Model of Solid Waste Management through the PAIC Process
รูปแบบการจัดการขยะมูลฝอยโดยใช้กระบวนการพาอิก

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Abstract

The research objective was to compare mean scores and knowledge of waste management, environmental attitudes, inspiration of public mind on environmental conservation and pro-environmental behavior of waste management before and after implementation through the Participation-Appreciation-Influence-Control (PAIC) process. The sample group of the 21 VHVs were selected with purposive sampling from VHVs in Patchim Ma That community, Talad Sub-district, Muang Mahasarakham District, Mahasarakham Province in Northeastern of Thailand. The questionnaire was used to collect data both before and after training. Paired t-test and One-Way ANOVA were used to analyze the data. After Participation-Appreciation-Influence-Control (PAIC)were implemented, the results revealed that the mean scores of the posttest of knowledge of waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior of waste management and training achievement were higher than pretest with statistical significance ($p < 0.01$ for all aspects). In the present and future situations, it was illustrated that mean scores were not different with statistical significance ($p > 0.05$ and $p > 0.05$). Furthermore, for theFour-Dimensional Evaluation, the mean scores were not different with statistical significance ($p > 0.05$). The recommendation of this researchis that PAIC process can increase participation on waste management. Moreover, the PAIC process can be used to train the trainer during training; therefore, the local administrative organization should assist VHVs to extend this training to other VHVs in other communities for effective waste management to meet better health and life quality for the people in the community.

Keywords: solid waste, management, PAIC process, village health volunteer

บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์ เพื่อเปรียบเทียบคะแนนเฉลี่ยของความรู้ความเข้าใจเกี่ยวกับการจัดการขยะมูลฝอยใน
ชุมชน เจตคติต่อการจัดการขยะมูลฝอยในชุมชน แรงบันดาลใจในการมีจิตสาธารณะเพื่อการอนุรักษ์สิ่งแวดล้อม และ
พฤติกรรมการจัดการขยะมูลฝอยชุมชน ระหว่างก่อนและหลังการอบรมด้วยกระบวนการพาอิก การวิจัยครั้งนี้เป็นการ
วิจัยแบบกึ่งทดลอง โดยใช้การประชุมเชิงปฏิบัติการอย่างมีส่วนร่วมแบบพาอิกกลุ่มตัวอย่าง คือ อาสาสมัครสาธารณสุข

ประจำหมู่บ้าน (อสม.) ชุมชนปัจฉิมทัศน์ จำนวน 21 คน ได้มาจากการสุ่มเลือกแบบเจาะจง จาก อสม.ในชุมชนปัจฉิมทัศน์ ตำบลตลาด อำเภอเมือง จังหวัดมหาสารคาม โดยใช้แบบทดสอบในการเก็บข้อมูลก่อนและหลังการอบรม สถิติที่ใช้ ในการวิเคราะห์ข้อมูลคือ Paired Sample t-test และ One-way ANOVA หลังการประชุมเชิงปฏิบัติการอย่างมีส่วนร่วม แบบพาอิก ผลการวิจัยพบว่า หลังการอบรมมีคะแนนเฉลี่ยสูงกว่าก่อนการอบรมในด้านความรู้ความเข้าใจเกี่ยวกับ การจัดการขยะมูลฝอยในชุมชน เจตคติต่อการจัดการขยะมูลฝอยในชุมชน แรงบันดาลใจในการมีจิตสาธารณะเพื่อการ อนุรักษ์สิ่งแวดล้อม และพฤติกรรมการจัดการขยะมูลฝอยในชุมชน และผลสัมฤทธิ์ของการอบรมมีความแตกต่างกัน อย่างมีนัยสำคัญทางสถิติที่ระดับ 0.01 ทั้งหมดทุกด้าน ในสถานการณ์ปัจจุบันและอนาคต คะแนนเฉลี่ยมีค่าแตกต่างกัน อย่างไม่มีนัยสำคัญทางสถิติที่ระดับ 0.05 นอกจากนี้การประเมินสี่ด้าน คะแนนเฉลี่ยมีค่าแตกต่างกันอย่างไม่มีนัยสำคัญ ทางสถิติที่ระดับ 0.05 ข้อเสนอแนะจากการวิจัยครั้งนี้ การอบรมด้วยกระบวนการพาอิก สามารถทำให้การมีส่วนร่วม ในการจัดการขยะมูลฝอยเพิ่มขึ้น ยิ่งไปกว่านั้นกระบวนการพาอิกยังสามารถใช้ในการอบรมการเป็นวิทยากรฝึกอบรมได้ เพราะฉะนั้นองค์การปกครองส่วนท้องถิ่นควรให้ความช่วยเหลือแก่ อสม. โดยให้คำแนะนำแก่ อสม. ในชุมชนต่าง ๆ ให้ร่วมกันจัดการขยะมูลฝอยในชุมชนได้อย่างมีประสิทธิภาพเพื่อสุขภาพและคุณภาพชีวิตที่ดีขึ้นของคนในชุมชน

คำสำคัญ: ขยะมูลฝอย, การจัดการ, กระบวนการพาอิก, อาสาสมัครสาธารณสุข

Introduction

At present, waste accumulation has been an important environmentally problem of every country in the world. Particularly, Thailand, the waste occurrence of the community waste of whole country was approximately 26.8 million tons annually in 2013. The corrective disposal was 7.2 million tons (26.9 percent), the improper management was 14.3 million tons (53.4 percent), and potential benefit was 5.1 million tons (19.0 percent). The waste accumulation was about 19.9 million tons annually. The main problems of community waste are the waste disposal without separation at household, the less bringing the waste for utilization, and there are not enough places for proper disposal. Moreover, the toxic and hazardous wastes of community are not managed properly since the local administrative organization lacks collection, storage and transport with systemically management (Department of Pollution and Control, 2014).

The waste accumulation of community waste has become seriously problems because it is an origin of environmental problem in various aspects whether in terms of wastewater discharge, soil degradation, air pollution including human health effects with vector borne disease and well being. At national level and local level try to attack these problems with huge budget for succeeding year. Especially, it may come from the inefficiency and ineffectiveness of waste management with conceptual approach through local participation, the waste collection process, inadequate and improper of waste transportation, disposal site and eradication method. Additionally, community people who play an important part for waste management at the household level with correctly understanding, attitude, and inspiration of public mind for environmental conservation and pro-environmental behavior for waste management. The improper waste management will become waste accumulation and it results of vector borne disease regarding to their health and quality of life. The problem of waste management has become to diverse pollution and nuisance situations in numerous areas whether urban and rural areas, thus it is an urgent issue that should be paid attention by various sectors to solve the problem in order to meet safe guard for clean and safe environment (Department of Pollution and Control, 2015; Laopecth, 2016; Kamin, et al., 2014; Solid and Hazardous Substances Management Bureau,

Pollution Control Department, 2015;Thiengkamol, 2013).

Presently, the rapid growth of population is up to 7 billion in 2012. It is over the limit of growth for ecological system. The population growth and the expanded life span are the major cause of daily consumption. Additionally, the effective science and technology had speed up with the more easily consumption to access the product from diverse regions of the world. The productions including food, product, housing, medicine and other basic needs, require the agricultural and industrial practices with land use for production to accomplish the human requirements. Lastly, after heavy consumption, the waste would accumulate inevitably. The community people still lacks of knowledge and understanding of proper waste management, especially, at household management with separation. Consequently, the ineffective waste management would affect human health. The community and social well-being involved politic and economic conflicts in the same time in both cities and rural sites. However, management of waste accumulation is important environmental problem; in particular wastewater contamination and soil degradation affecting ecological system. The large numbers of environmental health diseases including cancer, diarrhea, malaria, dengue, genetic disorder diseases, bubonic plague and leptospirosis could be occurred from waste accumulation (Kaewhao, et al., 2015; WHO, 2014).

The state of solid wastes and disposal problem are extensively environmental problem of Thailand that is distribution and cause the health condition of people across this country, thus all sectors of society, particularly government, private, local administrative organization and popular sectors must pay attention to participate and cooperate with positive attitude to help each other to explore strategy, policy and plan to set projects and activities to solve this severe problem together. Accomplishment of successful solid wastes, they require to begin the sustainable programs and projects

to implement waste management activities regarding to people participation in separation at household level and proper collection with effective transportation to dispose through appropriate techniques in order to minimize and decrease the environmental impacts for protecting the quality of life and balance the ecosystem to meet people well-being lastly. Nevertheless, the beginning step of waste collection of people is an essential initial step of waste management. Therefore, the community people should gain more knowledge and understanding with positive attitude and sincerely participation in waste management with real responsibility. This will lead to the successful waste management. Even though, local administrative organization has good policy and plans to manage the waste disposal but lack of people participation, the success depends on the cooperation and people behavior (Kaewhao, et al., 2015; Solid and Hazardous Substances Management Bureau, Department of Pollution and Control, 2015; WHO, 2014).

The Ministry of Public Health had issued the regulations of village health volunteer B.E.2011 to define meaning of village health volunteer and recruitment process as the followings. Village health volunteer refers to a person who was selected from village or community and passed the standard of village health volunteer training course according to the committee definition as (1) health volunteer at village, (2) Bangkok health volunteer in Bangkok boundary, and (3) other health volunteer according to Ministry of Public Health has abbreviation ofOr SorMor and in English called village health volunteer (VHV). The duties of VHVs are as the followings. (1) Practice follows the policy of Ministry of Public Health. (2) Do public relation or campaign arrangement of public health and provide knowledge of basic health. (3) Provide health service following to regulation of Ministry of Public Health or other law regulation. (4) Arrange surveillance activity and prevent health problem that is congruent to local health status.

(5) To be leader as health behavior change to develop community quality of life through community participation and corroborate with supportive plan of local administration and others sources. (6) Provide knowledge in aspect of health right and benefit to reach health service for people and participate to propose opinion of community about public policy of health. (7) Study, self-develop and participate to meeting and practice to requirement of other sectors. (8) Implement follows the standard of village health volunteer competency. (9) Corporate health work implementation in community and work together with government officer and local organization administration including other local developmental organization. Generally, VHV is pattern of people participation for self, family and community health cares via training process from officer public health and they practice with public mind. Ministry of Public Health has implemented since 1977. At present there are 1 million and one hundred thousand of VHVs and each of them takes responsibility to look after 8-15 households (Ministry of Public Health, 2012).

Therefore, it is interesting to study the problem and guideline of the solid waste problem solving in Patchim Ma That community by using the PAIC process as the training technique which is quasi-experimental research through brain storming (Tinvan, et al., 2015; Thiengkamol, 2011) for participants who were village health volunteers of Patchim Ma That community, Talad Sub-district, MuangMahasarakham District, Mahasarakham Province who lived in the community. The participation in the PAIC process would be able to initiate and encourage them to gain more knowledge and change attitude to assist to begin to separate waste at household level. Moreover, after training they will be as trainer and educator for other VHVs and community people to distribute their knowledge and understanding with positive attitude to accomplish the better waste
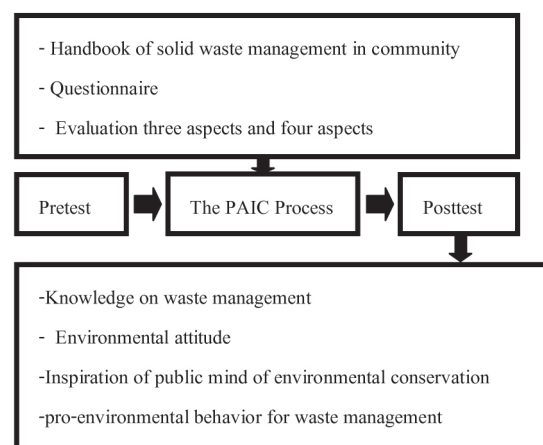
management to reach better life quality and well-being (Boonruang, 2013; Chaisena, et al., 2013; Kaewhao, et al., 2015; Pusdorn, et al., 2013).

The Participation-Appreciation-Influence-Control (PAIC) emphasized on the result of behavioral change in various issues on environmental conservation behavior based on the knowledge, understanding,awareness, attitude, skill, participation, and sensitivity for people to alter their behavior to achieve the pro-environmental conservation for sustainable development. Moreover, it was arranged in the diverse target group whether students with different levels, undergraduate, general people, community leader, VHV, and hospital worker, (Thiengkamol, 2012a; Thiengkamol, 2012b; Dejkunchorn, et al., 2014; Phinnarach, et al., 2012; Pusdorn, et al., 2013; Srikaewtum, et al., 2015).

Research Objective

The research objective was to compare mean scores of knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior of waste management between before and after implementation through the PAIC process.

Research Process

Research Hypothesis

The research hypothesis were mean scores of after training through the PAIC process achievement about knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior of waste management were higher than before trainingthrough the PAIC process.

Methodology

The research design was implemented in steps by step as follows:

1. Construction of handbook for village health volunteers through the PAICprocess covered knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management (Boonruang, 2013; Chaisena, et al., 2013; Department of Pollution Control, 2015; Gonggool, et al., 2012; Laopecth, et al., 2016; Moolmanee, et al., 2013; Kaewhao, et al., 2015; Ruboon, et al., 2012; Thiengkamol, 2011a; Thiengkamol, 2011; Volker, 2007).

2. The research tools contained the questionnaire and evaluation form. The questionnaire was used for determining knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management. The Content analysis was examined by 5 experts. The item with Item Objective Congruent (IOC) more than 0.50 would be selected (Rovinelli&Hambleton, 1977). Subsequently, the questionnaire was tried out with 30 VHVs of the adjacent community. The difficulty determination for part of knowledge on waste management the item with Difficulty between 0.2 and 0.8 and Discrimination more than 0.2 would be selected.Subsequently, the reliabilities of environmental attitude, inspiration of public mind of

environmental conservation, pro-environmental behavior for waste management and total of questionnaire were 0.846, 0.905, 0.865, and 0.943 respectively (Cronbach, 1951).

3. The evaluation form of Three Dimensions and Four Dimensions were employed to evaluate the participant participation and trainer role play during the PAIC process implemented.

4. The 21 VHVs were selected with purposive sampling from VHVs in Patchim Ma That community, Talad Sub-district, MuangMahasarakham District, Mahasarakham Province in Northeastern of Thailand. They would be recruited according to the setting criteria of willingness, time, devotion, commitment, and public mind.

5. The 21 VHVs were examined their knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation, pro-environmental behavior for waste management before and after the PAIC process. The brain storming approach was integrated into the focus group discussion. Training of Trainer (TOT) was employed for role play performing (Langly, 1998; Phinnarach, et al., 2012; Pusdorn, et al., 2013; Srikaewtoom, et al., 2014; Srikaewtum, et al., 2015). The Three Dimensional Evaluation (TDE) was used to determination the participation of participant and The Four Dimensional Evaluation (FDE) was used for evaluation of trainer performance (Thiengkamol, 2011a; Srikaewtum, et al., 2015).

Results

The results of the study were as the followings.

General Characteristics of VHVs

The sample group of this study was 21 VHVs of Patchim Ma That community, Talad Sub-district, MuangMahasarakham District, Mahasarakham Province in Northeastern region of Thailand in the year of 2016.

The sample was VHVs who were chosen to be trained as trainer on Knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation, and pro-environmental behavior for waste management. Most of them were female with 19 (90.50%), paid respect to Buddhism with 21 (100.00%), graduated with primary school level with 11 (52.40%), their family were nuclear family with 14 (66.70%), their ages were between 45-75 years old with mean of 59.00 years old, their income between 5,001-10,000 bath and living at their house with 18 (85.70%) as illustrated in Table 1.

Table 1

Demographic Characteristics of VHVs

Characteristics	Swine Farmers	
	Frequency	Percent
Sex		
Male	2	9.50
Female	19	90.50
Age		
Between 45-75 years,		
Mean=59.00, S.D.=6.54		
Religion respect		
Buddhism	21	100.00
Christ	-	-
Islamic	-	-
Education Level		
Primary School	11	52.40
Lower Secondary School	3	14.30
Upper Secondary School	3	14.30
Vocation	1	4.70
Bachelor	3	14.30
Master and higher	-	-

Characteristics	Swine Farmers	
	Frequency	Percent
Family Characteristics		
Nuclear Family	14	66.70
Extended Family	7	33.30
Living		
House	18	85.70
Rent	3	14.30
Income (baht)		
<5,000	12	57.10
5001-10,000	7	33.30
10,001-15,000	2	9.60
15,001-30,000	-	-
30,001-50,000	-	-
>50,0000	-	-
Total	21	100.00

Results of Pretest and Posttest with PAIC technique

PAIC technique was trained for 21 VHVs with issues of knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management. The research results revealed that before and after the PAIC training process was implemented, the mean scores of posttest of training achievement about knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management, and training achievement were higher than pretest with statistical significance ($p < 0.01$, $p < 0.01$, $p < 0.01$, $p < 0.01$, and $p < 0.01$), as illustrated in Table 2.

Table 2

Pretest and Posttest of Sample Group

Training Issues	Posttest		Pretest		t	p
	$\overline{X}$	S.D.	$\overline{X}$	S.D.		
Knowledge on waste management	10.29	1.37	7.57	1.40	10.11	0.00**
Environmental attitude	78.33	7.77	60.00	8.25	20.01	0.00**
Inspiration of public mind of environmental conservation	88.29	7.05	67.86	6.65	20.35	0.00**
pro-environmental behavior for waste management	82.52	5.55	64.29	4.41	21.37	0.00**
Training Achievement	259.43	12.39	199.71	13.51	37.17	0.00**

** Significant Level at 0.01

Results of Three Dimensional Evaluations for Participation in Present Situation

Three Dimensional Evaluations including Self-evaluation, Friend-evaluation, and Facilitator-evaluation, were conducted for examining the participation of 21 VHVs in present situation. One-way ANOVA was used for data analysis to consider the mean score differences of three groups. The results of One-way ANOVA illustrated that there were no different mean scores among Self-Evaluation, Friend-Evaluation and Facilitator- Evaluation about participation in training process with statistically significant level ($p > 0.05$) as illustrated in Table 3.

Table 3

Three Dimension Evaluation of VHVs for Participation in Present Situation

Source of Variation	Sum of squares	df	Mean Square	F	Sig.
Between Group	1.64	2	0.82	2.38	0.10
Within Group	20.70	60	0.34		
Total	22.35	62			

* Significant Level at 0.05

Results of Three Dimensional Evaluations for Participation in Future Situation

Three Dimensional Evaluations composing of Self-evaluation, Friend-evaluation, and Facilitator-evaluation, were used for examining the participation of 21 VHVs in future situation. One-way ANOVA was employed for investigating the mean scores difference of three groups. The results of One-way ANOVA showed that the mean scores of three aspects were no different with statistical significance ($p < 0.05$) as illustrated in Table 4.

Table 4

Three Dimension Evaluation of Sample Group for Participation in Future Situation

Source of Variation	Sum of squares	df	Mean Square	F	Sig.
Between Group	0.88	2	0.44	0.66	0.51
Within Group	40.16	60	0.66		
Total	41.04	62			

* Significant Level at 0.05

Results of Four Dimensional Evaluations for Trainer Role Play

Four Dimensional Evaluations including Trainer self-evaluation, trainer Friend evaluation, Audience evaluation and Expert trainer evaluation, were employed for determination the trainer role play performance.

One-way ANOVA was used for investigating the mean score differences of four aspects. The results of One-way ANOVA demonstrated that the mean scores of 4 aspects on trainer role play performance during the PAIC process were no differences with statistically significant level ($p>0.05$) as illustrated in Table 5.

Table 5

Results of Four Dimensional Evaluations for Trainer Role Play

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.33	3	0.11	0.61	0.60
Within Groups	12.67	70	0.18		
Total	13.01	73			

* Significant Level at 0.05

Brain storming was integrated in focus groups discussion for the duration of the PAIC process conducted. Consequently, it is visibly seen that they had a very good participation because they were able to express their idea and to communicate to their friends in the small group happily. In addition to the role playing as trainer, they can perform excellently and fruitfully. Moreover, during small group discussion, they cheerfully participated and were able to imagine for drawing their imagination and they were able to communicate their idea and imagination by proposing project to implement after PAIC training ended. However, they arrange to distribute their knowledge and understanding on waste management with inspiration of public mind that got from the PAIC process to other VHVs in other communities in order to spread the concept of proper waste management. Finally, they wish to have success of waste management in order to accomplish healthy life and good environmental quality for meeting sustainable development.

Discussion

The results revealed that the VHVs gained more knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management after they participated in the PAIC process training. These were harmonious to various researches of Thiengkamol, (2012a, 2012b) and her colleagues (Boonruang, et al., 2013; Chaisena, et al., 2013; Pusdorn, et al., 2013; Srichaimool, et al., 2014). It might be

concluded that the training with PAIC technique is able to raise knowledge , change attitude, and inspire public mind for environmental conservation in various matters and for numerous target groups and it can be used for encouragement to gain more knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management after participation in the PAIC process with real practice in their daily life with minimization of consumption. Moreover, the VHVs will correctly reuse, reduce and recycle the waste by starting separation the waste at household level and share their knowledge to other VHVs as well.

These results indicated that participation is effective to encourage VHVs to practice for pro-environmental conservation for waste management to reach the better quality of life via environmental education concept including knowledge, understanding, awareness, attitude, skill, participation for environmental problem solving and transferring environmental knowledge and practice for others with public mind.

The results of TDE are three aspects evaluation, Self-evaluation, Friend-evaluation, and Facilitator-evaluation; it was conducted with 21 VHVs through PAIC process to investigate the participation of VHVs. The mean scores three aspects were no difference among three aspects in present situation (p>0.05). This might be implied that they had similar perceptions on participant participation. Furthermore in future situation, the mean scores of Self-evaluation, Friend-evaluation, and Facilitator-evaluation were also not different, thus it point out that the 3 aspects of evaluations had similar opinions on participation of participants.

FDE composing Trainer-self-evaluation, Trainer-friend evaluation, Audience evaluation, and Expert trainer evaluation, were used to evaluate the trainer role play of VHVs. It was revealed that the mean scores of 4 aspects were not different with statistically significant level of 0.05. It might imply that VHVs paid very good attention for PAIC training process. Moreover, they are able to gain more knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management.

However, it was revealed that PAIC training is effective for training with integration of brain storming process to develop a shared vision, action plan and projects in different issues of training such as in this study of gained more knowledge on waste management, environmental attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management or even in other several researches on energy conservation, urban community food security management, environment and natural resource conservation, development of health cities network for Mekong Region, community strengthening, hospital management, and LD (learning Disability) development, in every level of education, community people and general people in both rural and urban areas (Thiengkamol, 2004; Thiengkamol, 2005).

Suggestion

The research results explicated that after training the PAIC process, the participants' knowledge on waste management, environmental attitude, and pro-environmental behavior of waste management were higher than before training with the statistically significant level of 0.01. The local administrative organization should establish the policy, plan and implementation in terms of training courses to provide the corrective knowledge on waste management via the projects and activities to change their attitude, inspiration of public mind of environmental conservation and pro-environmental behavior for waste management. With regular activities to persuade villagers to participate in waste management, the proper demonstration with the proper and effective

waste management techniques must be run. Additionally, they should operate the waste disposal system by providing proper knowledge of waste separation at household level to meet the real participation of community people by using reduce, reuse, and recycling the waste by setting waste bank to make profit for people in community.

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