or many products including machine service electric appliances and auto-machine (wood and metal scraps). These were difficult to decompose. The college had brought these scraps recycle in the form of reusing or producing other pieces of work and selling some of them. For this waste knowledge the students got the low average mark criteria 5.42 from 14 scores and be not sure to waste management by separating the waste 60%, agree 36% and disagree 4% as well as no relation between the knowledge and attitude of waste management at the education level. In addition, its research result could be provided the waste management plan on creating awareness, watching and preventing plan, restoration plan and action research plan.

Supanee Thongchai (2000) studied the study and evaluation of municipal solid waste separation promotion program by using co-operation between students and solid waste buy-back center in the school of Chonburi Municipality. The sample students ware 120 students of primary level, Pratom Suksa 6, of Tesaban Intapanya School at the municipality in Chonburi. It was found that pre-test and post-test were not statistically significant different, students could be separated into 4 groups of solid waste, namely, glass, paper, plastic and metals.

Ratchanit Kaewsrichuang (2000: 156-164) studied the proper approaches for recycling waste, a case study: community of Watbangpai in Bangbauthong, Nonthaburi, used questionnaires, focused groups and indepth interviews for the present waste amount, management, attitudes towards and patterns of recyclable waste

collection, leading to proper approaches to a recyclable waste management model. It was found that the total waste amount was about 363.12 kg/day, 47.28% was all waste. The approaches for recyclable waste management were in the form of Waste Separation Management Project by bill-boards, having a certain drop-off center and providing for waste collection on Sunday.

Teerapong Kanjanawong (2002: 117-119) studied the knowledge, attitude and behaviour towards domestic waste collection among the housewives at Bonkai Housing Community. The sample group was 382 housewives, using questionnaires. It was found that most of the sample group had knowledge, attitude and behaviour towards domestic waste collection at the moderate level. The knowledge of the sample group depended on their education, the attitude depended on age but the behaviour was not statistically significant different on the age, education, occupation, members, floor of living, time of residence in the flats and frequency of receiving environmental information.

Membiela, P., Nogueiras, E. & Suarez, M. (1993: 30-34) studied the matayomsuksa students preconceptions in advance about urban environmental problems and solid waste. The sample group was 15 Matayom Suksa students of the achievement learning at the moderate and low level in Orange, using the questionnaires about urban environmental problems. Guideline for improving of deposal waste, meaning of recycle as well as guideline for waste reduction. It was found that most of the students (54.5%) thought that waste problem was the most important problems and the guideline for improving should provide the efficiently service and enough waste equipment. 70.9% of students thought that they should have sanitary landfill, 39.0% did not know the meaning of recycle as well as 35.8% did not know the guideline for waste reduction.

From this relevant research study both participatory learning and waste management, it was found that the first research would make students' knowledge, attitude and behaviour and the achievement study result better, whereas, the second research would make the people and youths' knowledge, attitude and behaviour in waste management better and waste reduction. However, the research "Youth Participatory Learning Regarding Waste Separation and Recycling in College, by CIPPA MODEL" had not been made, so the researcher was interested in studying, developing, trying out and evaluating the effectiveness of the youth participatory

learning regarding waste separation and recycling in college, by CIPPA MODEL. Due to it would have good awareness in youth group which understood the waste situation and guideline for improving waste problem in college as well as good attitude and looking for the importance of waste separation and recycling as well as making the solid waste management system in college could reduce the amount of waste here and the good result on the whole environment in provincial level.

CHAPTER III
RESEARCH METHODOLOGY

This research was an action research to study and try out the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL: A case study of Samutsongkhram Technical College, Muang, Samutsongkhram.

3.1 Target Population and Sample Students

Target population in this research were taken from all students of Samutsongkhram Technical College, Muang, Samutsongkhram totally 3,362 persons. (Samutsongkhram Technical College, 2002).

Sample students used the purposive sampling technique, 27 persons of Business Computer Club of Samutsongkhram Technical College who were interested in the environmental problems by dividing in sub-groups that would be 5-6 members.

Because of group process, the most effectiveness for learning must have the members 6-8 persons, for the all members provided opportunity to more participate. (The National Education Commission, 1997).

3.2 Conceptual Framework of the Research

This research was an action research to study and try out the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL for the sample students learned how to receive the knowledge, understanding, good attitude and aim the importance of waste separation and recycling, as well as, make the solid waste management system in Samutsongkhram Technical College, Muang, Samutsongkhram as Chart 3.

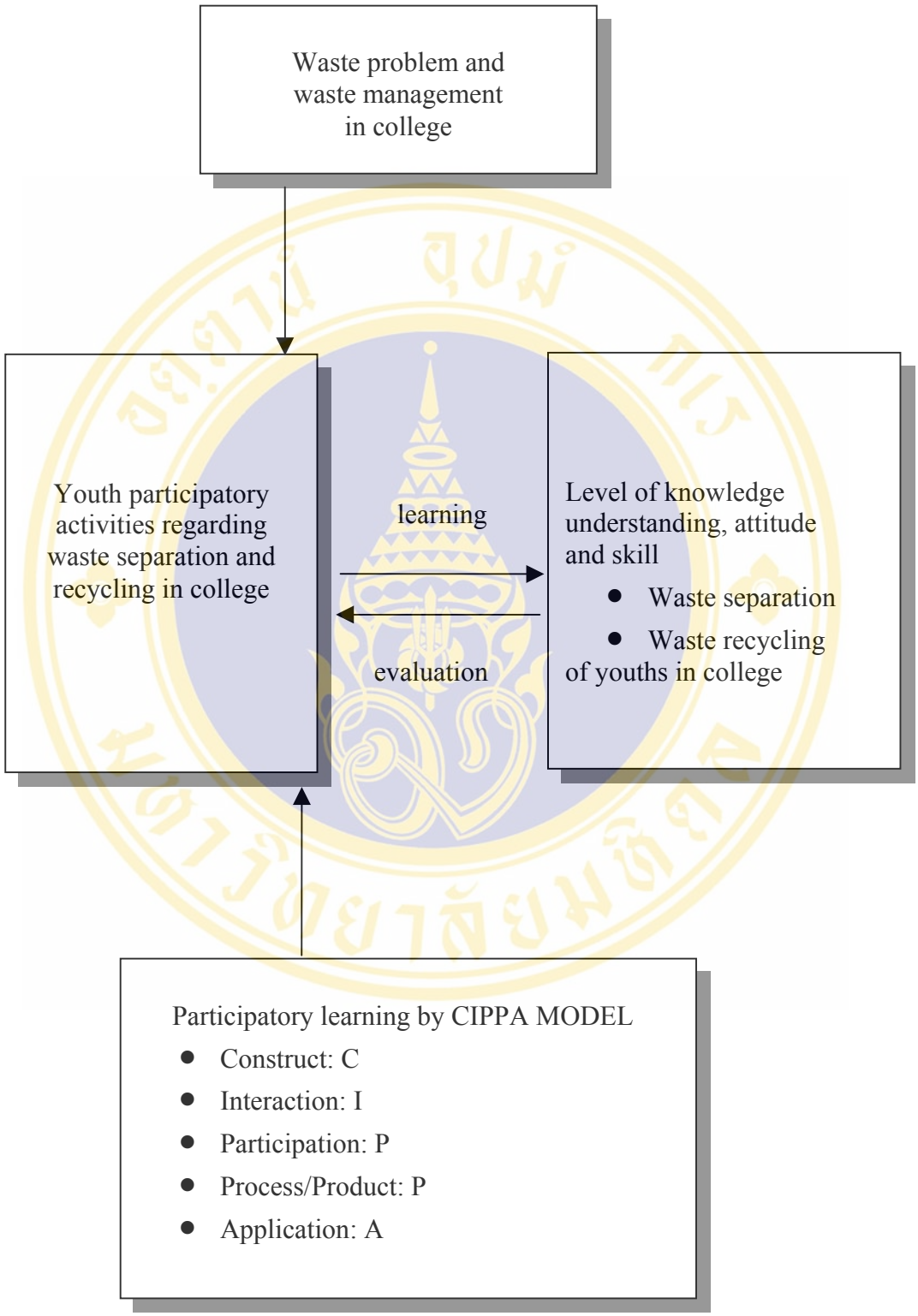

Chart 3 Conceptual Framework for the studies entitled "Youth Participatory Learning Regarding Waste Separation and Recycling in College"

3.3 Research Design

This research used the one-group pre-test and post-test design as follows:

R	O_1	X	O_2

R = Purposive sample students

O_1 = Pre-test scores of knowledge, attitude and participatory behaviour before the learning.

X = The participatory learning plan with CIPPA MODEL

O_2 = Post-test scores of knowledge, attitude and participatory behaviour after the learning.

3.4 Research Procedures

There are three steps as follows: 1) Preparation for the participatory learning. 2) Operation of the participatory learning with CIPPA MODEL. 3) Evaluation as Chart 4 and 5.

Step 1: Preparation for Participatory Learning

Preparation for participatory learning is composed of many steps as follows:

1.1) Self-preparation for the researcher

Youth participatory learning regarding waste separation and recycling in college, by CIPPA MODEL. The researcher plays an importance role in giving knowledge service, explanation, suggestion, consultation and clear data for learners including suggestion knowledge sources for learners to search information. Therefore, he must work hard for self preparation with reading, searching, studying and having experiment in needed contents, including collecting data and other experiences concerned to be useful for learners as follows:

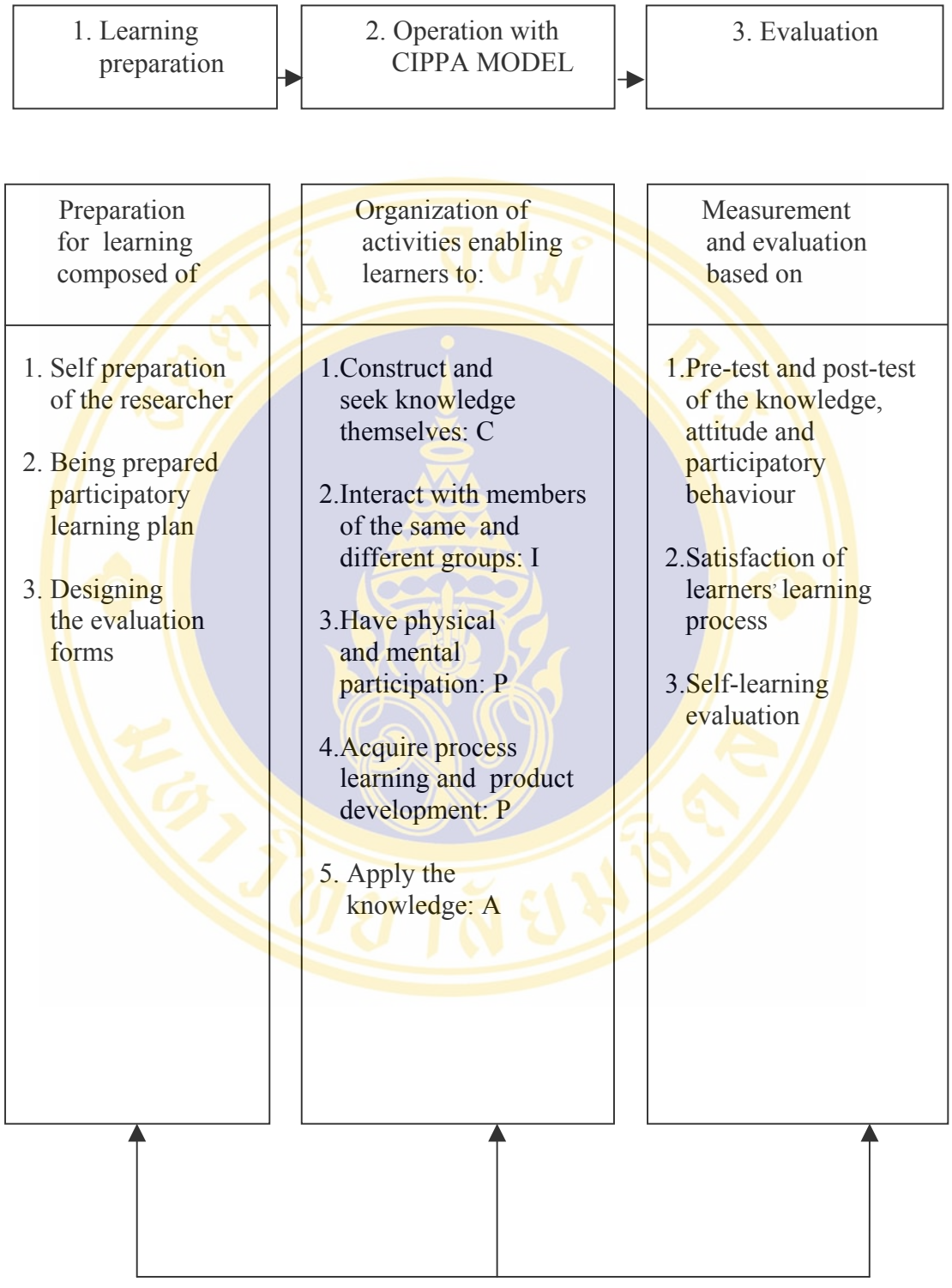

Chart 4 Steps of "Youth Participatory Learning Regarding Waste Separation and Recycling in College"

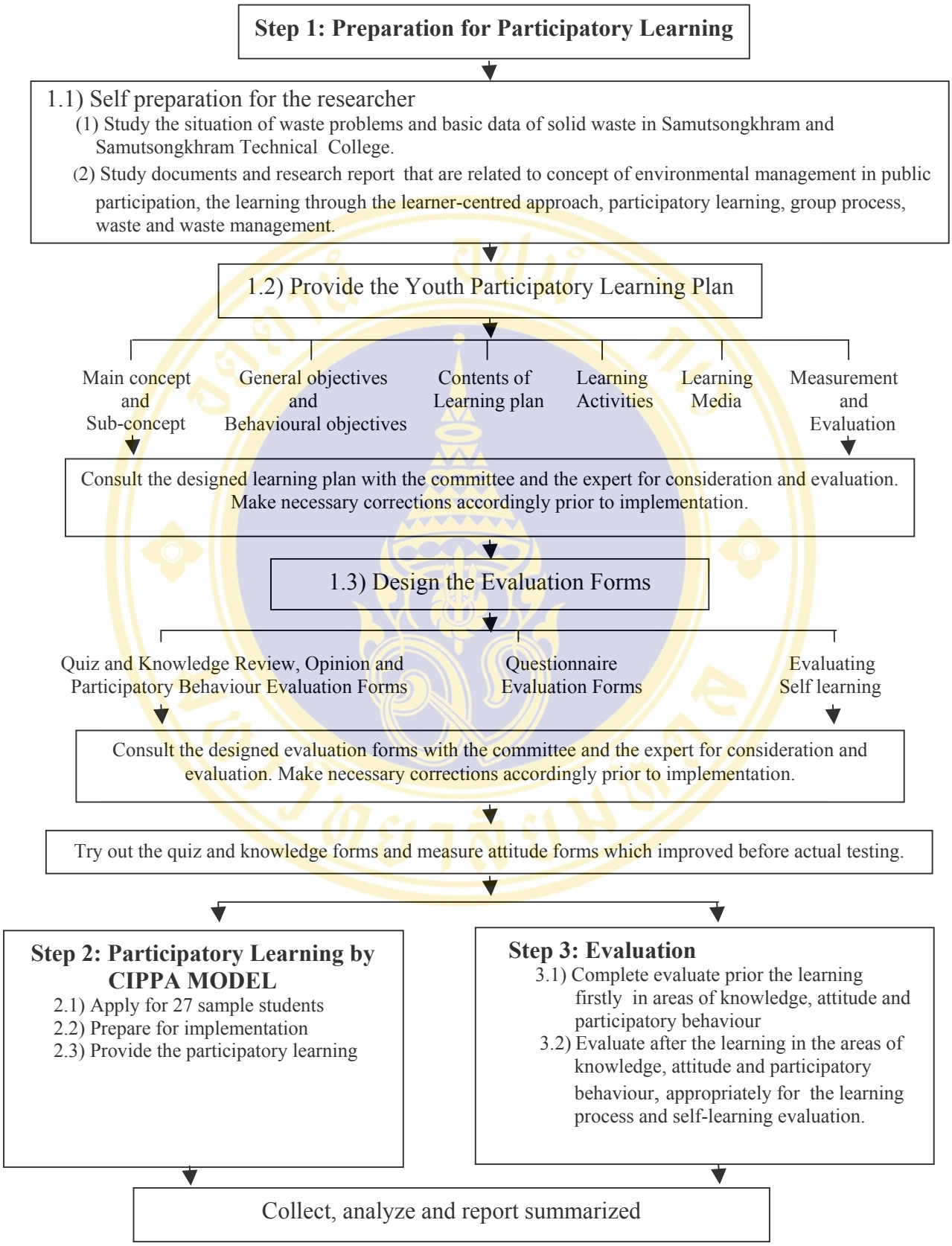

Chart 5 Detail of Steps in "Youth Participatory Learning Regarding Waste Separation and Recycling in College"

(1) Study the situation of waste problems and basic data of solid waste in Samutsongkhram and Samutsongkhram Technical College from summarized report of Samutsongkhram Municipality, from the annual report of the Provincial Environmental Management Action Plan in 2003 of Samutsongkhram and the annual report action plan in 2002 of Samutsongkhram Technical College.

(2) Study documents and research report that are related to the concept of management in public participation, the learning through learner-centred approach, participatory learning, group process, waste and waste management in community.

1.2) Provide the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL, composed of main concept, sub-concept, general objectives, behavioural objectives, contents of learning plan, learning activities, learning media, measurement and evaluation.

Submit the participatory learning plan to the thesis committee and request official documentation from the Dean of the Faculty of Social Sciences and Humanities, along with inviting 2 experts to consider and evaluate the clarity, appropriateness and correctness in language usage. After that, corrections are made based on the recommendations before being put to use.

1.3) Design the Evaluation Forms

(1) Designing a knowledge test on the youths regarding waste separation and recycling in college.

- Study the details regarding the design of the test form concerning documents and texts.
- Design an analysis table according to the youth participatory learning plan regarding waste separation and recycling in college, to analyze and find the ratio.
- Design a knowledge test according to its contents and objectives behaviourally which the researcher designs in the form of a multiple choice test of 4 answers choices to a question, totally 35 questions. It categories the degrees of understanding behaviour into 3 levels, namely, knowledge, comprehension and application. Scores are given in the following which have: Correct answer – 1 point. Wrong answer or blank – 0 point. Criteria on evaluating is similar to those students whose scores are based on the total percentage.

Score Level	Knowledge Level
Less than or equal 60%	Low
60% – 79%	Average
80% and above	High

- Submit the test form to the thesis committee for evaluation and use their recommendations to improve the form in areas of correctness of content, theory and usage.

- Bring the improved test forms to try out the 30 other students of Samutsongkhram Technical College. Correct the test by giving scores and analyzing the quality on the test forms.

The value of the Difficulty Power and Discrimination Power (cited from Boontham Kijpredaborisuth, 1991: 86-87) were calculated by using 27% of both the high group and the lower group, which were analyzed to find their values.

By $$p = \frac{P_H + P_L}{2n}$$

$$r = \frac{P_H - P_L}{n}$$

When P = Difficulty Power

r = Discrimination Power

n = Number of students in the high or lower group

P_H = Number of students answering correctly (high group)

P_L = Number of students answering correctly (low group)

From an analysis of 35 questions of the knowledge test, 20 questions were chosen from questions that had a difficulty power of 0.2-0.8 and a discrimination power of at least 0.2. The results were that all 20 questions passed as Table 3. They were measured for their internal consistency with the Kuder-Richardson Formula 20 (cited from Puangrat Taweerat, 1997: 123).

K.R. 20 $r_{tt} = \frac{n}{n-1}\left[1 - \frac{\sum pq}{S_t^2}\right]$

When r_{tt} = Internal consistency

n = Number of questions

p = Number of students answering the question correctly

q = Number of students answering the question incorrectly (=1-p)

S_t^2 = Deviation of the total score

When $S_t^2 = \frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}$

Table 3 The Analysis on the Contents in the Youth Participatory Learning Plan Regarding Waste Separation and Recycling in College

Behaviour / Contents	Knowledge	Understanding	Application	Total
1.Meanings of solid waste	1	-	-	1
2.Types and sources of solid waste	2,13	3	-	3
3.Situation of solid waste problems in Thailand and the impact	11	4,15	12	4
4.Waste Management in Thailand	14	5	9,10	4
5.Protection and solving the waste problem	-	6,8,16,19	7,18	6
6.Public participation in protection and solving the waste problem	-	20	17	2
Total	5	9	6	20

The results were that the knowledge test regarding waste separation and recycling in college, had an internal consistency of 0.78, which was in the standard range of research, the criteria on the reliability upward 0.7 of the test item was accepted and could be used for the research. (Boontham Kijpredaborisuth, 1988: 17).

(2) Designing an attitude test on the youths regarding waste separation and recycling in college

- Study details about designing forms to measure attitude from related documents and texts.

- Design an attitude measurement form using the measurement method of Likert (total 25 questions). There were 5 levels: Strongly agree, agree, not certain, disagree and strongly disagree, and provided the criteria scoring as follows:

Attitude	Score Level	
	Positive Sentences	Negative Sentences
Strongly agree	5	1
Agree	4	2
Not certain	3	3
Disagree	2	4
Strongly disagree	1	5

Criteria on evaluating was similar to those students whose scores were based on the total of percentage.

Score Level	Attitude Level
Less than or equal 60%	Low
60% – 79%	Average
80% and above	High

- Submit the score sheet to the thesis committee for consideration and use their recommendations to improve the form in areas of correctness of content, theory and usage.

- Bring the improved test forms to try out the 30 other students of Samutsongkhram Technical College. Correct them by giving scores and analyzing the quality on the test form.

The value of Discrimination Power was calculated by using the average scores between the high group and the low group for individual item of t-test method. (cited from Puangrat Taweerat, 1997:131-132).

$$t = \frac{\overline{x}_H - \overline{x}_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$

When
- t = The Distribution of t-test
- $\overline{X}_H$ = Average score of the high group points
- $\overline{X}_L$ = Average score of the low group points
- S_H^2 = Deviation of the high group points
- S_L^2 = Deviation of the low group points
- n = Number of the sample students

The analysis on attitude tests 25 questions which was found that all 16 passed the criteria. From then, the reliability value was found by using the α-Coefficient of Cronbach (cited from Puangrat Taweerat, 1997:125-126).

$$\alpha = \frac{n}{n-1}\left[1 - \frac{\sum S_i^2}{S_t^2}\right]$$

When
- α = Reliability level
- n = Number of questions
- S_i^2 = Deviation of each question
- S_t^2 = Deviation of total scores

The results were showed that the attitude test regarding waste separation and recycling in college had a value of 0.82, which conveyed that the attitude test in the standard range and could be used as a research tool.

(3) Designing a participatory behaviour test on the youth participatory learning regarding waste separation and recycling in college, using the measurement method of Likert from 13 questions. There were 4 levels: -Always practice, often practice, sometimes practice and never practice, for checking the changing of youth participatory behaviour regarding waste separation and recycling in college before and after learning and provide the criteria scores as follows:

Participatory Behaviour	Score Level
Always practice	4
Often practice	3
Sometimes practice	2
Never practice	1

Criteria on evaluating was similar to those students whose scores were based on the total of percentage.

Score Level	Participatory Behaviour Level
Less than or equal 60%	Low
60% - 79%	Average
80% and above	High

(4) Designing a learning process evaluation test form for evaluating the satisfaction on learning process of youth participatory learning regarding waste separation and recycling in college by CIPPA MODEL divided into 3 levels (high, moderate and must be improved) in 9 items: For researcher, techniques of participatory learning, audio-visual aids, duration, place, learning organization atmosphere, facilitation in general, knowledge gained from the learning and as a whole, how much does this learning appropriate for the participants?

(5) Designing an evaluation of self-learning test to evaluate the sample students' opinions which this learning thing had effected how to apply for solid waste management in Samutsongkhram Technical College as well as how to manage by really participation in the future.

Step 2: Participatory Learning by CIPPA MODEL

Youth participatory learning regarding waste separation and recycling in college, the researcher managed the learning activities through contents of learning plan with CIPPA MODEL and the learning activities emphasis on authentic practice of learners all 7 steps through sample students of 27 persons of Business Computer Club of Samutsongkhram Technical College who were interested in the environmental problems. By integrating with Project Subject which these sample students should be registered in this year. It took 1 semester (20 weeks) for learning as follows:

2.1) Apply the sample students

The researcher applied the purposive sample students, the members of Business Computer Club were 27 persons and contacted with the project of Business Computer ' s teacher (Mrs.Sirirut Jiemjit, Instructor 2 level 7) to join the study learning plan, exchange the opinion and conclude together. Providing it as the activity according to the students' subject major, namely, the sample students had made the website about the solid waste and waste management, then, participate in learning activity by waste separation, selling recycled waste and reused with composting by using effective micro-organisms (E.M.) and molasses that known as liquid fertilizer production. After that, contact the career and free clubs in 16 clubs of the college, janitors, shop representatives and cleaners for creating the participation in reducing the amount of solid waste in this college.

2.2) Prepare for implementation

(1) Contact the Director of Samutsongkhram Technical College for the consultant in this research and other relevant officers for preparing media, equipments and place for this learning.

(2) Contact the learning moderator and provide time, date and place for this learning.

(3) Contact the sample students including the core representatives of each club totally 16 groups, janitors, shop representatives and cleaners in Samutsongkhram Technical College to participate for this learning.

2.3) Provide the participatory learning

Provide the youth participatory learning with sampling group, together with the core representative of each club, janitors, shop representatives and cleaners in Samutsongkhram Technical College.

Step 3: Evaluation

There are steps which using CIPPA MODEL:

3.1) Pre-test evaluation using the knowledge questionnaires, attitude tests and the participatory behaviour measuring tests before which followed by time and provided places with sample students before managing the learning activities.

3.2) Post-test evaluation by time and provided place with sample students:

- Using the knowledge tests, attitude measuring forms and the participatory behaviour measuring tests after post-test like the pre-test.
- Using the learning process evaluation test and self-learning evaluating test after the participatory learning.

To follow up the action of waste separation, selling recycled waste and making liquid fertilizer production for waste minimization in Samutsongkhram Technical College for 10-12 weeks.

3.5 Instrument for the Research

Instrument for this research was composed as follows:

1) Youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL.

2) Evaluation Form

(1) The knowledge test, attitude and participatory behaviour measuring tests regarding waste separation and recycling in college.

(2) The learning process evaluation test forms for evaluating the satisfaction on learning process of youth participatory learning regarding waste separation and recycling in college.

(3) The self-learning evaluation forms.

3.6 Data Collection and Analysis

The steps of collection as follows:

1) Collect and check the completely of all data for reorganizing and grouping them.

2) Analyze them from evaluations:

- From the knowledge, attitude and participatory behaviour were analyzed by percentages, means and standard deviation. Then comparisons of the differences in knowledge, attitude and participatory behaviour before and after learning (Pre-test and Post-test) were tested by using the t-test statistic. (cited from Prakong Gunnasooth, 1995: 111)

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

When t = t-test

D = Different scores between before and after learning

N = Number of sample students

(N-1) = Degree of freedom

- From participants' satisfaction on learning process and self-learning tests analyzed by statistic number and percentage.
- From follow up the action of waste separation, selling recycled waste and making liquid fertilizer production for waste minimization in Samutsongkhram Technical College for 10-12 weeks were analyzed by statistic number, percentage and descriptive statistic.
- Report summarized to the Director of Samutsongkhram Technical College.

CHAPTER IV
RESULTS

Results on the youth participatory learning regarding waste separation and recycling in college, by CIPPA MODEL: A case study of Samutsongkhram Technical College. The researcher presents as follows:

4.1 Characteristics of the Sample Students

Table 4 was shown the percentage of some selected study characteristics of the 27 sample students of Business Computer Club of Samutsongkhram Technical College, who were interested in the environmental problem. Data were shown that:

The majority of the sample students (88.9%) were female, the rest (11.1%) were male.

The majority of the sample students were in the age between 19-21 years.

For grade point average (G.P.A.), the sample students reported that the majority of them (48.2%) had average GPA with in 2.01-2.50 and the rest were higher or less.

The majority of present parent of sample students were mother (81.5%) while 11.1% were father and the rest were cousin (7.4%).

The parental occupation were commerce or business 44.5%, labor 29.6%, agriculture 14.8%, government official 7.4% and housewife 3.7%.

The majority of the sources that the sample students had acquired information on solid waste and waste management were television (88.2%) newspaper 51.9%, radio 40.7%, text book 37.0% and talk with group or activity group 7.4%.

All of sample students had never been member group with environmental concerned and also had never experienced participation in waste management. (Table 4)

Table 4 Number and Percentage of the Sample Students Classified by the Study Characteristics.

Number of Sample Students = 27 (100%)

Study Characteristics	Number	Percentage
1. Sex		
Male	3	11.1
Female	24	88.9
2. Grade point average (G.P.A.)		
< 2.00	3	11.1
2.01-2.50	13	48.2
2.51-3.00	5	18.5
3.01-3.50	6	22.2
> 3.50	0	0
3. Present parent		
Father	3	11.1
Mother	22	81.5
Cousin	2	7.4
4. Parental' s occupation		
Government official	2	7.4
Commerce or Business	12	44.5
Agriculture	4	14.8
Labor	8	29.6
Farm	0	0
Housewife	1	3.7

Table 4 Number and Percentage of the Sample Students Classified by the Study Characteristics. (Continued)

Number of Sample Students = 27 (100%)

Study Characteristics	Number	Percentage
5. The sources that sample students have acquired information on solid waste and waste management *		
television	23	85.2
radio	11	40.7
newspaper	14	51.9
news' tower	2	7.4
talk with group or activity group	2	7.4
text book	12	37.0
6. Ever being member group with environmental concerned ?		
Yes	0	0
Never	27	100.0
7. Ever experienced participation in waste management ?		
Yes	0	0
Never	27	100.0

note : * answer more than 1 choice

4.2 Participatory Learning Plan / Learning Activities

In the studying and developing of youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL, composed of main concept, sub concept, general objectives, behavioural objectives, contents of learning plan, learning activities, learning media, measurement and evaluation, which detailed information were shown in the appendix C.

4.3 Learning Achievement as the Results of the Participatory Learning Implementation

4.3.1 Research Procedures and Results are showed as chart 6

Steps	Activities	Results
1. Definding target group	1. Select school and student group	1. Twenty seven participants in Samutsongkhram Technical College
2. Setting learning problem	2.1 Study waste management problem 2.2 Study learning problem on waste separation and recycling	2.1 Waste and waste management problem in Samutsongkhram Technical College 2.2 Learning problem
3. planning on CIPPA MODEL	3. Provide participatory learning plan by CIPPA MODEL	3. Participatory learning plan
4. CIPPA Implemantation - C : Construct - I : Interaction - P : Participation - P : Process/Product - A : Application	4.1 Construct website 4.2 Provide exhibition 4.3 Discuss on waste management experience 4.4 Demonstrate on waste minimization 4.5 Campaign on waste minimization 4.6 Operate on waste separation, selling recycled waste and produce liquid fertilizer	4.1 Knowledge, attitude and participatory behaviour on waste separation and recycling 4.2 Needed behaviour on waste separation and recycling 4.3 Waste minimization in college 4.4 Special income from selling recycled waste
5. Evaluating	5.1 Pre-test and post-test knowledge, attitude and participatory behaviour 5.2 Evaluate satisfaction of learning process 5.3 Evaluate self-learning	5. Expected results confirmation

Chart 6 Research Procedures and Results

4.3.2 The Pre-test and Post-test of the Knowledge

During the implementation of the participatory learning the pre-test and post-test of the knowledge were increased in order to examine the learning achievement as result of the learning implementation. Table 5 was shown that the number and percentage of the sample students of the learning for participants according their knowledge regarding waste separation and recycling in college, while Table 6 was provided the analysis result of knowledge which was classified by items and Table 7 was provided the comparison of such knowledge before and after the participatory learning.

Table 5 Number and Percentage of the Sample Students According to the Knowledge Scores, Before and After the Participatory Learning

Knowledge Score / Level of Knowledge	Before Learning		After Learning	
	Number	Percentage	Number	Percentage
< 12 scores / Low	1	3.7	1	3.7
12-15 scores / Medium	22	81.5	9	33.3
16 scores and above / High	4	14.8	17	63.0
Total	27	100	27	100

Total score: 20 scores

From Table 5 was shown that before the participatory learning the majority of the participants (81.5%) had the knowledge regarding waste separation and recycling in college at the moderate level, 14.8% at the high level and 3.7% at the low level. After the participatory learning, the knowledge of the participants knowledge varied from the background.

Table 6 The Analysis Result of Knowledge Regarding Waste Separation and Recycling in College Classified by Items.

Number of Sample Students = 27 (100%)

Question	Before Learning		After Learning	
	Correct Answer (%)	Incorrect Answer (%)	Correct Answer (%)	Incorrect Answer (%)
1.When did materials or things become waste?	14 (51.9)	13 (48.1)	16 (59.3)	11 (40.7)
2.What kind of material that was used a long time for degradation ?	19 (70.4)	8 (29.6)	27 (100.0)	0 (0)
3. Which question concerns the hazardous waste?	8 (29.6)	19 (70.4)	11 (40.7)	16 (59.3)
4. What kind of the first and obviously waste problems?	23 (85.2)	4 (14.8)	26 (96.3)	1 (3.7)
5. How do you choose for waste disposal?	24 (88.9)	3 (11.1)	26 (96.3)	1 (3.7)
6. Which is the incorrect answer?	18 (66.7)	9 (33.3)	23 (85.2)	4 (18.4)
7. Which is the solving method for increasing the amount of waste at first?	16 (59.3)	11 (40.7)	23 (85.2)	4 (18.4)
8. Solving waste problem should be responsibility for whom?	20 (74.1)	7 (25.9)	24 (88.9)	3 (11.1)
9. Which is the most appropriate waste disposal for types of waste?	4 (14.8)	23 (85.2)	13 (48.1)	14 (51.9)
10.Which is the correct answer for improper waste management?	27 (100.0)	0 (0)	26 (96.3)	1 (3.7)

Table 6 The Analysis Result of Knowledge Regarding Waste Separation and Recycling in College Classified by Items.(Continued)

Number of Sample Students = 27 (100%)

Question	Before Learning		After Learning	
	Correct Answer (%)	Incorrect Answer (%)	Correct Answer (%)	Incorrect Answer (%)
11.Which answer is not shown the impact of waste?	21 (77.8)	6 (22.2)	23 (85.2)	4 (18.4)
12. Which is the waste management that has effected to environment at least?	23 (85.2)	4 (14.8)	26 (96.3)	1 (3.7)
13. Which question concerns the recycled waste?	25 (92.6)	2 (7.4)	22 (81.5)	5 (18.5)
14. Which is the prior waste disposal that used in the past?	17 (63)	10 (37)	17 (63)	10 (37)
15. Which answer is shown the pollution problem from the waste?	26 (96.3)	1 (3.7)	26 (96.3)	1 (3.7)
16. Which answer is shown the practical for recycle?	20 (74.1)	7 (25.9)	20 (74.1)	7 (25.9)
17. Which is the answer that shown the public participation in reducing the amount of waste?	13 (48.1)	14 (51.9)	23 (85.2)	4 (14.8)
18. Which is the answer that is shown activity of waste reducing?	20 (74.1)	7 (25.9)	15 (55.6)	12 (44.4)
19. Which answer is not shown the benefit of recycling?	18 (66.7)	9 (33.3)	14 (51.9)	13 (48.1)
20. Which is the answer that is shown the sustainable waste management?	21 (77.8)	6 (22.2)	23 (85.2)	4 (14.8)

From Table 6 was shown that before learning the majority of the participants could answer question 2,4,5,6,8,10,11,12,13,14,15,16,18,19 and 20 correctly and 1,3,7,9 and 17 incorrectly while after learning they could answer almost all questions correctly. It was found that the participants had knowledge increasing after learning.

Table 7 Comparison of the Pre-Test and Post-Test of Knowledge Scores Regarding Waste Separation and Recycling in College among the Sample Students, Before and After the Participatory Learning

Participatory Learning	Number	Mean	Standard Deviation	df	t-valve	p-valve
Before learning	27	13.96	1.69	26	11.13	0.00
After learning	27	15.70	2.01	26		

- $P < 0.05$

$t (df = 26 , 0.05) = 2.056$

Analysis on the difference of the average scores of the participants' knowledge was shown that, the pre-test scores of averaged 13.96 scores, while the post-test average cores increased to 15.70. From the statistical analysis of the knowledge, it was revealed that there was a significant difference of the pre-test and the post-test scores. Therefore, it could be concluded that the participatory learning provided the increasing knowledge to the participants.(Table 7)

4.3.3 The Pre-test and Post-test of the Attitude

Apart from the pre-test of the knowledge, the participants' attitudes regarding waste separation and recycling in college was also measured, before the learning implementation, approximately fifty percents (51.9%) of the participants had the favorable attitudes regarding waste separation and recycling in college at the high level, 44.4% had the attitudes at the moderate level and 3.7% had the attitudes at the low level. After the participatory learning, was shown that most of the participants

(85.2%) had the favorable attitudes at the high level, while 11.1% showing the attitudes at the moderate level and 3.7% had the attitudes at the low level. (Table 8)

Table 8 Number and Percentage of the Sample Students According to the Attitude Scores, Before and After the Participatory Learning

Attitude Score / Level of Attitude	Before Learning		After Learning	
	Number	Percentage	Number	Percentage
< 48 scores / Low	1	3.7	1	3.7
48-63 scores / Medium	12	44.4	3	11.1
64 scores and above / High	14	51.9	23	85.2
Total	27	100	27	100

Total score: 80 scores

Table 9 Comparison of the Pre-Test and Post-Test of Attitude Scores Regarding Waste Separation and Recycling in College among the Sample Students, Before and After the Participatory Learning

Participatory Learning	Number	Mean	Standard Deviation	df	t-valve	p-valve
Before learning	27	63.81	5.99	26	2.65	0.013
After learning	27	68.92	6.98	26		

- $P < 0.05$

$t (df = 26 , 0.05) = 2.056$

From Table 9 was shown that, the pre-test scores of the averaged 63.81 scores, while the post-test averaged scores increased to 68.92 scores. From the statistical analysis of the attitude, it was revealed that there was a significant difference of the pre-test and the post-test scores. Therefore, it could be concluded that the participatory learning provided the increasing the attitude to the participants.

4.3.4 The Pre-test and Post-test of the Participatory Behaviour

The testing result on youth participatory behaviour regarding waste separation and recycling in college of the sample students, before and after the participatory learning as table 10.

Table 10 Number and Percentage of the Sample Students According to the Participatory Behaviour Scores, Before and After the Participatory Learning

Participatory Behaviour Score / Level of Participatory Behaviour	Before Learning		After Learning	
	Number	Percentage	Number	Percentage
< 31 scores / Low	10	37.0	5	18.5
31-41 scores / Medium	17	63.0	12	44.5
42 scores and above / High	0	0	10	37.0
Total	27	100	27	100

Total score: 52 scores

From Table 10 was shown that before the learning implementation, most of the participants (63.0%) had the participatory behaviour at the moderate level, 37.0% had the participatory behaviour at the low level. After the participatory learning, was shown that, most of them (44.5%) had the participatory behaviour at the moderate level, while 37.0% exhibited the participatory behaviour at the high level and 18.5% had the participatory behaviour at the low level. It was shown that after participatory learning, the participatory behaviour of the participants was higher than before learning.

Analysis on the difference of the average scores of the participants participatory behaviour was shown that the pre-test scores of averaged 30.96 scores, while the post-test averaged scores increased to 38.55 scores. From the statistical analysis of the participatory behaviour, it was revealed that there was a significant difference of the pre-test and the post-test scores. Therefore, it could be concluded that

the participatory learning provided the increasing participatory behaviour to the participants. (Table 11)

Table 11 Comparison of the Pre-Test and Post-Test of Participatory Behaviour Scores Regarding Waste Separation and Recycling in College among the Sample Students, Before and After the Participatory Learning

Participatory Learning	Number	Mean	Standard Deviation	df	t-valve	p-valve
Before learning	27	30.96	4.45	26	4.97	0.00
After learning	27	38.55	7.51	26		

- $P < 0.05$

$t (df = 26 , 0.05) = 2.056$

4.3.5 Satisfaction of the Participatory Learning among the Learning Participants

Table 12 Number and Percentage of the Sample Students According to the Levels of Satisfaction

Number of Sample Students = 27 (100%)

Topic	Satisfaction Level					
	High		Moderate		Must be Improved	
	Number	%	Number	%	Number	%
1. Researcher	15	55.6	12	44.4	0	0.0
2. Techniques of Participatory Learning	11	40.7	16	59.3	0	0.0
3. Audio-Visual Aids	5	18.5	22	81.5	0	0.0
4. Duration	16	59.3	11	40.7	0	0.0
5. Place	16	59.3	11	40.7	0	0.0
6. Learning Organizations Atmosphere	10	37.0	12	44.4	5	18.5
7. Facilitation in general	5	18.5	16	59.3	6	22.2

Table 12 Number and Percentage of the Sample Students According to the Levels of Satisfaction (Continued)

Number of Sample Students = 27 (100%)

Topic	Satisfaction Level					
	High		Moderate		Must be Improved	
	Number	%	Number	%	Number	%
8. Knowledge gained from the learning	16	59.3	11	40.7	0	0.00
9. As a whole, how much this learning appropriate for the participants?	17	63.0	10	37.0	0	0.0

From Table 12 was shown that most of the sample students of participatory learning 81.5% had at the level of satisfaction on the audio-visual aids at the moderate level, 63% had the high level of satisfaction as a whole, how much this learning appropriate for the participants, 59.3% had the high level of satisfaction on the knowledge with towards to the daily life, place and the duration for the participatory learning, 55.6% had at the high level of satisfaction on the researcher, while 40.7% had at the high level of satisfaction with the techniques of the participatory learning, 37.0% had at the high level of satisfaction on the learning organizations atmosphere as well as 18.5% had at the high level of satisfaction on facilitation in general, the rest had at the moderate level of satisfaction.

4.3.6 Self-Learning among the Learning Participants

The result from the self-learning among the learning participants for evaluating the learning opinion which applied to the waste management of Samutsongkhram Technical College in the future as Table 13:

Table 13 Number and Percentage of the Sample Students Classified by the Opinion Level from Learning

Number of Sample Students = 27 (100%)

Topic	Opinion Level					
	High		Moderate		Must be Improved	
	Number	%	Number	%	Number	%
1. The students can construct their own knowledge by group process in waste and waste management.						
- Participate in learning enthusiastic activities.	11	40.7	16	59.3	0	0.0
- Co-operate and responsible for providing the activities with groups both the searching data, educational data and conclusion.	22	81.5	5	18.5	0	0.0
- Get the suggestion and accept the other opinions.	22	81.5	5	18.5	0	0.0
- Use the most opinion which had the interact, thought, supporting, exchanging the opinion and own feeling with others.	5	18.5	16	59.3	6	22.2
- Show the own ability and get the others.	6	22.2	21	77.8	0	0.0
- Decide and solve the problem among learning.	5	18.5	16	59.3	6	22.2

Table 13 Number and Percentage of the Sample Students Classified by the Opinion Level from Learning (Continued)

Number of Sample Students = 27 (100%)

Topic	Opinion Level					
	High		Moderate		Must be Improved	
	Number	%	Number	%	Number	%
- Learn from group as well as help the group to get learning.	0	0.0	27	100	0	0.0
2. The students can create many products from the learning process.	10	37.0	17	63	0	0.0
3. The students can present the learning products to their friends in waste management plan of college.	6	22.2	5	18.5	16	59.3
4. The students can apply the knowledge with learning by doing from waste management plan.	5	18.5	16	59.3	6	22.2
5. The students have the awareness and realizing on waste problem as well as waste management of college.	11	40.74	11	40.74	5	18.52
6. The students are looking forward to develop the waste management of college continuously.	5	18.52	11	40.74	11	40.74

From Table 13, was shown that the students could construct their own knowledge by group process using CIPPA MODEL in waste and waste management. 100% had the opinion that could have at the moderate level of group process learning and helped to acquire the learning, 81.5% had at the good high level of co-operate and

responsibility for providing the activities with group both seeking, studying the data as well as conclusion to get with accepting the suggestion and other abilities, 77.8% had at the good moderate level in showing own abilities and accepting the other abilities, 59.3% had at the good moderate level with participation in learning enthusiastic activities, using the most opinion which had the interact, thought, supporting, exchanging the opinion and own feeling with others together with the decision as well as solving many problems among learning. For creating many products from learning process of students, it was found that 63.0% had at the good moderate level whereas the presentation to their friends in college by waste management plan of college found that most of them 59.3% had at the low level and at the good moderate level of bringing the knowledge to apply in the real situation 59.3%. In addition to this, having the awareness as well as realization on the waste and waste management of college together with expecting to develop the waste management of college continuously which the students get at the good moderate level was 40.74%.

4.4 Monitoring of the Participatory Learning

After the completion of the participatory learning, about 10 – 12 weeks later, a monitoring program, namely, the action of waste separation, selling recycled waste and making liquid fertilizer production for waste minimization in Samutsongkhram Technical College was carried out, to the change of the quantity of waste in college and find the appropriate pattern for waste management in college too. The results as seen below.

4.4.1 The Making of Liquid Fertilizer Production for 12 weeks in three containers which could reduce the scrap of fruits and peel of fruits that must be disposed of 286 kilograms and get the liquid fertilizer production was 775 litres (Table 14)

Table 14 Number of Scrap and Peel of Fruits and the Liquid Fertilizer Production

Times	Scrap and Peel of Fruits (Kilogram)	The Liquid Fertilizer Production (Litre)
1st	149	391
2nd	137	384
Total	286	775

4.4.2 Waste Separation for 12 weeks could be separated recycled waste totally 882 kilograms, namely, plastic bottles 463 kilograms, paper 382 kilograms and others 35 kilograms as well as sold them totally 3,660 baht as Table 15:

Table 15 Number of Separated Recycled Waste Classified by Types

Week	Separated Recycled Waste (Kilogram)			Money (Baht)
	Plastic Bottles	Paper	Others	
1	30.5	19	5	237.50
2	50	37	4	391.00
3	51	3	0	360.00
4	37.5	147	9	418.50
5	30	82	9	301.00
6	45	39	4	358.00
7	47.5	15	3	350.50
8	52.5	11	0	378.50
9	38	2	0	268.00
10	38	12	3	281.00
11	24	8	0	276.00
12	19	7	0	140.00
Total	463	382	37	3,660.00

4.4.3 Bulk Density of Waste

The data are shown that before learning the bulk density of waste in Samutsongkhram Technical College was 0.112 kg./l. but after learning was 0.126 kg./l. as Table 16:

Table 16 Bulk Density of Waste Before and After the Participatory Learning

Number	Before Learning			After Learning		
	Weight of Waste and Container	Net Weight of Waste	Bulk Density	Weight of Waste and Container	Net Weight of Waste	Bulk Density
1	24.2	11.6	0.116	25.9	13.3	0.133
2	20.0	7.4	0.074	22.8	10.2	0.102
3	31.0	18.4	0.184	28.1	15.5	0.155
4	19.4	6.8	0.068	22.4	9.8	0.098
5	24.6	12	0.012	26.8	14.2	0.142
Average Bulk Density of Waste (kg./l.)			0.112			0.126

Note: The weight of container 100 litres = 12.6 kilogram

$$\text{Bulk Density (D)} = \frac{\text{Net weight of waste}}{\text{Volume of container}}$$

4.4.4 The Composition of Recycled Waste

It was found that the amount of recycled waste in waste containers of Samutsongkhram Technical College had been decreased, before learning there was 23.4% and after learning was 13.9% of recycled waste as Table 17:

Table 17 The Composition of Recycled Waste in Samutsongkhram Technical College Before and After the Participatory Learning

Type of Waste	Before Learning		After Learning	
	Weight	Percentage	Weight	Percentage
Recycled Waste				
Paper	7.0	14.6	4.5	9.8
Glass	0.8	1.7	1.3	2.8
Metal	0.1	0.2	0.5	1.1
Plastic	3.3	6.9	0.1	0.2
Total	**11.2**	**23.4**	**6.4**	**13.9**
Organic Waste				
Leaf	1.9	4	2.6	5.6
scrap of food	2.4	5	4.3	9.3
Total	**4.3**	**9**	**6.9**	**14.9**
Hazardous Waste				
Batteries	1.8	3.8	3.1	6.7
Total	**1.8**	**3.8**	**3.1**	**6.7**
General Waste				
Foam, others	30.5	63.8	29.8	64.5
Total	**30.5**	**63.8**	**29.8**	**64.5**
Total	**47.8**	**100.0**	**46.2**	**100.0**

4.4.5 Waste Management System in the Responsible Area of Each Club had been happened in the concrete and according to real areas, campaigning for sign separating the waste before discard from clothing signs near the bins, sign boards together with the providing slogans of each department, getting the knowledge and training the core-leaders of each club to publicize the club members in giving knowledge, types and sources of waste boards. It had been created the participation to other friends widely in college' s every building as well as bringing the waste separation before disposing to of 5 S. system of each department by using the

separated waste bins from the project for main separated waste bins and providing more of them for many floors of building, then collecting the separated recycled waste which was separated, then collect the separated recycled waste which most of them were paper and plastic bottles to sell together on every Wednesdays of activity hours once per week, at the garage near the old workshop of machine shop building by appointing the permanent collectors at 3 P.M. by each of representative of the clubs, janitors of building as well as the cleaners for co-operating the responsibility continuously as follows:

Separation the recycled waste and selling

Responsibled area: Canteen

Students: Drop the plastic bottles in the separating waste bins and the cleaners collect for selling every day

Responsibled area: Industrial Trades, Commerce, Home-Sciences buildings, all-learning building and official building.

The students had dropped the recycled waste into the separated waste bins, prepare for building as well as Mr. Ekkarindh Suntraruk, responsibled and co-ordinated the relevant persons in selling whereas the non-permanent janitors of the building, asking for the representative of each club to collect and separate for selling together.

Making liquid fertilizer production from co-ordinating with Building Work by Mr. Samart Hutthakum had responsibled with the appointed janitors.

4.4.6 Result on the Attitude Interview and Participation in Waste Management of executives, teachers and students of Samutsongkhram Technical College, the sample students were 5 groups as follows:

The executives of college

The Director and Assistant Director of Samutsongkhram Technical College 4 divisions had the opinions that the youth of participatory activities in reducing the amount of waste here, it was the best thing to participate in college which is shown the participation of all persons both knowledge and good environment helping the amount of waste decreased and be able to separate waste for selling. (Add value), get the liquid fertilizer production.

Teachers

The teacher representative of Industrial Trades, Commerce, Home-Sciences Departments and Basic Subject Faculty, Samutsongkhram Technical College, had expressed their opinions according to say that making the project in college was good because at present, there was waste disposing every things in one bin, which helped the students separated and made waste for liquid fertilizer production reduce the amount of waste, made income which must begin himself first, how to organize waste management and how to use with others both houses and offices which made the college clean, reduced the janitors' tasks together with the suggestion of participation in reducing the amount of waste in college also. Creating the good awareness for teacher staff and students had more increased to reduce the environment of pollution, separate waste in department dispose into the right bin, right type, including get the supporting from organizations and the executives of college who had pushed for making whole system, not being the duty of any group and the finished project, then separated waste bins are only the souvenirs.

Students

The representatives of Career and Free clubs are 16 clubs (Certificate and Diploma levels) had expressed their opinions about making projects that they were the good, useful projects for students, care for clean, recycled waste, disposal waste to spread for friends which were made for a long time because everyone had participated in waste management also. It must have the efficient core-leader part and most trying the important was that everyone must co-operate and finally it would be successful, however; more waste bins everyone did not think to dispose so it is useless and must be supported this project continuously. If it could be practiced in college, it would be practiced in other places also. It must be first at himself and told to others, but he did not and then the others would do either.

The suggestion for participation in reducing the amount of waste in college should be campaigned on disposing waste, separating waste and dropping into the given bins by providing types including recycling waste, making posters, warning the people dropped the waste on the floor and recycling waste. In addition, reducing the amount of unnecessary objects, namely, plastic bags and foam, creating the optimistic point of view for students to know how to drop the waste into the right place and

properly. It should have the right waste bins with clearly signs for facilitation and not being complicated. The most important of this was to find the interesting method to attract the students more participate.

CHAPTER V
DISCUSSIONS

From this research "Youth Participatory Learning Regarding Waste Separation and Recycling in College": A case study of Samutsongkhram Technical College by CIPPA MODEL and 7 steps of participatory learning process by Tisana Khemmani (2000): The sample group was the members of Business Computer Club, Samutsongkhram Technical College who were interested in environmental problems. The result as follows:

5.1 Characteristics of Sample Students

This sample students was 27 members of Business Computer Club, Samutsongkhram Technical College who were interested in the environmental problems and had been studying at the Diploma 2 (Business Computer Department), age between 19 – 21 years old which most of them had the scores at the moderate level (G.P.A. was 2.01 – 2.50), acquired information on solid waste and waste management which most of them were from television. However, non-members of group and non- participants or experience on concerning the solving waste problem first but interesting in this problem, participating as sample group in youth participatory learning regarding waste separation and recycling in college which the researcher provided, while the members practiced the activities in the project of youth participatory activity in waste minimization of Samutsongkhram Technical College which was the partial of subject which sample students and the researcher brought this content to integrate with the subject owner of the project.

Hence, the organization of learning activities was the responsibility between the co-operation of sample students, the subject owner teacher of this project and the researcher. Choosing this sample group for the best result of every concerning unit, having the participation and the owner together, having effectiveness for motivating

the operation well as well as good for achievement on study after learning in every aspect.

5.2 Structure of Youth Participatory Learning Plan Regarding Waste Separation and Recycling in College, by CIPPA MODEL

Providing the Concept was the providing concept of guideline from content of waste and waste management classified to look the principal concept that waste was the problem from the behaviour of human living in many aspects which had the impact on life quality and environment by public participation, government sector and private sector in reducing the amount of waste before disposing with waste separation and recycling, then protected and solved the waste problem effectively and sustainably.

Providing the Objective was the providing the sub topics of waste content and waste management for the sample students received the knowledge, understanding, meanings, types and waste sources. Having awareness on the waste problem situation, impact for life quality and environment, knowing and understanding of proper waste management correctly and effectively including the guideline on protection, solving the waste problem and the role on public participation. The most important thing was that it must be skillful and experience on correct waste management by own role which was provided the general objective and divided into sub topics: behavioural objectives of sub topics according to the concept.

Providing the Content Framework of Learning was the providing the framework of topic which covered the content of waste and waste management by rearranging the order according to the conceptualization and objective as follows:

1. Meanings of solid waste, types and sources of solid waste
2. Situation of solid waste problems in Thailand and the impact
3. Waste Management in Thailand
4. Protection and solving the waste problem
5. Public participation in protection and solving the waste problem

Providing the Learning Activities the researcher provided the learning activities by the framework of created learning plan, by CIPPA MODEL and 7 steps of participatory learning process (Tisana Khemmani, 2000) took 1 semester

(20 weeks) from this step: *Construction their own knowledge*, *preparation for exhibition* in talking and training, *participation in talking and getting for training* were the important part for the sample students to receive knowledge and understand the waste and waste management of the various increasingly methods respectively including creating the learning network with the core representative of each club (16 clubs), janitors, shop representatives and cleaners in college in the step of *application the knowledge* for *waste separation, selling recycled waste and making liquid fertilizer production* 12 weeks continuously.

It was obviously that this learning plan which was applied by CIPPA MODEL of Tisana Khemmani (2000), composing of the concept of experiential learning and group process which provided the activities covered 4 components of participatory learning, namely, bringing the original experience to develop the body of knowledge, reflecting the opinion for exchanging and learning each other, understanding and giving conceptualization and experiment or application for using many situations by learning activities guideline emphasized on learning by doing from oneself and group.

The good point of this learning plan was to be concerned from concept, objective, framework of learning which the students received from the knowledge, understanding of waste and waste management well including having knowledge and understanding the guideline on protection and solving the waste problem, especially for the role on participation of waste management himself in college very well, but it might have the limit in learning activities aspect which had many activities, took quite much time. It could be adjusted for the sample group properly.

5.3 Result on Trying Out the Participatory Learning Plan

5.3.1 Responding to Learning Process of Sample Students

From the trying out of participatory learning plan, it was found that learning plan by CIPPA MODEL was created sample students learned and constructed knowledge in waste and waste management by themselves from website “Waste Minimization”. Having plan providing the role, duty and responsibility within and

between groups. It made the learning and experience exchange, reflection the opinions including conclusion the conceptualization of group for accomplishment, construction their own body of knowledge according to the subject major which the skilled students, learning by original experience to receive from new challenging learning continuously; Active learning had the interaction between self learners and learners to teachers. Each sample students provided the knowledge for the responsible topic in the form which satisfaction group, gave suggestion by teachers of Business Computer Department, improved the work, technique of computer and the researcher was responsible for suggestions' improving the content of waste and presented waste management, whereas, the sample students improved the work completely and participated between the sample students, the owner of subject and the researcher including with learning the proper process and the product development from creating of group and apply the knowledge by communicating the participants, talking and training from the website as well as making the documents in this research.

Talking about the experience of participatory waste management in community by the moderator from Muang Samutsongkhram Municipality and the officers from Thai Volunteer Service made the sample students receive knowledge, experience, exchange the opinions, open the problem points and opinions about waste and waste management in province, waste management within the limit of Municipality Officer' s responsibility including with the campaign for youth participation in waste management of Thai Volunteer Service at present. In addition, it gave the opportunity for 5 groups of sample students to meet the core representative of each club, janitors, shop representatives and cleaners in college for exchanging learning and looking for the guidelines in reducing the amount of waste in college which each club had responsibility together.

Training, demonstration and practice in reducing the amount of waste by the moderator from Department of Environmental Quality Promotion and Department of Pollution Control was that the sample students received the knowledge not only from directed experts in participation of government sector, especially the training result but more waste management in reducing and separating waste in the forms of Recycling Bank, Waste-for-Egg, Waste Donation Project, Recycled Material Center, Composting of Organic Waste, Weighing and finding the component of waste in college.

The above knowledge was the new knowledge which the researcher prepared for the sample students from many activities of learning and they had studied, understood the data / knowledge, built the data meaning / new experience by using the thinking process and group process for explanation including conclusion the understanding linking the original to new knowledge together, exchanging the knowledge and group understanding, then conclusion with their own body of knowledge and creating the group knowledge by campaigning the club for waste separation before disposing for presentation from both learning and implementation. In practical, reducing the rest amount of waste in college to have the least, learning from real practice in waste separation, selling recycled waste and making liquid fertilizer production, together with, creating the participation with core representative of each club, janitors, shop representatives and cleaners in college. On behalf of the operators and co-ordinators made the practice for reducing the amount of waste all college, making income, reducing the janitors' tasks as well as the expense on waste management.

Besides, the good point of created learning activities was that the individual sample students were responsible for the tasks every step of learning, composed of this sample students had high responsibilities and every work operated smoothly but some problems during the students were busy so practical work were late but adjusted for proper management by learning plan including in the first of operating which the sample students could not co-ordinate, motivated the core representative of each club who were responsible for this and then the researcher solved this problem by co-ordinating with the advisor of each club's activities including reporting the result to the college for participation with teachers in another way. This could be successful work completely.

5.3.2 Achievement of Learning Plan

The result on evaluation achievement of knowledge, attitude and participatory behaviour regarding waste separation and recycling in college of the sample students after learning by the participation of learning plan which was found that they received the average scores on knowledge, attitude and participatory behaviour regarding waste separation and recycling in college higher than before learning was at the statistically

significant different 0.05 level. It was shown that the learning process form had effected to students' learning development, having knowledge, correct understanding regarding waste and waste management including actual practice in the college area continuously through 1 semester. The sample students created the practical learning for knowledge, attitude and participatory behaviour regarding waste management better by the hypotheses and according to the research of Pavinee Suntorntarawong (2001). It was found that learning by using participatory learning in protection the consumers in school program that the trying out group students had the average scores on knowledge, attitude and behaviour on choosing food consumption higher than before trying out at the statistically significant different 0.01 level as well as according to the study of Prapaipun Boonkong (1997) which implemented the teaching-learning process through Learner-centred approach to apply systematically and continuously by process. Developing the participatory teaching-learning form Buddhism (S.018) to try out the trying out group of students and found that the achievement study of students after learning higher than before learning was at statistically significant 0.01 level and the students had attitude opinions at the high level every item including still according to the study of Suwatin Mitreput (1997: 120 – 122), it was found that the promotion of perception on the role of father with participatory learning was the teaching method using experiential learning form integrated with group process which the youths received the perception, understanding and look for the importance of practice the more duty role of father through the average scores of the perception of duty role of father after experiment was higher than before experiment.

From this research, it was found that participatory learning plan was suitable for youth participatory learning regarding waste separation and recycling in college. It was because that learning process emphasized on participation of learning participants which had according as well as responding the participants' need very well.

5.3.3 Project Evaluation

The researcher had used the questionnaires with sample students to evaluate the satisfaction towards the " youth participatory learning regarding waste separation and recycling in college" with evaluation the opinion themselves on the things which were received from learning and implementation. It was found that the participated

learners had more satisfaction than many aspects of learning process, namely, as a whole, the students thought that it was very suitable for the students as well as applied the knowledge for daily life, place, time and the researcher. For general facilitation, media, material and equipment, whole atmosphere of learning organization including technique or method of participatory learning, the participants had the satisfaction at the moderate level. Because this learning took time for 20 weeks and the sample students were busy, then the researcher could not be ready and prepare the media, material and equipment well in every step of learning, however, it was affected to the whole atmosphere of learning organization and techniques or method of participatory learning. For expressing own opinions about things and implementation. It was found that most of the sample students could make at the moderate level, either construct the own knowledge, present or implement the knowledge which may come from the same reason; much activities to do, some were done well but in some parts were not so its average, as a whole, was at the moderate level.

5.3.4 Monitoring

This following result had been followed the practical of waste separation result, selling recycled waste and making liquid fertilizer production which took time for 12 weeks. It was found that the sample students could manage of participating with core representative of each club, janitors, shop representatives and cleaners in college. Reducing the amount of waste before disposing, most of the separated waste were plastic bottles, paper scraps and others respectively; as well as selling recycled waste was average 60 baht per day. For degrading waste, namely, fruit scraps and fruit peels which could make liquid fertilizer production which the physical components of recycled waste in the college' bins decreasely, the collectors of Lardyai Sub-district Administrative Organization said that during of the research, the amount of waste decreased, in addition each club could manage the waste management system, giving knowledge through the signs in each building, together with the researcher reported the result to the college by co-ordinating and assigning the activities for building work and every club to manage continuously.

Hence, the result on opinion interview about attitude and participation in reducing the amount of waste in college: the executive committee, teachers and

students was found that every division had the same opinion that practical activities in this research was good not only receive knowledge but also environment, so it should be supported continuously if it was possible in college through the other places.

From this result, it was insisted that this learning was efficient as learning activities were the part in motivating students for learning including creating participation in waste management in college.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

Managing the environmental education for the students in college by giving the knowledge about the environment and environmental management which is one of the forms of the supporting and promoting the concept "Public Participation" in managing natural resources and environment for students to recognize awareness on conservation the natural resources and participate in controlling, protection and solving the environmental problems by steps. To begin from the nearest environment, namely, waste problems and waste management by using learner-centred approach, organizing the learning activities by stimulating, supporting to participate in thinking, action, mental and learners will be given opportunities to participate in activities as much as possible, thinking exchange together with group process, construct the knowledge from the original experiences and develop knowledge themselves through thinking process and seeking knowledge as well as the real practice and knowledge application for co-operation in planning and solving of waste problems which are the college' s goal, that is brought to manage the natural resources and environment of people network' s characteristics.

Another method to help the concept of youth participatory in solving and managing waste problems in college in the reality is *youth participatory learning regarding waste separation and recycling in college, by CIPPA MODEL.*

As this above reason, the researcher is interested and made a research "Youth Participatory Learning Regarding Waste Separation and Recycling in College, by CIPPA MODEL": A case study of Samutsongkhram Technical College, Muang, Samutsongkhram. The purpose is to study and develop the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL and try out as well as evaluate the effectiveness of the participatory learning plan.

It is an action research by using one-group pre-test and post-test design which can be divided into 3 steps.

1) Preparation for Participatory Learning

(1.1) Prepare the researcher to get the knowledge, understanding in the content of waste and waste management, situation of waste problems and basic data of solid waste in Samutsongkhram and Samutsongkhram Technical College, together with, the concept of environmental management in public participation and participatory learning.

(1.2) Provide the youth participatory learning plan regarding waste separation and recycling in college, by CIPPA MODEL.

(1.3) Design the evaluation forms, namely, a knowledge test, an attitude test and a participatory behaviour test on the youth regarding waste separation and recycling in college for measuring the achievement in learning and a learning process evaluation test for evaluating the satisfaction on learning process as well as a self-learning test for evaluating the sample students' s opinions from the learning.

2) Participatory learning by CIPPA MODEL

Sample students used the purposive sampling technique, 27 persons of Business Computer Club of Samutsongkhram Technical College who are interested in the environmental problems.

The time of learning is 1 semester (20 weeks) in the first semester (Academic year 2003) between May 19, 2003 – October 3, 2003 in Samutsongkhram Technical College.

3) Evaluation

The evaluation of this research used the instrument for collecting the data, namely, a knowledge test, an attitude test and a participatory behaviour test were analyzed by percentages, mean and standard deviation. Then comparisons of the differences in knowledge, attitude and participatory behaviour before and after the learning (pre-test and post-test) were tested by using t-test. Whereas, the participants' satisfaction on learning process and self-learning test were analyzed by statistic number and percentage. For the operation on waste separation, selling recycled waste and making liquid fertilizer production for 10-12 weeks were analyzed by statistic number, percentage and descriptive statistic.

6.1 Conclusions

The result on "Youth Participatory Learning Regarding Waste Separation and Recycling in College, by CIPPA MODEL", the researcher concluded as follows:

6.1.1 Sample Students

Sample students had some acquired information on solid waste and waste management but had never been the group members or relevant the environmental concerned as well as participated in the activities or relevant experience about solving waste problems, however, they had been interested in the environmental problems and provided youth participatory activities project in waste minimization in Samutsongkhram Technical College which is the partial subject which bringing the waste and waste management content to integrate the researcher, the teacher owned the project work of Business Computer Department and the sample students. It was shown the importance in waste management in college from this student group.

6.1.2 Youth Participatory Learning Plan Regarding Waste Separation and Recycling in College, by CIPPA MODEL

This goal was to increase the knowledge, understanding of waste and waste management, good attitude and the importance of participation role to solve it including applying for reducing the amount of waste in college by content frame covered the meaning, types and sources, situation of solid waste problems in Thailand and the impact, waste management in Thailand, protection and solving the waste problem, public participation in protection and solving the waste problem, providing the learning activities by CIPPA MODEL as well as 7 steps of participatory learning process by Tisana Khemmani (2000) the learners constructed and sought knowledge themselves (Construct: C), interacted with members of the same and different groups (Interaction: I), had physical and mental participation (Participation: P), acquired process learning and product development (Process/Product: P) and applied the knowledge (Application: A).

6.1.3 Research Procedures and Results

This research process and procedures concluded in five main steps: 1) definding target group, 2) setting learning problem, 3) planing on CIPPA MODEL, 4) CIPPA implementation and 5) evaluating. Its' main activities are based on CIPPA MODEL. This model has five components: 1) construction and seeking of knowledge by the student themselves (C), 2) interaction with members of the same and different groups (I), 3) physical and mental participation (P), 4) process learning and development of a product (P) and 5) application of the knowledge (A).

It was found that the participants had increased their knowledge, attitude and participatory behaviour on waste separation and recycling as well as waste minimization in college and special income from selling recycling waste.

6.1.4 The Effectiveness of the Participatory Learning Plan

The result on the evaluation of knowledge, attitude and participatory behaviour on the youths regarding waste separation and recycling in college. After the participatory learning by plan. It was found that the sample students' average score of knowledge, attitude and participatory behaviour regarding waste separation and recycling in college were statistically significant different (0.05) higher than before the participatory learning. It shows that the learning process form have effected to learning development of sample students, having knowledge together with the correct understanding in waste and waste management from self-learning using group process, having interaction with members of the same and different groups, having participation, acquiring process learning and product development and applying the knowledge by real practice in the college continuously for 1 semester by waste separation before disposing, selling recycled waste and making the liquid fertilizer production in Samutsongkhram Technical College. The sample students learned how to do and get better knowledge, attitude and participatory behaviour of waste management and most of them had the satisfaction for not only learning process but also bringing the knowledge to manage in reducing the waste in college at the moderate level.

The learning plan is suitable for the organization of youth participatory learning regarding waste separation and recycling in college because of learning process emphasizes on learners' participation that according and correspondence to the learners' participation very well.

6.2 Recommendations from the Research Findings

From this above research, there are recommendations as follows:

1) The organization of participatory learning by integrating with the subject that is the best thing which creates the responsible participation together. It does not drop of the relevant staff which has effected on management. So, there will be some recommendation for making action research that should be participated and linked the owners together as well as the part of the learning subject which is better than making it by managing the only research activity.

2) Providing the learning activities between the operation, there will have two characteristics, namely, campaigning on waste separation before disposing in the form of information, contest the slogan, invention from reused materials, waste management system in the responsible area for each club; giving rewards certificates to the participants who get the increasing movement on the organization of learning. On the other hand, the operation on waste separation, selling recycled waste and making liquid fertilizer production which manage the time to campaign on waste separation before disposing.

3) Making the learning network with the core representative of each club, janitors, shop representatives, cleaners in college and the sample students will extend and create the participation in reducing the amount of waste all of college. If it operates on specific target group that can not be created the actual participation exactly.

4) Creating the participation between government sector, local and central private sector which is the relevant unit on the research topic, using the co-resources in moderator, material media and learning instrument which not only bring everything in every way to make the ultimately usage but will be better result on research. However, it will help the reliable and more interesting research as well as the guideline of

participation in reducing waste in the college, but the important point is to have good management for co-operating properly the time and every staff, preparation and communicating before will provide the date and time properly.

5) Creating the co-operating every person in college' s participation is the necessary thing in the organization of action learning that takes a long time, continuously activity by responsible persons who push the job all the time which is the difficult job. Therefore, the Director will have the important role on campaigning the awareness with students by providing the policy or planning the activities for the reducing the amount of college' s waste obviously and the policy which teachers and students must be interested in and participated, together with, the whole organizations which can achieved the needed goal continuously.

6.3 Recommendations for Further Research Studies

From this research, the researcher recommends the further research:

1) Research the project' s evaluation after the end of learning process. In the measurement of changing the knowledge, attitude and participatory behaviour in reducing the amount of waste in the college from the sample students and follow the operation' s result in each club' s waste management system how can manage and create the continuously participation in reducing the amount of waste in college. In addition to know the retention of youth participatory learning regarding waste separation and recycling in college. In this way, there is the effectiveness on promoting the knowledge, attitude and participatory behaviour in reducing the amount of waste in college much better by providing the goal.

2) Try out the participatory learning plan to the other target group by adjusting the form and the organization of learning method with appropriately for each target group or in according to needs of target group but still be the way of CIPPA MODEL, use the construction the body of knowledge by themselves, from giving the learners to construct and seek knowledge themselves (Construct: C), interact with members of the same and different groups (Interaction: I), have physical and mental participation (Participation: P), acquire process learning and product development (Process/Product: P) and apply the knowledge.(Application: A).

3) Make the providing participatory learning plan in reducing the amount of waste in college by using the concept on providing the other activities compared the learning plan' s effectiveness from this research.

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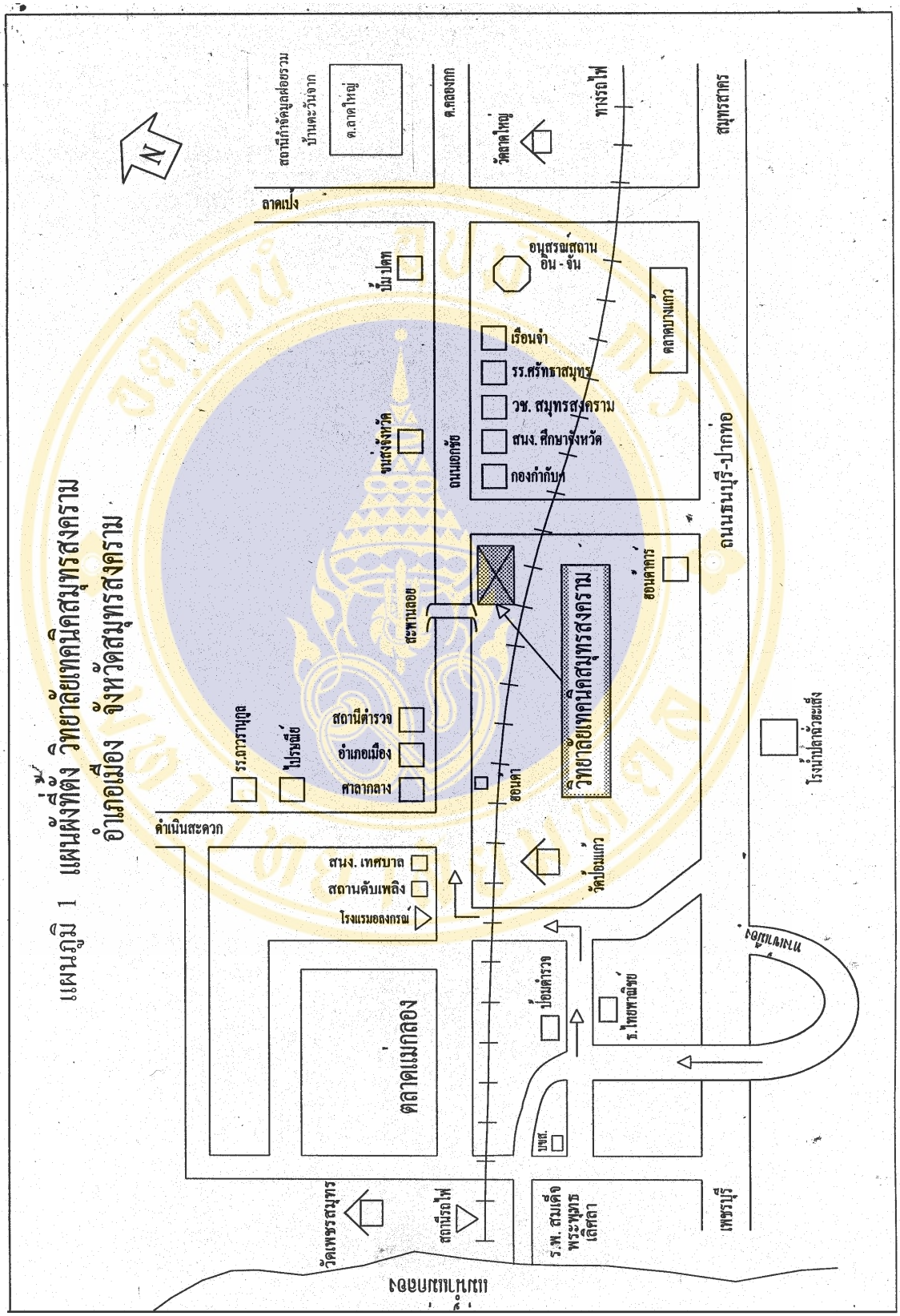
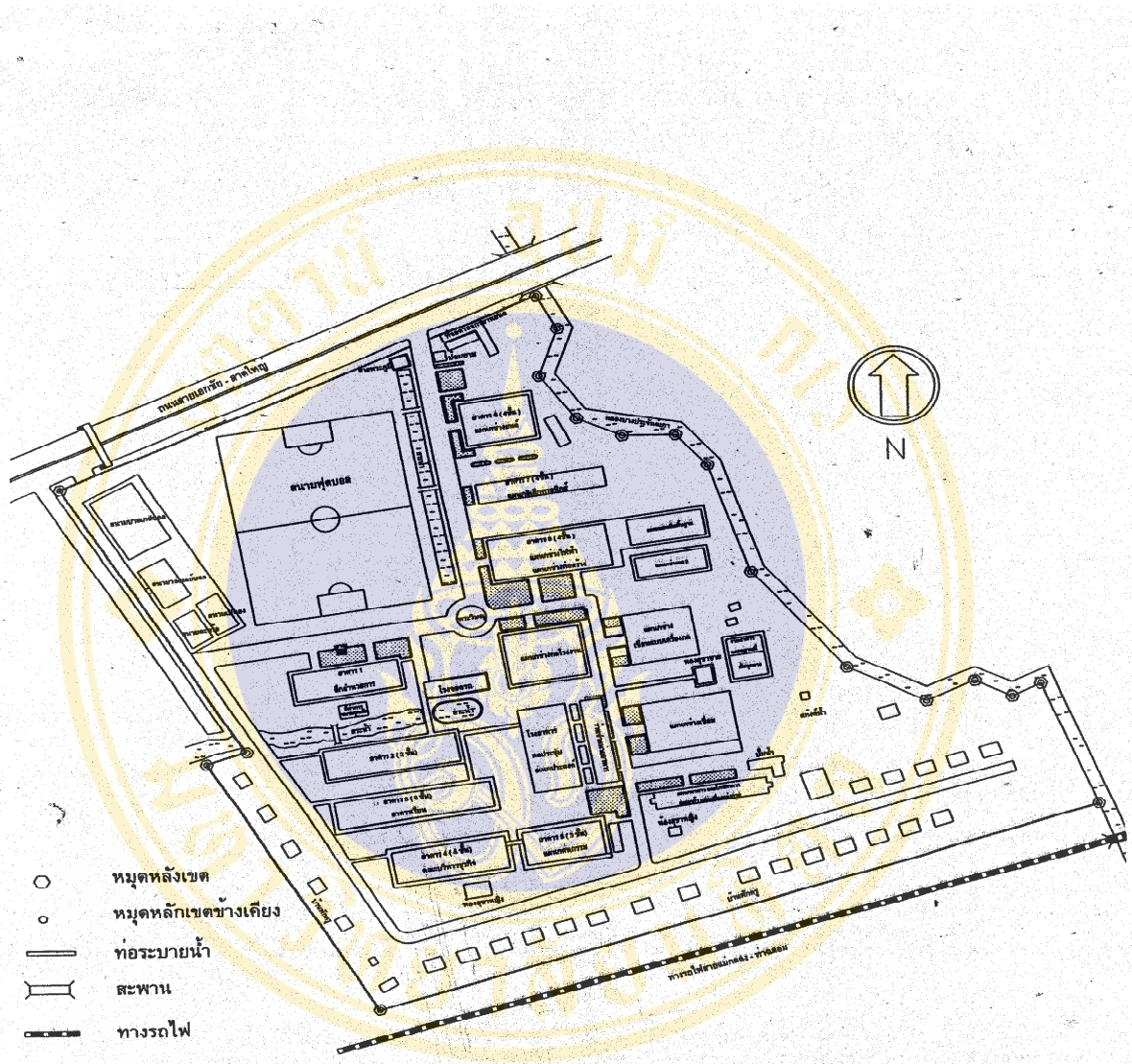
APPENDIX A

Location of Samutsongkhram Technical College



APPENDIX B

Diagram of Samutsongkhram Technical College



แผนภูมิ 2 ผังบริเวณวิทยาลัยเทคนิคสมุทรสงคราม

ต.ลาดใหญ่ อ.เมือง ฯ

จ.สมุทรสงคราม

เนื้อที่ 42 ไร่ 1 งาน มาตราส่วน 1 : 1800

APPENDIX C

Youth Participatory Learning Plan Regarding Waste Separation and Recycling in College

มูลฝอยและการจัดการมูลฝอย

ความคิดรวบยอดหลัก

มูลฝอยเป็นปัญหาสำคัญที่เกิดขึ้นจากพฤติกรรมในชีวิตประจำวันของมนุษย์ และกระบวนการผลิตทางเกษตรกรรมและอุตสาหกรรม ซึ่งมีความสัมพันธ์กับจำนวนประชากร สภาวะทางเศรษฐกิจ พฤติกรรมในการสร้างมูลฝอยของประชาชน ประสิทธิภาพของการจัดการ ก่อให้เกิดผลกระทบต่อคุณภาพชีวิตและสิ่งแวดล้อมที่ต้องอาศัยความร่วมมือกันในการป้องกันแก้ไขจาก ทุกฝ่ายทั้งภาครัฐและเอกชน การปรับเปลี่ยนเจตคติและพฤติกรรมเกี่ยวกับมูลฝอยของประชาชน การจัดการมูลฝอยโดยใช้เทคโนโลยีที่เหมาะสมและการรณรงค์ให้ประชาชนมีส่วนร่วมในการลดปริมาณมูลฝอยรูปแบบต่าง ๆ

ความคิดรวบยอดรอง

1.มูลฝอยเป็นสิ่งของเหลือทิ้งจากการอุปโภคและบริโภคหรือไม่เป็นที่ต้องการแล้วของมนุษย์

2. มูลฝอยแยกได้เป็นหลายประเภทตามแหล่งที่มา ลักษณะส่วนประกอบมูลฝอย และวิธีการจัดการ

3. ปัญหามูลฝอยเป็นผลสืบเนื่องจากประชากรมีจำนวนเพิ่มขึ้น สามารถจับจ่ายใช้สอยได้มาก และขาดความระมัดระวังในการก่อให้เกิดมูลฝอย กับการจัดการมูลฝอยที่ขาดประสิทธิภาพ

4. ปัญหามูลฝอยมีผลกระทบต่อทั้งคุณภาพชีวิตของคนและสิ่งแวดล้อม

5. การจัดการมูลฝอยเป็นกระบวนการต่อเนื่องตั้งแต่ การจัดเก็บ การขนส่ง การร่วมมือกับประชาชนเพื่อลดปริมาณมูลฝอย และการกำจัด

6. การใช้มาตราการและวิธีการที่เหมาะสม บุคลากร อุปกรณ์ และงบประมาณที่เพียงพอและความร่วมมือจากประชาชน เป็นปัจจัยสำคัญที่ช่วยให้สามารถจัดการมูลฝอยให้มีประสิทธิภาพได้

7. การป้องกันและแก้ไขปัญหามูลฝอยให้ประสบความสำเร็จจำเป็นต้องร่วมมือกันทั้งภาครัฐและประชาชน

8. การคัดแยกมูลฝอยให้สะดวกต่อการจัดเก็บและการกำจัดกับการนำมูลฝอยมาใช้ประโยชน์ใหม่ เป็นแนวทางที่ประชาชนสามารถมีส่วนร่วมในการป้องกันและแก้ไขปัญหามูลฝอยได้อย่างมีประสิทธิภาพ

วัตถุประสงค์ทั่วไป

เพื่อให้นักศึกษากลุ่มตัวอย่าง

1. รู้และเข้าใจ ความหมาย ประเภท และที่มาของมูลฝอย

2. ตระหนักในสภาพปัญหามูลฝอย และผลกระทบต่อคุณภาพชีวิตและสิ่งแวดล้อม

3. รู้และเข้าใจการจัดการมูลฝอยที่เหมาะสม ถูกต้อง และมีประสิทธิภาพ

4.รู้และเข้าใจแนวทางในการป้องกัน แก้ไขปัญหามูลฝอย และบทบาทการมีส่วนร่วมของประชาชน

5. มีทักษะและประสบการณ์ในการจัดการมูลฝอยอย่างถูกวิธีตามบทบาทของตน

วัตถุประสงค์เชิงพฤติกรรม

หลังจากการเรียนรู้ นักศึกษากลุ่มตัวอย่าง มีความสามารถดังนี้

1. วิเคราะห์ความหมายของมูลฝอยได้

2. แยกประเภทของมูลฝอยตามแนวทางหรือเกณฑ์ต่างๆได้

3. วิเคราะห์ความสัมพันธ์ของชนิดของมูลฝอยกับแหล่งที่มาได้

4. วิเคราะห์สภาพและปัญหามูลฝอย สาเหตุ และผลกระทบได้

5. วิเคราะห์การจัดการมูลฝอย อุปสรรค ปัญหา และแนวทางการแก้ไขปัญหาของรัฐและองค์กรการปกครองท้องถิ่นส่วนต่างๆได้

6. อภิปรายเปรียบเทียบข้อดีข้อเสียของวิธีการกำจัดหรือทำลายมูลฝอยแบบต่าง ๆ ได้

7. วิเคราะห์แนวทางป้องกันและแก้ไขปัญหามูลฝอยร่วมกัน ระหว่างองค์กรของรัฐและท้องถิ่นกับประชาชนได้

8. อภิปรายแนวทางที่ประชาชนสามารถมีส่วนร่วมในการป้องกันและแก้ไขปัญหามูลฝอยได้อย่างมีประสิทธิภาพ

9. จัดทำแผนการจัดการมูลฝอยของวิทยาลัย และปฏิบัติตามแผนเพื่อการมีส่วนร่วมในการป้องกันและแก้ไขปัญหามูลฝอยในวิทยาลัยได้

กรอบเนื้อหา

1. ความหมายของมูลฝอย ประเภท และที่มาของมูลฝอย
2. สภาพปัญหามูลฝอยในประเทศไทยและผลกระทบ

3. การจัดการมูลฝอยในประเทศไทย
4. การป้องกันและแก้ไขปัญหามูลฝอย
5. การมีส่วนร่วมของประชาชนในการป้องกันและแก้ไขปัญหามูลฝอย

กิจกรรมการเรียนรู้

ผู้วิจัยจัดกิจกรรมการเรียนรู้ตามกรอบเนื้อหาของแผนการเรียนรู้แบบมีส่วนร่วมที่จัดทำขึ้น โดยใช้ CIPPA MODEL และขั้นตอนกระบวนการเรียนรู้แบบมีส่วนร่วม 7 ขั้นตอน (ทิศนา แขมมณี, 2543) ภายในระยะเวลา 1 ภาคเรียน (20 สัปดาห์) ดังนี้

สัปดาห์ที่	กิจกรรมการเรียนรู้
1	<u>ขั้นการแสวงหาความรู้เดิม</u> 1) ผู้วิจัยประเมินผลก่อนการเรียนรู้ (Pretest) โดยให้นักศึกษากลุ่มตัวอย่างทำแบบทดสอบความรู้ แบบวัดเจตคติ และแบบวัดพฤติกรรมการมีส่วนร่วมเกี่ยวกับการคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่ ในสถานศึกษาก่อนการเรียนรู้ 2) ผู้วิจัยจัดแบ่งนักศึกษาออกเป็นกลุ่มย่อย 5 กลุ่มๆละ5-6 คน ตามความสมัครใจของนักศึกษา แต่ละกลุ่มเลือกประธาน รองประธาน และเลขานุการ และเลือกหัวข้อเรื่องในกรอบเนื้อหาของแผนการเรียนรู้ที่กลุ่มต้องรับผิดชอบจัดทำ Website ของกลุ่ม
2 –3	<u>ขั้นการแสวงหาความรู้ใหม่, ขั้นการศึกษาทำความเข้าใจข้อมูล / ความรู้ใหม่และเชื่อมโยงความรู้ใหม่กับความรู้เดิม ขั้นการแลกเปลี่ยนความรู้ความเข้าใจกับกลุ่ม ขั้นการสรุปและการจัดระเบียบความรู้ และขั้นการแสดงผลงาน</u> ผู้วิจัยจัดให้มีกิจกรรมต่าง ๆ ดังนี้ 3) การจัดทำ Website ชื่อ “ Waste Minimization ” ของนักศึกษากลุ่มตัวอย่าง นักศึกษาแต่ละกลุ่มศึกษาเนื้อหาที่กลุ่มรับผิดชอบจากแผนการเรียนรู้ที่ผู้วิจัยจัดทำขึ้น และนำเอกสาร สื่อต่างๆ ที่เกี่ยวข้องไปศึกษา ค้นคว้า ประกอบการจัดทำ Website ภายในกลุ่มด้วยการใช้กระบวนการกลุ่ม โดยการสร้างความรู้ด้วยตนเอง(Construct :C) มีปฏิสัมพันธ์ช่วยกันเรียนรู้(Interaction :I) มีบทบาทและมีส่วนร่วมในการสร้างความรู้ด้วยตนเอง(Participation :P)ช่วยให้ได้เรียนรู้

สัปดาห์ที่	กิจกรรมการเรียนรู้
	กระบวนการ (Process :P) ควบคู่ไปกับการมีผลงาน (Product :P)หลังจากนั้นแต่ละกลุ่มก็นำความรู้ที่ได้ไปใช้ (Application :A) โดยนำเสนอผ่าน Website ชื่อ " Waste Minimization " ซึ่งเป็นไปตาม CIPPA MODEL ของทิศนา แขมมณี นั่นเอง พร้อมทั้งให้อาจารย์ในแผนกวิชาคอมพิวเตอร์ธุรกิจ อาจารย์ผู้สนใจ และผู้วิจัยประเมินผลงาน ให้ข้อเสนอแนะเพื่อปรับปรุงงาน จนได้เป็น Website ที่สมบูรณ์ พร้อมใช้งานสำหรับเผยแพร่ให้ผู้ที่สนใจได้ศึกษาต่อไป
4	4) นักศึกษากลุ่มตัวอย่างจัดเตรียมนิทรรศการแสดงในการเสวนาและอบรมในด้านต่างๆ ได้แก่ การจัดทำเอกสารประกอบการอบรม การจัดทำบอร์ดข่าวเกี่ยวกับมูลฝอยและปัญหาการจัดการมูลฝอยในจังหวัดสมุทรสงคราม การคัดแยกมูลฝอย และราคาสินค้ารีไซเคิล การทำปุ๋ยน้ำหมักชีวภาพ การจัดแสดงตัวอย่างมูลฝอยรีไซเคิลประเภทต่างๆ ตัวอย่างมูลฝอยมีพิษ และตัวอย่างการประดิษฐ์สิ่งของจากวัสดุใช้แล้ว ให้พร้อมก่อนการเสวนา และการอบรม รวมทั้งจัดทำบอร์ดประชาสัมพันธ์งาน การ์ดเชิญครู-อาจารย์เข้าร่วมการเสวนาและการอบรม และการ์ดมอบถังคัดแยกมูลฝอย
5	5) จัดเสวนาประสบการณ์ด้านการจัดการมูลฝอยแบบมีส่วนร่วมในชุมชนโดยวิทยากรจากเทศบาลเมืองสมุทรสงคราม และเจ้าหน้าที่มูลนิธิอาสาสมัครเพื่อสังคม ให้แก่นักศึกษากลุ่มตัวอย่าง ตัวแทนแกนนำของแต่ละชมรม นักการภารโรง ตัวแทนร้านค้า และพนักงานทำความสะอาดของวิทยาลัย
6	6) จัดอบรม สาธิต และฝึกปฏิบัติในด้านการลดปริมาณมูลฝอย โดยวิทยากรจากกรมส่งเสริมคุณภาพสิ่งแวดล้อม และกรมควบคุมมลพิษให้แก่นักศึกษากลุ่มตัวอย่าง ตัวแทนแกนนำของแต่ละชมรม นักการภารโรง ตัวแทนร้านค้า และพนักงานทำความสะอาดของวิทยาลัย
7	<u>ขั้นการประยุกต์ใช้ความรู้</u> 7) การจัดประชุมตัวแทนชมรมเพื่อปฏิบัติการคัดแยกมูลฝอย จัดจำหน่ายมูลฝอยรีไซเคิล และทำปุ๋ยน้ำหมักชีวภาพ พร้อมทั้งทำความเข้าใจ แลกเปลี่ยนความคิดเห็น หาข้อตกลงเพื่อที่จะให้เห็นภาระงานที่จะต้องทำต่อในระยะเวลาอีก 10 – 12 สัปดาห์อย่างต่อเนื่อง โดยนักศึกษากลุ่มตัวอย่างจะต้องเป็นผู้ประสานงานกับตัวแทนชมรมที่แต่ละกลุ่มรับผิดชอบ ให้สามารถดำเนินงานที่วางไว้ให้เกิดการมีส่วนร่วมในการลดปริมาณมูลฝอย ภายในวิทยาลัยให้เกิดขึ้นจริงให้ได้

สัปดาห์ที่	กิจกรรมการเรียนรู้
8-17	8) นักศึกษากลุ่มตัวอย่างติดตามประสานงานกับตัวแทนชมรมที่แต่ละกลุ่มรับผิดชอบ และร่วมกันปฏิบัติการคัดแยกมูลฝอยในพื้นที่รับผิดชอบของแต่ละชมรม จัดจำหน่ายมูลฝอยรีไซเคิล ในทุกวันพุธคาบกิจกรรม (14.10-16.10 น.) ของแต่ละสัปดาห์ และจัดทำเป็นปุ๋ยน้ำหมักชีวภาพ รวม 10 – 12 สัปดาห์ 9) ผู้วิจัยจัดให้มีการประกวดคำขวัญเกี่ยวกับการลดปริมาณมูลฝอย ณ แหล่งกำเนิด โดยการคัดแยกและการนำกลับมาใช้ประโยชน์ใหม่ การจัดประกวดการประดิษฐ์สิ่งของจากวัสดุเหลือใช้ และการประกวดระบบการจัดการมูลฝอยของแต่ละชมรม ซึ่งเป็นส่วนหนึ่งของการรณรงค์ภายในชมรมเพื่อให้เกิดการคัดแยกมูลฝอยก่อนทิ้ง และหารูปแบบระบบการจัดการมูลฝอยในพื้นที่รับผิดชอบของแต่ละชมรม 10) ผู้วิจัยรายงานผลการดำเนินงานครั้งที่ 1 เสนอต่อวิทยาลัยหลังจากการปฏิบัติงานผ่านไป 4 สัปดาห์ เพื่อทราบ ให้เห็นถึงปัญหา ข้อเสนอแนะ และสร้างการมีส่วนร่วมกับครู- อาจารย์ ในวิทยาลัย 11) นักศึกษากลุ่มตัวอย่าง ประชาสัมพันธ์ความเคลื่อนไหวโครงการหน้าเสาธงในการเข้าแถวตอนเช้า เรียนเชิญท่านผู้อำนวยการแจกรางวัลและเกียรติบัตรแก่ผู้ชนะเลิศ รองชนะเลิศ การประกวดประเภทต่างๆ ผู้เข้าร่วมการเสวนา อบรม และผู้ปฏิบัติงานด้านการลดปริมาณมูลฝอยในโครงการ เพื่อเป็นการรณรงค์เพื่อนๆ นักเรียน นักศึกษา
18	12) ผู้วิจัยจัดให้มีการสรุปงานของนักศึกษากลุ่มตัวอย่าง เพื่อหารูปแบบระบบการจัดการมูลฝอยที่เหมาะสมของวิทยาลัย สำหรับการนำไปเป็นแนวทางปฏิบัติในการลดปริมาณมูลฝอยของวิทยาลัย
19	13) ผู้วิจัยประเมินผลหลังการเรียนรู้ (Posttest) โดยให้ - นักศึกษากลุ่มตัวอย่างทำแบบทดสอบความรู้ แบบวัดเจตคติ และแบบวัดพฤติกรรมการมีส่วนร่วม ชุดเดียวกับที่ใช้ทดสอบก่อนการเรียนรู้ - นักศึกษากลุ่มตัวอย่างทำแบบประเมินผลกระบวนการเรียนรู้ และแบบประเมินการเรียนรู้ด้วยตนเองตามแบบทดสอบที่กำหนดไว้
20	14) ผู้วิจัยจัดทำสรุปผลการเรียนรู้ และรายงานผลเสนอต่อผู้อำนวยการวิทยาลัยเทคนิคสมุทรสงคราม

สื่อการเรียนรู้

1. สิ่งพิมพ์จากหนังสือพิมพ์ที่เกี่ยวกับปัญหาและสถานการณ์มูลฝอย
2. แผ่นพับของกรมส่งเสริมคุณภาพสิ่งแวดล้อมที่เกี่ยวกับมูลฝอยและการจัดการมูลฝอย
3. หนังสือจากกรมส่งเสริมคุณภาพสิ่งแวดล้อม กรมควบคุมมลพิษ สำนักรักษาความสะอาด และหน่วยงานอื่น ๆ ที่เกี่ยวข้องกับมูลฝอยและการจัดการมูลฝอย ดังนี้
   - ความรู้เรื่องสิ่งแวดล้อมสำหรับครู (ระดับมัธยมศึกษา) เรื่อง ขยะมูลฝอย
   - หนังสืออ่านเพิ่มเติมด้านสิ่งแวดล้อมระดับมัธยมศึกษา เรื่อง ขยะมูลฝอย
   - คู่มือการสอนสำหรับครู เรื่องขยะมูลฝอย
   - เกณฑ์มาตรฐาน และแนวทางการจัดการมูลฝอย ชุมชน
   - ช่วยกันลดขยะ เพื่อลดมลพิษกันเถอะ
   - การจัดการขยะและน้ำเสีย หนึ่งในโครงการ “รวมใจรักษ์...พิทักษ์สิ่งแวดล้อม”
   - คู่มือการลดปริมาณมูลฝอย ในสถาบันการศึกษา สถานพยาบาล ชุมชน ห้างสรรพสินค้า
4. วิดีทัศน์ที่เกี่ยวข้องกับเรื่องมูลฝอย
   - วีดิทัศน์ รณรงค์แยกขยะก่อนทิ้ง เพื่อสิ่งแวดล้อมในอนาคต ชุด “แยกขยะมูลฝอยกับคุณถังขยะ”
   - วีดิทัศน์ ส่งเสริมความรู้เกี่ยวกับขยะพิษ และขยะอุตสาหกรรม ชุด “ขยะอันตราย (HAZARDOUS WASTE)”
   - วีดิทัศน์ รณรงค์การนำวัตถุเหลือกลับมาใช้ประโยชน์ใหม่ ชุด “การแปรรูป ใช้ใหม่ และการใช้ซ้ำ (RECYCLE & REUSE)”

การวัดและประเมินผล

1. การวัดความรู้ เจตคติ และพฤติกรรมการมีส่วนร่วม ก่อนและหลังการเรียนรู้
2. การประเมินความพึงพอใจต่อกระบวนการเรียนรู้
3. การประเมินความคิดเห็นด้วยตนเองต่อการเรียนรู้

APPENDIX D

1. List of Experts
2. List of Learning Moderators
3. List of Sample Students

รายนามผู้ทรงคุณวุฒิ

1. นางสาวศรินพร ลีมหารุ่งเรือง
   ตำแหน่ง ผู้อำนวยการกองวิชาการและแผนงาน
   สถานที่ทำงาน กองวิชาการและแผนงาน สำนักรักษาความสะอาด
   กรุงเทพมหานคร

2. นายสมศักดิ์ ดลประสิทธิ์
   ตำแหน่ง เจ้าหน้าที่วิเคราะห์นโยบายและแผน
   สถานที่ทำงาน สำนักงานรัฐมนตรี กระทรวงศึกษาธิการ

รายนามวิทยากร

1. นายวิโรจน์ องค์ปรีชา รองนายกเทศมนตรี เทศบาลเมืองสมุทรสงคราม
2. นางดวงใจ อุสายพันธ์ รองปลัดเทศบาล เทศบาลเมืองสมุทรสงคราม
3. นายอภิชาติ ลือสกล เจ้าหน้าที่มูลนิธิอาสาสมัครเพื่อสังคม
4. นายพีรพัฒน์ พรชนะรัตน์ นักวิชาการสิ่งแวดล้อม 5 กรมควบคุมมลพิษ
5. นายวิจารณ์ อินทรกำแหง นักวิชาการสิ่งแวดล้อม 4 กรมควบคุมมลพิษ
6. นางสาวระเบียบ ภูผา นักวิชาการเผยแพร่ 6 ว กรมส่งเสริมคุณภาพสิ่งแวดล้อม
7. นางสาวอุษณีย์ บุญกล่ำ นักวิชาการเผยแพร่ กรมส่งเสริมคุณภาพสิ่งแวดล้อม
8. นายสุรชัย โคตมี นักวิชาการเผยแพร่ กรมส่งเสริมคุณภาพสิ่งแวดล้อม
9. นายอนิวรรต แปะตะขบ นักวิชาการสิ่งแวดล้อม กรมส่งเสริมคุณภาพสิ่งแวดล้อม

รายนามผู้เข้าร่วมการเรียนรู้

การเรียนรู้แบบมีส่วนร่วมของเยาวชนในการคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่ ในสถานศึกษา : กรณีศึกษาวิทยาลัยเทคนิคสมุทรสงคราม

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1. นางสาวกรรณิกา ทองจับ
2. นางสาวจงดี แซ่โซว
3. นางสาวฉันทิดา ไทรชมภู
4. นางสาวณัฐฐา คำวัฒนะกุล
5. นางสาวดวงดาว วงศ์เขียว
6. นางสาวทัศณีย์ ทองวารี
7. นางสาวนันทนา ปัญญาเรือง
8. นางสาวเบญจพร มรรคผล
9. นางสาวพรพิมล นวมศิริ
10. นางสาวภัทรวดี เมืองนาม
11. นางสาวภัทรานิษฐ์ คีรีวงศ์
12. นางสาวมยุรา บุตรเพชร์
13. นางสาวมยุรี พึ่งสุข
14. นางสาวรัตติกาล นาคอ่อน
15. นางสาววนัสรา เงินวิไลวัฒนา
16. นางสาววาสนา มานะ
17. นางสาวศิริลักษณ์ จำรัสศรี
18. นางสาวสมาพร กุมภาพันธ์
19. นางสาวสุกัญญา กลานสกุล
20. นางสาวสุกัญญา วงศ์นิติกร
21. นางสาวสุวัจนา มุสิกะนันทน์
22. นางสาวอรุณรัตน์ มานะ
23. นางสาวอาภรณ์ พิพัฒศรี
24. นายกฤษ จันทร์ขำ
25. นายณัฐพล ปะมี
26. นายนพดล เสถียรพงษ์
27. นางสาวปฏิการ ตรีสุวรรณ

APPENDIX E

Research Questionnaires

แบบสอบถาม

ข้อมูลทั่วไปของนักศึกษากลุ่มตัวอย่าง

<u>คำชี้แจง</u> โปรดเติมคำหรือข้อความลงในช่องว่างที่กำหนดไว้ หรือทำเครื่องหมาย✓ ลงใน ○ หน้าข้อความที่ตรงกับความเป็นจริงเกี่ยวกับตัวท่าน

1. เพศ ○ ชาย ○ หญิง
   <u>อายุ</u> …….. ปี
2. ระดับคะแนนเฉลี่ยสะสม (GPA) ของท่านขณะศึกษาในปัจจุบัน
   ○ ต่ำกว่า 2.00 ○ 2.01-2.50 ○ 2.51-3.00
   ○ 3.01-3.50 ○ 3.50 ขึ้นไป
3. ผู้ปกครองปัจจุบันของนักศึกษา
   ○ บิดา ○ มารดา ○ ญาติ โปรดระบุ……..
4. อาชีพของผู้ปกครอง
   ○ รับราชการ หรือรัฐวิสาหกิจ ○ ค้าขายหรือธุรกิจ
   ○ เกษตรกรรม ○ รับจ้าง
   ○ เลี้ยงสัตว์ ○ อื่นๆ โปรดระบุ……..
5. นักศึกษารับรู้ข่าวสารเกี่ยวกับมูลฝอยและการจัดการมูลฝอยจากแหล่งใด (ตอบได้มากกว่า 1ข้อ)
   ○ โทรทัศน์ ○ วิทยุ ○ หนังสือพิมพ์
   ○ หอกระจายข่าว ○ พูดคุยกับกลุ่มหรือชมรมต่างๆ
   ○ หนังสือเรียน ○ อื่นๆ โปรดระบุ…….
6. นักศึกษาเคยเป็นสมาชิกกลุ่มหรือชมรมใดที่เกี่ยวข้องกับสิ่งแวดล้อมมาก่อนหรือไม่
   ○ เคย (โปรดระบุชื่อกลุ่มหรือชมรม)……
   ○ ไม่เคย
7. นักศึกษาเคยร่วมกิจกรรมหรือเคยมีประสบการณ์ที่เกี่ยวข้องกับการแก้ไขปัญหามูลฝอยหรือไม่ เช่น รณรงค์การคัดแยกมูลฝอย การทำปุ๋ยหมักชีวภาพ ฯลฯ
   ○ เคย (โปรดระบุ)……..
   ○ ไม่เคย

แบบทดสอบความรู้ของเยาวชนเกี่ยวกับการคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่ในสถานศึกษา

<u>คำชี้แจง</u> แบบทดสอบความรู้ของเยาวชนเกี่ยวกับการคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่ ในสถานศึกษา ก่อน- หลังการเรียนรู้ จำนวน 20 ข้อ คำถามทั้งหมดเป็นแบบเลือกตอบ 4 ตัวเลือก ให้นักศึกษาเลือกคำตอบที่ถูกต้องที่สุดเพียงคำตอบเดียว โดยใส่เครื่องหมาย X ลงบนกระดาษคำตอบในข้อที่เลือก

1. วัตถุ สิ่งของ จะกลายเป็นมูลฝอยเมื่อใด
   - ก. ถูกทิ้งไป เพราะไม่ใช้แล้ว
   - ข. เก่าและชำรุดแล้ว
   - ค. ไม่ใช้ หรือไม่เป็นที่ต้องการแล้ว
   - ง. ล้าสมัยและไม่เป็นที่นิยม

   ข้อ ก
2. วัตถุในข้อใดใช้เวลาในการย่อยสลายตัวตามธรรมชาตินานที่สุด
   - ก. รองเท้าหนัง
   - ข. กระป๋องเหล็ก
   - ค. พลาสติก
   - ง. ผ้าอ้อมใช้แล้วทิ้ง

   ข้อ ค
3. มูลฝอยในข้อใดเป็นมูลฝอยอันตราย
   - ก. ขวดน้ำอัดลมที่ไม่เปิดฝา
   - ข. ยาหมดอายุใช้งานไม่ได้แล้ว
   - ค. ขวดพลาสติกใส่นม
   - ง. กระป๋องอะลูมิเนียม

   ข้อ ข
4. ปัญหาแรกที่เห็นได้เร็วและเด่นชัดของปัญหามูลฝอยคือข้อใด
   - ก. การลักลอบนำมูลฝอยอันตรายมาทิ้งไว้ในที่ชุมชน
   - ข. มูลฝอยมีปริมาณมากและเพิ่มขึ้นเรื่อยๆ
   - ค. การกำจัดมูลฝอยไม่ถูกต้องตามหลักสุขาภิบาล
   - ง. การเก็บขนมูลฝอยไม่ตรงเวลาและไม่สม่ำเสมอ

   ข้อ ข

5. วิธีการกำจัดมูลฝอยทุกวิธีมีทั้งข้อดีและข้อเสีย จะเลือกได้อย่างไร

ก. พิจารณาความเหมาะสมกับพื้นที่ งบประมาณ ความสะดวกในการใช้และผลกระทบ

ข. พิจารณาความยากง่ายหรือซับซ้อนของเทคโนโลยี

ค. พิจารณาราคาในการลงทุนที่ต่ำกว่า

ง. พิจารณาประสิทธิภาพเป็นเรื่องสำคัญ ข้อ ก

6. คำกล่าวในข้อใด<u>ไม่ถูกต้อง</u>

ก. การนำกลับมาแปรรูปใช้ใหม่หรือการรีไซเคิลคือการนำสิ่งของเหลือใช้กลับมาใช้ใหม่โดยผ่านกระบวนการผลิต

ข. การคัดแยกมูลฝอยเพื่อการนำกลับมาแปรรูปใช้ใหม่ช่วยลดค่าใช้จ่ายในการกำจัดมูลฝอย

ค. การคัดแยกมูลฝอยเพื่อการนำกลับมาแปรรูปใช้ใหม่ทำให้มีการใช้ทรัพยากรเท่าเดิม

ง. การนำมูลฝอยบางประเภทมาใช้เป็นวัตถุดิบเพื่อผลิตใหม่หรือที่เรียกว่าการรีไซเคิลเป็นการลดปริมาณมูลฝอยวิธีหนึ่ง ข้อ ค

7. ข้อใดคือวิธีการแก้ปัญหาการเพิ่มปริมาณมูลฝอยที่ต้นเหตุ

ก. การลดการเกิดมูลฝอย

ข. การเผามูลฝอยในเตาเผา

ค. การนำมูลฝอยไปหมักทำปุ๋ย

ง. การขุดหลุมฝังภายในบ้าน ข้อ ก

8. การแก้ปัญหามูลฝอยควรเป็นหน้าที่ความรับผิดชอบของผู้ใด

ก. เทศบาลและองค์การบริหารส่วนตำบล

ข. ประชาชนทุกคน

ค. เจ้าหน้าที่ของรัฐ

ง. ถูกทุกข้อ ข้อ ง

9. วิธีการกำจัดมูลฝอยวิธีใดเหมาะสมกับประเภทมูลฝอยที่นำมากำจัดมากที่สุด

ก. การนำไปหมักทำปุ๋ยเหมาะสมสำหรับมูลฝอยที่เป็นสารอนินทรีย์

ข. การเทกองกลางแจ้งเหมาะสำหรับมูลฝอยที่เป็นสารอินทรีย์

ค. การฝังกลบอย่างถูกหลักสุขาภิบาลเหมาะสำหรับมูลฝอยที่มีพิษ

ง. การเผาในเตาเผาเหมาะสำหรับมูลฝอยที่มีเชื้อโรคปนเปื้อน ข้อ ง

10. มูลฝอยในข้อใดใช้วิธีการจัดการได้ไม่เหมาะสม

ก. กระดาษ แก้ว พลาสติก และโลหะ กำจัดโดยคัดแยกเพื่อขายให้ผู้รับซื้อมูลฝอยเพื่อนำส่งต่อให้โรงงานอุตสาหกรรมแปรรูปกลับมาใช้ใหม่

ข. เศษอาหารกำจัดโดยการหมักทำปุ๋ยหรือนำไปเลี้ยงสัตว์

ค. ถ่านไฟฉาย แบตเตอรี่ กระป๋องสารเคมี กำจัดโดยคัดแยกส่งให้เทศบาลรับไปจัดการโดยวิธีพิเศษ

ง. ทิ้งมูลฝอยทุกชนิดรวมกันได้อยู่แล้วเพราะถึงอย่างไรเทศบาลก็ใช้วิธีจัดเก็บรวมในรถคันเดียวกัน ข้อ ง

11. ข้อใดมิใช่ผลกระทบที่เกิดจากมูลฝอย

ก. เป็นแหล่งเพาะพันธุ์เชื้อโรค

ข. สภาพแวดล้อมขาดความอุดมสมบูรณ์

ค. เกิดปัญหามลพิษทางน้ำ อากาศ และดิน

ง. ทำลายทัศนียภาพ ขาดความเป็นระเบียบเรียบร้อย ข้อ ข

12. ข้อใดเป็นการจัดการมูลฝอยที่ก่อให้เกิดผลกระทบต่อสิ่งแวดล้อมน้อยที่สุด

ก. วิทยานำเศษผักและเปลือกผลไม้ไปทำน้ำปุ๋ยหมักชีวภาพ

ข. อรชานำมูลฝอยประเภทโฟมและพลาสติกไปเผา

ค. นวลอนงค์นำขวดยาฉีดไปประดิษฐ์เป็นของชำร่วย

ง. สุวัฒน์นำเศษยางที่เหลือจากการผลิตไปฝัง ข้อ ก

13. ข้อใดจัดเป็นมูลฝอยรีไซเคิล

ก. เศษอาหาร เศษผัก เปลือกผลไม้ และมูลสัตว์

ข. เศษวัสดุก่อสร้าง ซองบะหมี่ และถุงพลาสติกใส่ขนม

ค. กระดาษ พลาสติก แก้ว และโลหะ

ง. สารเคมีทิ้งแล้ว ยาเสื่อมสภาพ แบตเตอรี่ และหลอดไฟ ข้อ ค

14. ข้อใดเป็นวิธีการกำจัดมูลฝอยแบบดั้งเดิมที่เคยใช้กันมาในอดีต

ก. เทกองทิ้งไว้ปล่อยให้มูลฝอยย่อยสลายเอง และการเผากลางแจ้ง

ข. ใช้วิธีการฝังกลบอย่างถูกหลักสุขาภิบาล

ค. ใช้วิธีการเผาในเตาเผามูลฝอย

ง. ใช้วิธีการหมักทำปุ๋ย ข้อ ก

15. ข้อใดเป็นปัญหาภาวะมลพิษที่เกิดจากมูลฝอย

ก. การกองหรือทิ้งมูลฝอยในหลุม ทำให้มีสารเคมีหรือน้ำชะมูลฝอยปนเปื้อนลงในดิน

ข. การเผามูลฝอยกลางแจ้งหรือในเตาเผาที่ไม่ได้มาตรฐานก่อให้เกิดมลพิษในอากาศ

ค. การทิ้งมูลฝอยลงในแหล่งน้ำทำให้แหล่งน้ำสกปรก

ง. ถูกทุกข้อ ข้อ ง

16. การกระทำในข้อใดคือการรีไซเคิล

ก. การหลีกเลี่ยงการก่อให้เกิดมูลฝอย

ข. การซ่อมแซมของที่ชำรุดแล้วนำกลับมาใช้ใหม่

ค. การนำสิ่งของที่ใช้แล้วกลับมาเป็นวัตถุดิบผ่านกระบวนการผลิต ออกมาเป็นผลิตภัณฑ์ชิ้นใหม่

ง. การนำสิ่งของใช้แล้วกลับมาใช้ประโยชน์ใหม่ซ้ำอีก ข้อ ค

17. ข้อใดคือการกระทำที่แสดงว่าประชาชนมีส่วนร่วมในการลดปริมาณมูลฝอย

ก. เลือกใช้สินค้าชนิดเติมใหม่แทนสินค้าชนิดทิ้งบรรจุภัณฑ์

ข. เลือกใช้สินค้าที่ห่อบรรจุภัณฑ์ที่แน่นหนาหลายชั้น เพื่อความแข็งแรง ทำให้ใช้งานได้นาน

ค. เลือกใช้สินค้าที่มีบรรจุภัณฑ์หรือใช้วัสดุที่ย่อยสลายยากทำให้ไม่สิ้นเปลือง

ง. ถูกทุกข้อ ข้อ ก

18. ข้อใดเป็นกิจกรรมที่แสดงถึงการลดการเกิดมูลฝอย (reduce)

ก. เอาหนังสือที่ไม่ใช้แล้วไปบริจาคโครงการห้องสมุดสาธารณะ

ข. เปลี่ยนขาโต๊ะที่หักเสียใหม่

ค. ไม่เอาถุงพลาสติกเพราะมีตะกร้ามา

ง. ให้เสื้อผ้าเก่าที่ยังใช้ได้แก่คนยากจน ข้อ ค

19. ข้อใดไม่ใช่ประโยชน์ของการนำมูลฝอยกลับมาใช้ใหม่

ก. ลดปริมาณมูลฝอย

ข. ลดการใช้ทรัพยากรโลก

ค. ลดการใช้พลังงานและลดมลพิษต่าง ๆ

ง. ลดขั้นตอนการผลิต ข้อ ง

20. ข้อใดแสดงถึงการจัดการมูลฝอยอย่างยั่งยืน

ก. การร่วมมือในการจัดการมูลฝอยทั้งภาครัฐ เอกชน และประชาชน

ข. การจัดหาพื้นที่ที่เหมาะสมเพื่อการฝังกลบอย่างถูกสุขาภิบาล

ค. การจัดสร้างเตาเผามูลฝอยที่ถูกหลักวิชาการ

ง. การคัดแยกมูลฝอยสดไปหมักทำปุ๋ย ข้อ ก

แบบวัดเจตคติของเยาวชนเกี่ยวกับการคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่ในสถานศึกษา

<u>คำชี้แจง</u> โปรดใส่เครื่องหมาย ✓ ลงในช่องที่ตรงกับความคิดเห็นของนักศึกษามากที่สุดเพียงช่องเดียว

เห็นด้วยอย่างยิ่ง หมายถึง ข้อความนั้นตรงกับความคิดเห็นของนักศึกษามากที่สุด
เห็นด้วย หมายถึง ข้อความนั้นตรงกับความคิดเห็นของนักศึกษามาก
ไม่แน่ใจ หมายถึง ข้อความนั้นบางครั้งตรงกับความคิดเห็นของนักศึกษาและบางครั้งไม่ตรงกับความคิดเห็นของนักศึกษา
ไม่เห็นด้วย หมายถึง ข้อความนั้นไม่ตรงกับความคิดเห็นของนักศึกษามาก
ไม่เห็นด้วยอย่างยิ่ง หมายถึง ข้อความนั้นไม่ตรงกับความคิดเห็นของนักศึกษามากที่สุด

ข้อความ	เห็นด้วยอย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยอย่างยิ่ง
1. การจัดการปัญหามูลฝอยในวิทยาลัยเป็นหน้าที่สำคัญที่ทุกคนต้องช่วยกันทำ					
2.การคัดแยกมูลฝอยจะทำให้ลดปริมาณมูลฝอยที่ต้องกำจัดจริงๆ ลงได้					
3. การทิ้งมูลฝอยโดยไม่ต้องคัดแยกเป็นวิธีที่ง่ายและสะดวก					
4. การนำมูลฝอยกลับมาใช้ประโยชน์ใหม่เป็นการใช้ทรัพยากรอย่างคุ้มค่าและรู้คุณค่า					
5. การคัดแยกมูลฝอยแล้วนำไปจำหน่าย สามารถช่วยเพิ่มรายได้					
6.การคัดแยกมูลฝอยทำให้เสียเวลาเพราะถึงอย่างไรก็ต้องนำไปกำจัดในที่เดียวกันอยู่แล้ว					

ข้อความ	เห็นด้วยอย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยอย่างยิ่ง
7.ในวิทยาลัยมีปริมาณมูลฝอยที่เป็นกระดาษจากการเรียนการสอน และพลาสติกจากการบริโภคเป็นจำนวนมาก					
8.นักเรียนนักศึกษาไม่จำเป็นต้องให้ความสนใจในการจัดการปัญหามูลฝอย เพราะเป็นหน้าที่ของนักการภารโรงโดยตรงที่ต้องทำอยู่แล้ว					
9.การทำน้ำปุ๋ยหมักชีวภาพขึ้นใช้ภายในวิทยาลัย เป็นการช่วยลดรายจ่ายและลดมลพิษจากการใช้สารเคมีได้อีกทางหนึ่ง					
10.น้ำปุ๋ยหมักชีวภาพที่ทำจากเศษผักและเปลือกผลไม้มีประโยชน์สามารถนำมาใช้เป็นปุ๋ยธรรมชาติและกำจัดกลิ่นไม่พึงประสงค์ได้					
11. กระดาษ พลาสติก แก้ว และโลหะเป็นมูลฝอยที่ยังมีคุณค่า สามารถขายและนำกลับมาใช้ประโยชน์ใหม่ได้					
12. การทำน้ำปุ๋ยหมักชีวภาพจากมูลฝอยเศษอาหารเป็นสิ่งที่น่ารังเกียจเพราะมีเชื้อราเกิดขึ้น					
13.การมีส่วนร่วมในการจัดการมูลฝอยของวิทยาลัยเป็นเรื่องที่น่าภาคภูมิใจ					
14. การคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่ เป็นการแสดงถึงการมีส่วนร่วมในการรับผิดชอบต่อสิ่งแวดล้อมและสังคม					

ข้อความ	เห็นด้วยอย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยอย่างยิ่ง
15.การเข้าร่วมในกิจกรรมของชมรมอนุรักษ์ทรัพยากรธรรมชาติและสิ่งแวดล้อม สามารถช่วยลดมลพิษจากมูลฝอยลงได้					
16. นักศึกษารู้สึกว่าการที่แม่ค้าใช้ถุงพลาสติกใส่ของให้ลูกค้ามากเกินความจำเป็นเป็นการเพิ่มปริมาณมูลฝอย					

แบบวัดพฤติกรรมการมีส่วนร่วมของเยาวชนเกี่ยวกับการคัดแยกมูลฝอย
และการนำกลับมาใช้ประโยชน์ใหม่ ในสถานศึกษา

คำชี้แจง โปรดใส่เครื่องหมาย ✓ ลงในช่องที่แสดงถึงพฤติกรรมที่นักศึกษาได้เคยทำหรือไม่เคยทำตามความเป็นจริง

ข้อความ	ทำทุกครั้ง	ทำบ่อยครั้ง	ทำบางครั้ง	ไม่เคยทำ
1.นักศึกษาทิ้งมูลฝอยลงในถังรองรับในที่สาธารณะโดยไม่สนใจว่าทิ้งลงถังถูกประเภทหรือไม่				
2. นักศึกษาคัดแยกมูลฝอยก่อนทิ้ง				
3.นักศึกษารวบรวมมูลฝอยรีไซเคิลประเภทกระดาษ พลาสติก แก้ว และโลหะ ที่คัดแยกไว้เพื่อนำไปขายให้กับคนรับซื้อของเก่า				
4.นักศึกษานำมูลฝอยเศษอาหารไปทำปุ๋ยหมัก/ น้ำปุ๋ยหมักชีวภาพ				
5.นักศึกษานำมูลฝอยที่คัดแยกไว้กลับมาใช้ซ้ำ / ประดิษฐ์ของเล่น - ของใช้				
6.นักศึกษาซ่อมแซมของเล่นหรือสิ่งของที่ชำรุดเล็กน้อยเพื่อนำกลับมาใช้ใหม่				
7.นักศึกษาใช้กระดาษเขียนหนังสือหมดทั้งสองหน้า				
8.นักศึกษาเลือกใช้ผลิตภัณฑ์ที่หมดแล้วเติมใหม่				
9.นักศึกษาหลีกเลี่ยงการใช้โฟมและพลาสติกในการจัดกิจกรรม				
10.นักศึกษาคัดแยกภาชนะบรรจุสารฆ่าแมลง กระป๋องสารเคมี ออกจากมูลฝอยอื่นก่อนทิ้ง				

ข้อความ	ทำทุกครั้ง	ทำบ่อยครั้ง	ทำบางครั้ง	ไม่เคยทำ
11.นักศึกษาคัดแยกซากถ่านไฟฉาย แบตเตอรี่ หลอดไฟฟ้า ออกจากมูลฝอยอื่นก่อนทิ้ง				
12.นักศึกษาเคยเข้าร่วมกิจกรรมเกี่ยวกับการคัดแยกมูลฝอยและการนำกลับมาใช้ประโยชน์ใหม่				
13.นักศึกษาชักชวนให้เพื่อนและคนในครอบครัวคัดแยกมูลฝอยก่อนทิ้งและนำมูลฝอยกลับมาใช้ประโยชน์ใหม่				

แบบประเมินผลกระบวนการเรียนรู้ เพื่อประเมินความพึงพอใจต่อกระบวนการเรียนรู้

คำชี้แจง โปรดใส่เครื่องหมาย ✓ ลงในช่องที่ตรงกับความรู้สึกของนักศึกษามากที่สุดเพียงช่องเดียว

หัวข้อ	ระดับความพึงพอใจ		
	มาก	ปานกลาง	ต้องปรับปรุง
1. ผู้วิจัย			
2. เทคนิคหรือวิธีการที่ใช้ในการเรียนรู้			
3. สื่อและวัสดุอุปกรณ์			
4. ระยะเวลาที่ใช้ในการเรียนรู้			
5. สถานที่ที่ใช้ในการเรียนรู้			
6. บรรยากาศในการเรียนรู้โดยรวม			
7. การอำนวยความสะดวกโดยทั่วไป			
8 .ความรู้ที่ได้รับกับการนำไปใช้ประโยชน์ในชีวิตประจำวัน			
9.ในภาพรวมนักศึกษาคิดว่าการเรียนรู้ครั้งนี้เหมาะสมสำหรับนักศึกษาที่เข้าร่วมการเรียนรู้มากน้อยเพียงใด			

แบบประเมินการเรียนรู้ด้วยตนเอง

คำชี้แจง โปรดใส่เครื่องหมาย ✓ ลงในช่องที่ตรงกับความคิดเห็นของนักศึกษามากที่สุดเพียงช่องเดียว

หัวข้อ	มาก	ปานกลาง	น้อย
1. นักศึกษาสามารถสร้างความรู้ด้วยตนเอง ผ่านกระบวนการกลุ่ม ในเรื่องเกี่ยวกับมูลฝอยและการจัดการมูลฝอยโดย - เข้าร่วมกิจกรรมการเรียนรู้อย่างกระตือรือร้น			
- ให้ความร่วมมือและรับผิดชอบในการดำเนินกิจกรรมกับกลุ่ม ทั้งในด้านการแสวงหาข้อมูล การศึกษาข้อมูล และการสรุป			
- รับฟังข้อพิจารณาและยอมรับความคิดเห็นของผู้อื่น			
- ใช้ความคิดอย่างเต็มที่ ปฏิสัมพันธ์โต้ตอบ คิดค้น สนับสนุน แลกเปลี่ยนความคิดเห็นและความรู้สึกของตนกับผู้อื่น			
- ได้แสดงความสามารถของตนและยอมรับความสามารถของผู้อื่น			
- ได้ตัดสินใจ และแก้ปัญหาต่างๆ ในระหว่างการเรียนรู้			
- ได้เรียนรู้จากกลุ่มและช่วยให้กลุ่มเกิดการเรียนรู้			
2. นักศึกษาสามารถสร้างผลงานต่างๆจากขั้นตอนการเรียนรู้ได้			
3. นักศึกษาสามารถนำเสนอผลงานการเรียนรู้ให้เพื่อนๆในวิทยาลัยในรูปของแผนการจัดการมูลฝอยของวิทยาลัยได้			
4. นักศึกษาสามารถนำความรู้ที่ได้จากการเรียนรู้ไปประยุกต์ใช้จริงโดยการลงมือปฏิบัติตามแผนการจัดการมูลฝอยที่วางไว้ได้			
5. นักศึกษามีจิตสำนึกและเกิดความตระหนักในปัญหามูลฝอยและการจัดการมูลฝอยของวิทยาลัย			
6. นักศึกษามีความมุ่งหวังที่จะพัฒนาการจัดการมูลฝอยของวิทยาลัยอย่างต่อเนื่อง			

APPENDIX F

1. Difficulty Power and Discrimination Power of Knowledge Test

2. Discrimination Power of Attitude Test

ค่าความยากง่ายและค่าอำนาจจำแนกของแบบทดสอบความรู้ของเยาวชนเกี่ยวกับการคัดแยกมูลฝอย และการนำกลับมาใช้ประโยชน์ใหม่ ในสถานศึกษา

ข้อที่	P_H	P_L	$P_H + P_L$	$P_H - P_L$	P	R
1	5	3	8	2	0.50	0.25
2	7	7	14	0	0.87*	0.00*
3	7	3	10	4	0.62	0.50
4	6	2	8	4	0.50	0.50
5	6	2	8	4	0.50	0.50
6	1	0	1	1	0.06*	0.12
7	7	7	14	0	0.87*	0.00*
8	8	6	14	2	0.87*	0.25
9	6	7	13	-1	0.81*	-0.13*
10	7	3	10	4	0.62	0.50
11	7	7	14	0	0.87	0.00*
12	7	1	8	6	0.50	0.75
13	2	2	4	0	0.25	0.00*
14	7	2	9	5	0.56	0.62
15	7	4	11	3	0.68	0.37
16	3	1	4	2	0.25	0.25
17	2	3	5	-1	0.31	-0.13*
18	8	3	11	5	0.68	0.62
19	6	3	9	3	0.56	0.37
20	8	5	13	3	0.81	0.37
21	8	2	10	6	0.62	0.75
22	6	4	10	2	0.62	0.25
23	3	3	6	0	0.37	0.00*
24	8	5	13	3	0.81	0.37
25	8	2	10	6	0.62	0.75
26	8	6	14	2	0.87*	0.25
27	5	6	11	-1	0.68	-0.13*
28	7	7	14	0	0.87	0.00*
29	7	3	10	4	0.62	0.50
30	8	4	12	4	0.75	0.50
31	6	6	12	0	0.75	0.00*
32	6	6	12	0	0.75	0.00*
33	4	2	6	2	0.37	0.25
34	6	6	12	0	0.75	0.00*
35	8	3	11	5	0.68	0.62

หมายเหตุ : * หมายถึง ตัดทิ้ง

ค่าอำนาจจำแนกของแบบวัดเจตคติของเยาวชนเกี่ยวกับการคัดแยกมูลฝอย
และการนำกลับมาใช้ประโยชน์ใหม่ ในสถานศึกษา

ข้อที่	t – test
1	2.38
2	0.40*
3	2.40
4	2.63
5	3.06
6	3.13
7	3.38
8	1.98*
9	7.32
10	1.53*
11	2.10
12	1.16*
13	3.44
14	3.13
15	0.28*
16	1.43*
17	3.37
18	1.00*
19	2.58
20	1.73
21	2.42
22	0.52*
23	1.14*
24	2.27
25	5.21

หมายเหตุ : * หมายถึง ตัดทิ้ง

APPENDIX G

Club Activity

กิจกรรมชมรม

กิจกรรมชมรมเป็นกิจกรรมเสริมหลักสูตรที่กำหนดไว้ในระเบียบกระทรวงศึกษาธิการว่าด้วยการจัดกิจกรรมในสถานศึกษา สังกัดกระทรวงศึกษาธิการ พ.ศ.2532 (ฉบับปรับปรุง พ.ศ.2533) ซึ่งกำหนดให้นักศึกษาต้องเข้าร่วมกิจกรรมชมรมอย่างน้อย 1 ชมรม ในแต่ละภาคเรียนทุกภาคเรียนในคาบกิจกรรม และต้องมีเวลาเข้าร่วมปฏิบัติกิจกรรมไม่ต่ำกว่าร้อยละ60ของคาบกิจกรรมที่จัดขึ้นในแต่ละภาคเรียน จึงจะถือว่าผ่านเกณฑ์การประเมินผลการเรียนตามหลักสูตร ปวช. 2545 และปวส. 2540 ในหมวด 3 และหากนักเรียนและนักศึกษาได้เข้าร่วมกิจกรรมไม่ครบถ้วน หรือไม่เข้าร่วมกิจกรรมเลยจะถือว่าไม่ผ่านกิจกรรม(มผ.)ในภาคเรียนนั้น และจะต้องดำเนินการขอซ่อมกิจกรรมจนกว่าจะผ่านเกณฑ์การประเมินผล(ผ.)

กิจกรรมชมรมเป็นกิจกรมที่เปิดโอกาสให้นักเรียนและนักศึกษาได้พัฒนาคุณภาพตนเองด้วยการทำกิจกรรมที่นอกเหนือจากการเรียนในห้องเรียน ได้ใช้ความรู้ความสามารถในการริเริ่มสร้างสรรค์ และใช้เวลาว่างให้เป็นประโยชน์ จึงกำหนดกิจกรรมชมรมให้นักเรียนและนักศึกษาได้เข้าร่วม ดังนี้

1. นักเรียนระดับ ปวช. 1 กำหนดให้เป็นสมาชิกชมรมลูกเสือ เนตรนารีวิสามัญ

2. นักเรียนระดับ ปวช. 2 และปวช.3 ให้เป็นสมาชิกชมรมวิชาชีพ และนักศึกษาระดับ ปวส. 1 และ ปวส. 2 ให้เลือกชมรมโดยเสรี

APPENDIX H

List of Pictures in the Participatory Learning Activities with CIPPA MODEL

นักศึกษาแผนกวิชาช่างเชื่อมโลหะแผ่น
จัดทำถังคัดแยกมูลฝอย

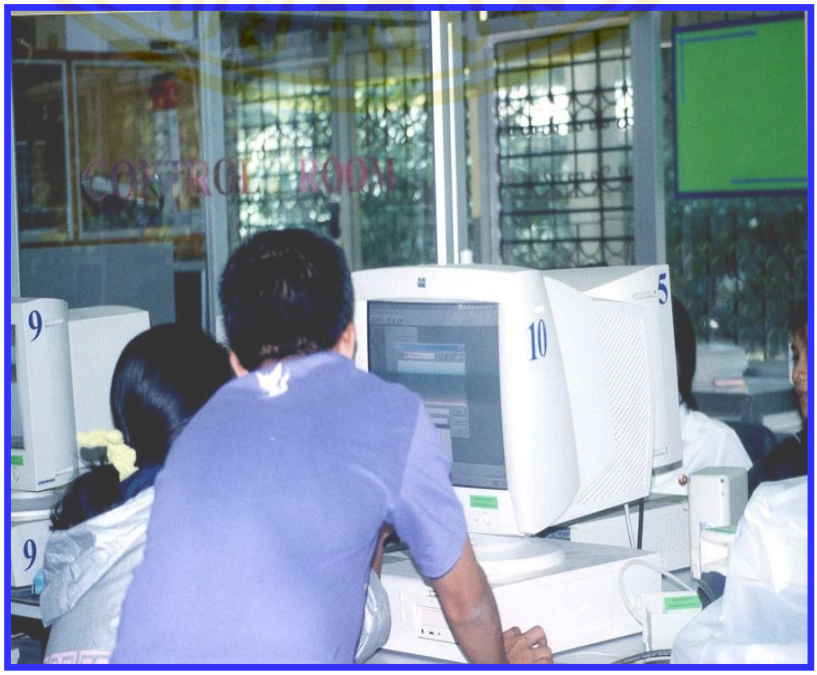
ตัด – เชื่อมตัวถัง

ทาสี – ทำสัญลักษณ์ที่ถัง

ผู้อำนวยการวิทยาลัยเทคนิคสมุทรสงคราม
รับมอบถังคัดแยกมูลฝอย
จากตัวแทนการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
27 พฤษภาคม 2546

ถังคัดแยกมูลฝอย 4 ประเภท

นักศึกษากลุ่มตัวอย่างจัดทำ Website “Waste Minimization”



นักศึกษากลุ่มตัวอย่างจัดทำป้ายนิเทศแสดงนิทรรศการ

ข่าวมูลฝอยและการจัดการมูลฝอย
ในจังหวัดสมุทรสงคราม

การคัดแยกมูลฝอย

การประชาสัมพันธ์รณรงค์คัดแยกมูลฝอยก่อนทิ้ง

การจัดแสดงตัวอย่างมูลฝอย 4 ประเภท
และตัวอย่างการประดิษฐ์สิ่งของ
จากวัสดุใช้แล้ว

Website “Waste Minimization”

การเสวนาประสบการณ์ด้านการจัดการมูลฝอยแบบมีส่วนร่วมในชุมชน

4 มิถุนายน 2546

นายกองค์การวิชาชีพ
กล่าวรายงาน

ผู้อำนวยการวิทยาลัยเทคนิคสมุทรสงคราม
กล่าวเปิดงาน

วิทยากรจากเทศบาลเมืองสมุทรสงคราม
และมูลนิธิอาสาสมัครเพื่อสังคม
ร่วมเสวนา

นักศึกษากลุ่มตัวอย่าง ตัวแทนแกนนำ 16 ชมรม
นักการภารโรง ตัวแทนร้านค้า
และพนักงานทำความสะอาดของวิทยาลัย
เข้าร่วมการเสวนา

ครู – อาจารย์ วิทยาลัยเทคนิคสมุทรสงคราม
เข้าร่วมฟังการเสวนา

นิทรรศการประกอบการอบรม

การอบรม สาธิต และฝึกปฏิบัติ
ในด้านการลดปริมาณมูลฝอย
11 มิถุนายน 2546

นักศึกษากลุ่มตัวอย่าง ตัวแทนแกนนำ 16 ชมรม
นักการภารโรง ตัวแทนร้านค้า
และพนักงานทำความสะอาดของวิทยาลัย
เข้าร่วมการอบรม

การสาธิตการทำปุ๋ยน้ำหมักชีวภาพ

ถังคัดแยกมูลฝอยที่เตรียมส่งมอบให้แต่ละชมรม

ตัวอย่างถังคัดแยกมูลฝอย

การชั่งและหาองค์ประกอบของมูลฝอยที่เกิดขึ้นภายในวิทยาลัย

การสุ่มตัวอย่างมูลฝอย

การทำ Quartering
แบ่งมูลฝอยออกเป็น 4 ส่วน

การชั่งน้ำหนักมูลฝอย
เพื่อหาองค์ประกอบมูลฝอย

การหาค่าความหนาแน่นปกติ
ของมูลฝอย

นักศึกษากลุ่มตัวอย่างทำปุ๋ยน้ำหมักชีวภาพ
ในช่วงของการฝึกปฏิบัติขณะฝึกอบรม

เตรียมส่วนผสมน้ำและกากน้ำตาล

คนให้เข้ากันก่อนใส่เศษผลไม้
และเปลือกผลไม้ลงในถังหมัก

ในช่วงการปฏิบัติการ

ชั่งน้ำหนัก

นำเศษผลไม้และเปลือกผลไม้ที่จะหมักใส่ถุงปุ๋ย

มัดปากถุงแล้วนำไปหมักในถังหมัก
ที่มีส่วนผสมของน้ำและกากน้ำตาล

นักศึกษากลุ่มตัวอย่างจำหน่ายมูลฝอยรีไซเคิลที่คัดแยกได้

รวบรวมมูลฝอย
จากพื้นที่รับผิดชอบของแต่ละชมรม

ชั่งน้ำหนักมูลฝอย ที่คัดแยกได้

ผู้รับซื้อมูลฝอยขนถ่ายมูลฝอย
ที่รับซื้อใส่ซาเล้ง

ผู้อำนวยการวิทยาลัยเทคนิคสมุทรสงคราม
มอบเกียรติบัตรให้นักเรียน - นักศึกษา

เกียรติบัตรการประกวดการประดิษฐ์สิ่งของจากวัสดุใช้แล้ว

ตัวแทนนักศึกษากลุ่มตัวอย่าง
กล่าวเรียนเชิญท่านผู้อำนวยการ
มอบเกียรติบัตร

เกียรติบัตรการประกวดคำขวัญ

เกียรติบัตรการประกวดการจัดระบบการจัดการมูลฝอย

นักศึกษากลุ่มตัวอย่าง
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