



Environmental Learning Experience Development for Elementary Students

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Abstract

Environment was a significant problem in every country because every life was affected by environmental impact. Nowadays, there were many ways to solve these problems, especially, education. Education was the best solution to solve environmental problem by changing human attitude and behavior toward the environment. The Objectives of this research were 1) to synthesize suitable environmental contents from the basic education core curriculum B.E. 2551 of Thailand for elementary students, and 2) to design Environmental Learning Experiences for elementary students. The samples were 30 elementary students from 6 schools located alongside of Damnoen Saduak canal. Suitable environmental contents were synthesized by focus group with 6 local environmental experts. Environmental Learning Experiences were assigned by researchers. The results showed that, the suitable local environmental contents for elementary students were 5 water quality indicators of the Damnoen Saduak canal as follows: (1) fish, (2) seaweed and water hyacinth, (3) nitrate, (4) dissolve oxygen, and (5) odor color and turbidity of water. The Environmental Learning Experiences were 7 learning stations. The evaluation of Environmental Learning Experience revealed that every students answered and practiced correctly 100 percent and the extracurricular experts thought that this Environmental Learning Experience was appropriate for elementary students due to: (1) appropriate location, (2) appropriate content and objective, (3) dividing group by mixing school, (4) one caretaker for each group, (5) fun activities, (6) gaming and answering in learning situation, and (7) suitable environmental contents arrangement. In addition, this research process could be developed to provide local curriculum for local schools around study area.

Keywords: Environmental Learning Experiences, Development, Elementary Students

Introduction

Environment was significant problem in every countries, everyone was affected by the environmental impacts. There were 4 major concepts to solve problem including control, elimination, treatment and restoration. In general, technology was used for eliminate pollution, waste treatment, and degraded resource restoration while law and education were used for attitude and behavior control (Chankaew, 1998). However there were many ways to solve environmental problems, education was an alternative choice to prevent and protect the environment for long term. Providing reasonable environmental education for child and young people could cultivate knowledge, belief, attitude and value. Suitable education could have changed their behavior and action on the environment

(Kongkhom, 1998). Base on Poopat and Thanamai's concept (Poopat & Tanamai, 1991), the achievement of education depended on the Learning Experiences. The Learning Experience was enthusiasm expression of student on learning situation designed by instructor (Tyler, 1974) and this method focus on interaction between instructors and learners. Not only teacher but also everybody could be instructor to push students or learners to get learning outcome. Lawan's Model purposed that there were 5 major factors effecting on the effective of student's learning outcomes including content, objective, learning situation, media, and evaluation and these factors was necessary to design the Learning Experience for all (Wijarn, 2013). In addition, children's perception was limitation. So, it was necessary to design the approach to induce their attention (Kammany, 2007). Outdoor activities such



as science camp and walk rally activity were renowned option in blending education and entertainment (Lao-imchan, 2002) and they could encourage student's learning outcomes. Outdoor activity was recommended to be the extracurricular activity by the Commission on Higher Education (Ministry of education, 2008).

Thus, this research focused on designing Environmental Learning Experiences for elementary students of school located alongside of Damnoen Saduak canal. In addition, this canal located on central of Thailand with the famous floating market namely Damnoen Saduak floating market. The major occupation of this community was agriculture because of soil fertility and plenty of water. However, this community has occurred rapidly environmental problems, especially, water quality of the Damnoen Saduak canal was lower than standard quality. The local people very concerned about this problem and they needed to solve it as fast as possible. However, environmental content from the basic education core curriculum B.E. 2551 of Thailand could be covered all of environmental situation around this community. The dramatic content was water quality. For community reason, suitable environmental content on this research focus on water quality and its indicator only.

Objectives of this research were synthesizing suitable environmental contents from the basic education core curriculum B.E. 2551 of Thailand for elementary students and designing Environmental Learning Experiences for elementary students. In addition, the research process could be developed to provide local curriculum for local schools around study area.

Methods and Materials

The samples were 30 elementary students in grade 5 from all 6 elementary schools located alongside of Damnoen Saduak canal. All of them were chosen by purposive sampling. The samples had to be keen

student and their house had to locate alongside the canal. Based on the objectives, the research was divided into 2 phases: Synthesizing suitable environmental contents from the basic education core curriculum B.E. 2551 of Thailand for elementary students and designing Environmental Learning Experiences for elementary students. The first phase could be separated into 2 parts: (1) Analyzing environmental contents for elementary students from the Basic Education Core Curriculum of Thailand (BECC) B.E.2551 (A.D.2008) by researcher and, (2) group interviewing with 6 local environmental experts who as teacher in science from 6 elementary schools in topic "What suitable environmental contents for elementary students are?"

The second phase could be separated into 2 parts: (1) synthesizing Environmental Learning Experiences by using Lawan's model (2013) that was the suitable model to push student to get learning outcome and change their positive behavior on local environment in the future and (2) evaluating the effective of Environmental Learning Experiences on student's learning outcomes by one shot case post-test model and 6 extracurricular activity expert's opinions. The data were analysed by using descriptive analysis including mean and standard deviation.

Results

The results of this research could be divided into 2 phases according to the objectives.

The first phase: Synthesizing suitable environmental contents from the basic education core curriculum B.E. 2551 of Thailand for elementary students.

1. Analyzing environmental contents.

From the Basic Education Core Curriculum of Thailand (BECC), there were 8 learning areas as follows: (1) Thai Language, (2) Mathematics, (3) Science, (4) Social Studies, Religion and Culture, (5) Health and Physical Education, (6) Arts, (7)



Occupation and Technology, and (8) Foreign Language. Each learning area prescribed what the learners should know and should be able to perform. However, all of learning areas were not directly focus on environment. After studied learning outcomes of each learning area, the results showed that the environmental content was inserted into 3 learning are as follows: (1) science, (2) Social Studies, Religion and Culture, and (3) Occupation and Technology.

2. Group interview.

Focus group was used as tool to synthesize the suitable environmental contents for elementary students. From group discussion with 6 local environmental experts in topic "What suitable contents for elementary students are? The experts thought that suitable content for their student should be:

2.1 Relate to water quality of Damnoen Saduak canal because water resource was local major environment that they very concerned about.

2.2 Focus on water quality indicators of Damnoen Saduak canal including species of fish, seaweed and hyacinth, dissolve oxygen, nitrate, and odor, and color and turbidity because they would like their children as local environmental monitoring experts in future.

2.3 Focus on practical content more than theoretical content because they needed their students had practical skills and could verify water quality by theirs.

2.4 Emphasize on learning situation that could motivate students to take care of the local environment.

The second phase: designing Environmental Learning Experiences for elementary students.

1. Learning Experiences. Base on Lawan's model, there were 5 components of the Learning Experiences as follows:

1.1 The content: the appropriate content had to relate with local environmental niche and student's characteristics. The content had to cover fact or doing elements.

1.2 The objective: the objective had to be educational objective including cognitive, psychomotor and affective domain. The appropriate objective had to be clear and relate with content.

1.3 Learning situation: the learning situation included instructor's behaviors and student's behavior. Instructor's behavior was providing learning activities for students and student's behaviors interacting with those learning activities.

1.4 Media: the media as tools for supporting students understand the content.

1.5 Evaluation: the evaluation was student's behaviors in learning situation assessment according to standard criteria.

2. Environmental Learning Experiences.

The results from the first phase showed that there were 4 characteristics of suitable local environmental contents for elementary students. This research decided to blend all of characters to be 7 Environmental Learning Experience stations as follows: (1) The past and present of the Damnoen Saduak canal, (2) how to play activities, (3) fish, (4) seaweed and water hyacinth, (5) nitrate, (6) dissolve oxygen, and (7) odor color and turbidity of water. The details of each Learning Experience as follow:

2.1 The past and present of Damnoen Saduak canal.

2.1.1 Content: in the past, water's quality of Damnoen Saduak canal was very clean and clear. People could use water from the canal for drinking, cooking, bathing, and swimming. There were more than 40 species of fish that people could catch for cooking and selling. In the present, water's quality of Damnoen Saduak canal got worse due to expanding of community, agriculture, and industrial. Many species of fish extinct but many species of aquatic weed spread. So people could not use water for life anymore.

2.1.2 Objective: Affective domain: appreciating the water quality of Damnoen Saduak canal.



2.1.3 Learning situations of instructor as follows: described and turned on the video about the current water's quality of the Damnoen Saduak canal, told students divided into group and drew picture about current situation of the Damnoen Saduak canal and asked question in topic "Do you want the Damnoen Saduak canal to be past or present?"

2.1.4 Learning situations of learner as follows: listened, divided into groups, drew the picture, and answered the questions about their felling.

2.1.5 Medias included video, flip chart papers and crayon.

2.1.6 Evaluation: students could present and compare the pros and cons between the past and present of the Damnoen Saduak canal correctly 100 percent.

2.2 How to play activities.

2.2.1 Content: how to play activities and it's condition following:

Divided students into 5 groups, 6 students per group by mixed school, every group received a map for travelling to learning stations, every group started together and they had to find the R.C hiding between ways by reading map, every group would get extra score if they could find the correct RC in 5 minutes, every group had to interact with all activities of every learning stations including played game and answered the questions, every group would get full score if they could play game and answer the questions correctly in 15 minutes, every group had to change and go the next station after 15 minutes by reading map. The scores were collected after finished all of station and the group got full score would get the reward.

2.2.2 Objective: Affective domain: encouraging student to pay attention on how to play activities.

2.2.3 Learning situations of instructor as follows:

1) Described how to play activities including: how to go each station by reading map, how

to find RC between change stations, how to play the game and game's condition.

2) If students could answer correctly they would get full score. If students could not answer correct instructor would explain again until they answered correctly.

2.2.4 Learning situation of learner as follows: listened, read map and traveled to station on time, sought the RC between changing station way and played game at stations.

2.2.5 Media was environmental Learning Experience stations map

2.2.6 Evaluation: students could answer the questions correctly 100 percent all station.

2.3 Fish

2.3.1 Content: in 40 past years ago, there were more than 55 species of fish in Damnoen Saduak canal such as Yellow tailed botia, Fire spiny eel, Wrestling halfbeak and Nile tilapia due to good water quality. Nowadays, there were less species and quantity of fish due to decreasing water's quality. In addition, if water's quality was very good there would have been Yellow tailed botia in the canal. If water's quality was good there would have been Fire spiny eel, Armed spiny eel, Hampala barb, Minnow, Grey featherback, and Red cheek barb in the canal. If water's quality was pretty bad there would have been Wrestling halfbeak, Trichopsis, Climbing perch, Eel, Dwarf, and snakehead in the canal. If water's quality was bad there would have been Nile tilapia in the canal. That means fish's species could be simple water's quality indicator.

2.3.2 Objective: Cognitive domain: Recognizing species of fish had been found in Damnoen Saduak canal during the past 40 years and understanding the relationship between water's quality and species of fish of Damnoen Saduak canal.

2.3.3 Learning situations of instructor as follows: described the relationship between water's quality and species of fish of Damnoen Saduak canal



by using the wheel of relationship, asked student matching the relationship between water's quality and species of fish of Damnoen Saduak canal and described again if the student could not matching correctly.

2.3.4 Learning situations of learner as follows: looked at the poster, answered the question about species of fish in the Damnoen Saduak canal during the past 40 years, watched, listened and played games.

2.3.5 Medias included the poster of 55 species of fish in the 40 past of Damnoen Saduak canal and the wheel of relationship between water's quality and species of fish in Damnoen Saduak canal.

2.3.6 Evaluation: students could answer the species of fish in Damnoen Saduak canal during the past 40 years and could match the relationship between water's quality and species of fish in Damnoen Saduak canal correctly 100 percent.

2.4 Seaweed and hyacinth.

2.4.1 Content: the quantity of seaweed and hyacinth were the biological water's quality indicators of Damnoen Saduak canal. Good water's quality had few seaweed and hyacinth but bad water's quality had more seaweed and hyacinth due to contamination of fertilizer from agriculture. If there were a lot of seaweed and hyacinth in the canal both of them would have blocked sunlight into the water. So, the most of water's life would be die bio degradation and dissolving oxygen would be happen. Finally, water's quality would get worse.

2.4.2 Objective: Cognitive domain: understanding the relationship between water quality and seaweed and hyacinth quantity.

2.4.3 Learning situations of instructor as follows: described the relationship between fertilizer quantity and water quality by using group of pictures, switched group of picture, asked the students sorting picture by focused on the relationship of water quality and seaweed and hyacinth of Damnoen Saduak canal and described again if the student could not sorting the

picture correctly.

2.4.4 Learning situations of learner as follows: listen and sorted the pictures.

2.4.5 Media was occurring of seaweed and hyacinth diagram.

2.4.6 Evaluation: students could sort the pictures correctly 100 percent.

2.5 Dissolve oxygen.

2.5.1 Content: dissolve oxygen quantity in water was the chemical water quality indicator of Damnoen Saduak canal. Good water quality had more dissolve oxygen but bad water quality had less dissolve oxygen. Dissolve oxygen quantity in water could be measured by simples test kits. The measuring steps as follows: upturned syringe containing 10 mL of water sample put the cone at the end of the syringe, push the syringe until water sample flowed up into the cone, dropped DO1 and DO2 solution one drop, the yellow suspension would be happen, pulled down the syringe until the water back into junction of the cone, plugged the pores plastic at top of cone and shook gently for 1 minute, pulled the plastic rod, pressed the syringe and then drop DO 3 and DO4 solution 4 drops, pulled down the syringe again and sealed the syringe with plastic stick, shook to mix the sediment, pulled the plastic rod, injected water solution into color glass bottom, and compared the color of solution with standard color sheet for measuring dissolve oxygen quantity in ppm unit.

2.5.2 Objective: Cognitive domain: understanding the relationship between water qualities and dissolve oxygen quantity. Psychomotor domain: using dissolve oxygen test kits under instructor.

2.5.3 Learning situations of instructor as follows: described the relationship between water quality and dissolve oxygen quantity in water, demonstrated how to test dissolve oxygen in 3 water samples including water from pipeline, the Damnoen Saduak canal, and the Saen Saeb canal by using simple test kits, instructed student do under instruction and



described again if the student could not doing correctly.

2.5.4 Learning situations of learner as follows, listen, watched the demonstration, acted under instruction and answered the question.

2.5.5 Medias included relationship diagram between water quality and dissolve oxygen in water, dissolve oxygen test kits, and 3 water samples including water from pipeline, Damnoen Saduak canal, and the Saen Saeb canal.

2.5.6 Evaluation: students could act under instruction and answered the question correctly 100 percent.

2.6 Nitrate

2.6.1 Content: nitrate in water was the chemical water quality indicator of Damnoen Saduak canal. Good water quality had few nitrate but bad water quality had more nitrate. Nitrate in water could be measured by simple test kits. The measuring step as follows: Sucked the water sample by using syringe about 2.5 mL into the first bottom, added Nta 1 solution one spoon into the water sample and shook for 1 minute, sucked the water sample by using syringe with cotton tube about 1 mL, pulled the cotton tube from the syringe and injected the solution into the second bottom, dropped the Nta 2 solution 2 drops into the bottom and Shook slightly, dipped the Nta3 paper into the solution about 3 seconds, and compared the paper with the standard color sheet within 5 minutes for measuring nitrate quantity in water.

2.6.2 Objective: Cognitive domain: understanding the relationship between water quality and nitrate quantity in water. Psychomotor domain: using dissolve oxygen test kits under instructor.

2.6.3 Learning situation of instructor as follows: Described the relationship between water quality and nitrate quantity in water, demonstrated how to test nitrate in 3 water samples including water form pipeline, Damnoen Saduak canal, and Saen Saeb canal by using simple test kits, instructed student do under instruction, described again if the student could not

doing correctly, and asked the students in topic “What is best water quality from 3 samples?”

2.6.4 Learning situations of learner as follows: listened, watched the demonstration, acted under instruction, and answered the question.

2.6.5 Medias included relationship diagram between water quality and nitrate in water, nitrate test kits, and 3 water samples including water form pipeline, Damnoen Saduak canal, ,and Saen Saeb canal.

2.6.6 Evaluation: students could act under instruction and answer the question correctly 100 percent.

2.7 Odor, color and turbidity

2.7.1 Content: odor, color and turbidity were the physical water’s quality of Damnoen Saduak canal. Good water’s quality was not smell, light brown color, and less turbidity. Bad water’s quality was garbage and silage smell, milk tea color, and more turbidity.

2.7.2 Objective: Cognitive domain: recognizing the characteristic of the odor, color, and turbidity of good water’ quality.

2.7.3 Learning situations of instructor as follows: Described the characteristic of the odor, color and turbidity of good water’ quality. Showed 4 types of water sample with difference odor, color and turbidity as follows: water from Damnoen Saduak canal, Saen Saeb canal, kitchen and agriculture, asked student in topic “What is the best one from 4 water samples?, and described about the good of water’s quality character again if the student could not answer correctly.

2.7.4 Learning situation of learner as follows: listened and answered question about the good of water’s quality characters of Damnoen Saduak canal.

2.7.5 Medias were water contamination’s point source diagram and 4 types of water samples: water from Damnoen Saduak canal, Saen Saeb canal, kitchen, and agriculture.



2.7.6 Evaluation: students could answer question about the good of water's quality characters of the Damnoen Saduak canal correctly 100 percent.

3. Evaluating Environmental Learning Experiences

Science camp was set for demonstrate Environmental Learning Experience assigned by researchers for 2 days. The participants in this camp were 30 elementary students from 6 schools located alongside of Damnoen Saduak canal. Evaluation

effectiveness of Environmental Learning Experiences by considering student's learning outcomes and satisfaction of extracurricular activity experts. The results showed as follows:

3.1 Student's learning outcomes

The score was used as tool to evaluate Student's learning outcomes. Each student group got score from the 1st to the 7th learning station. The results as shown in table 1.

Table 1 The evaluation of learning outcomes

Student Group	Learning Experience's score (percent)							Result
	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	
1	100	100	100	100	100	100	100	Effective
2	100	100	100	100	100	100	100	Effective
3	100	100	100	100	100	100	100	Effective
4	100	100	100	100	100	100	100	Effective
5	100	100	100	100	100	100	100	Effective

As indicated in table 1, every group got 100 percent from every station so the Environmental Learning Experiences designed were effective.

3.2 The satisfaction of extracurricular activity experts on the Environmental Learning Experiences. The group interview with 6 experts was used as tool to evaluate the Environmental Learning Experiences designed. The results as follows:

1. The location of each station was appropriate with the content because they located in real environment that could promote effective's learning outcomes of students.

2. The distance between each station was appropriate because each station was far enough to not disturb each other.

3. The content of each station was appropriate especially the 5th L.E. dissolve oxygen and the 6th L.E. nitrate because in these stations students had to practice by themselves.

4. The objective of each Learning Experience was appropriate with content.

5. The learning situation in each station was appropriate especially gaming and answering the

questions because they were fun and promoted student's learning outcomes.

6. Dividing group by mixing school encourage student's participation with others.

7. Route check activity (RC) encouraged student's observation skill.

8. All of activities of the Environmental Learning Experiences made students enjoy learning together.

Discussion

The suitable contents of this research were designed by group interview with 6 local environmental experts in topic "What suitable contents for elementary students are? However, this group was not included the specialists from the local environmental offices such as: division of public health and environment of local administration, local environment and natural resource office, and the local

conservation of water resource office that had really known about water quality standard of Damnoen Saduak canal. Therefore, the group interview was not mentioned about the amount of oxygen used by microorganism in the oxidation of organic matter namely Biological Oxygen Demand (BOD). The Biological Oxygen Demand was the major index indicated water quality, so it could be another Learning Experience.

As indicated in evaluation, every student group got 100 percent from all stations so the Environmental Learning Experiences were effective because the instructor of all stations started with describing knowledge of each station, showing the media involving the content, demonstrated, and recommended students to practice by themselves, questioned, explained, and recommended again, if the student could not answer correctly. This process could encourage student got 100 percent and achieved the objective of Learning Experiences. This result similar with the result from creating Learning Experience model in environment chemistry for high school student (Rakthai, Phauchai, & Warapo, 2015) and designing Learning Experience in Environmental Physics for high school student (Changjan, 2015). Both research showed that encouragement student to get total 100 percent or motivation student to practice again, if they could not answer correctly were the alternative way for small group or lower than 30 person.

Conclusion and Suggestion

The objectives of this research were synthesizing suitable environmental contents from the basic education core curriculum B.E. 2551 of Thailand for elementary students and designing Environmental Learning Experiences for elementary students. Group interview and Learning Experiences concept by

Lawan's model were adjusted as tools for developing the research. The results showed that:

1. The suitable environmental contents for local elementary students were environmental content involving 5 water quality indicators of the Damnoen Saduak canal including species of fish, seaweed and hyacinth, dissolve oxygen, nitrate, and odor, color and turbidity.

2. The Environmental Learning Experiences were 7 stations. All of stations consisted of 5 components: content, objective, learning situation, media, and evaluation.

3. Environmental Learning Experiences for elementary students were effective because all of them were designed according with local environmental niche of Damnoen Saduak community.

4. The future study should improve learning situation and evaluation method to encourage the learners to reach the objectives and learning outcomes. For example, using pretest and post-test model to evaluate the effectiveness of learning outcome, setting standard score of the learning outcomes lower than 100 percent for saving repeat activity times and evaluating the real effectiveness.

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References

Changjan, A. (2015). *Designing Learning Experience in Environmental Physics for high school student: Proceedings of an International Research Conference on Business, Economics and Social Sciences, IRC-2015 Istanbul, Turkey, (pp. 27-28).*



- Chankaew, K. (1998). *Environmental Technology*. Bangkok, Thailand: Kasetsart University Press.
- Kammany, K. (2007). *How to teach for lecturer experts*. Bangkok, Thailand: Kasetsart University Press.
- Kongkhom, R. (1998). *Development of environmental conscious of Prathum Saksa 5 students through habit formation process*. Changmai, Thailand: Chaingmia University Press.
- Lao-imchan, J. (2002). *Walk rally training package on Buddhism belief*. Bangkok, Thailand: King Mongkut's University of Technology.
- Ministry of education. (2008). *Core curriculum of basic education*. Bangkok, Thailand: Ministry of education.
- Poopat, S., & Tanami. S., (1991). *A manual of writing hand outs and lesson plans*. Bangkok, Thailand: Ministry of Education.
- Rakthai, S., Phauchai, P., & Warapo, K. (2016). Creating Learning Experience Model in Environmental Chemistry for High School Students. *Pathumwan Academic Journal*, 5(14), 43-49.
- Tyler, R. W., (1974). *Basic Principles of Curriculum and Instruction*. Chicago, USA: The University of Chicago Press.
- Wijarn, L. (2013). *A model of Learning Experience*. Pathumtani, Thailand: Rungsit University.