Pakistan Journal of Social Sciences 7 (2): 117-122, 2010
ISSN: 1683-8831

The Development and Verification of the Quality of Environmental Education Indicators for Lifelong Learning

[1]Sirichai Rintarhat, [1]Penkhae Thamsenanupap, [2]Jiraporn Khiewyoo and
[3]Chowwalit Chookhampaeng
[1]Department of Environmental Education, Faculty of Environment and Resource Studies,
Mahasarakham University, Mahasarakham, Thailand
[2]Faculty of Public Health, Khon Kaen University, Thailand
[3]Faculty of Education, Mahasarakham University, Thailand

Abstract: This research had the purposes to develop environmental education indicators for lifelong learning and to verify the quality of the developed environmental education indicators. The research comprised two steps: Step 1, development of the environmental education indicators for lifelong learning and Step 2, verification of the quality of the development indicators. The sample used in this research included 371 administrators and teachers from royal honored environmental creative award-winner schools and provincial environmental education centers and 25 experts in environment, environmental education, education, lifelong learning and policy. The Delphi technique used for collecting data, which were conducted using two types of instrument; an interview and a questionnaire. The statistics used for analyzing the data were the exploratory factor analysis, validity and reliability through verification of the stability, average and standard deviation. The research results were found that there were 200 environmental education indicators for lifelong learning, developed by the researchers, in 14 factors and two dimensions, namely 12 factors and 171 indicators in the internal educational institution dimension and two factors and 29 indicators in the external educational institution dimension. When the importance of the indicators were weighted, it was found that there were 104 indicators, were weighted at the highest level, including 93 indicators in the internal educational institution dimension and 11 indicators in the external education institution dimension. In addition, when the stability of the indicators was verified, it was found that there were 68 indicators with the high stability, including 59 indicators in the internal educational institution dimension with the high numbers of indicators in the first five factors including administrators and dissemination (8), learning process organization (7), promotion and support, policies and administrative management, student skills and attitudes and student characteristics (6), environmental teacher knowledge and skills (5) and students (4) and 9 indicators in the external educational institution dimension with the highest number of indicators in the factor of family and community support.

Key words: Environmental education, lifelong learning, indicator development, verification of indicator quality, Thailand

INTRODUCTION

At present environment is facing critical problems. Human beings and society have been becoming effected by these environmental problems throughout the world (Ozden, 2008). These problems have been created by inappropriate human actions towards natural resources and environment (Tarttong, 2007). Most people as well as scholars have believed that environmental education is an important factor and a tool for prevention of environmental problems (Ozden, 2008). It was evident in 1972 that the importance of environmental education was originally emphasized. At the International Conference on Human Environment held in Sweden, it was agreed that Environmental Education (EE) was on importance tool for solving problems and improving quality of environment. Following that conference there have been continuously organizing activities and conferences on environment. The lastest one on global environment has just been held in Canada in 2009. The agenda covered the topics such as ecological systems, environment and environmental health, economics and policies on planning urban environment, environment in universities and social environmental learning and so on. In regard to Thailand,

Corresponding Author: Sirichai Rintarhat, Department of Environmental Education, Faculty of Environment and Resource Studies, Mahasarakham University, Mahasarakham, Thailand

there have been a concept in emphasizing the importance of environmental education for sustainabledevelopment. This will lead to building up awareness, enhancing and adjusting attitudes and behaviors towards supporting the development on the basis of maintenance and restoration of environment (Department of Environmental Quality Promotion, 2008) the concept of environmental education for sustainable development is related to lifelong learning that involves all types of learning.

The foundation concepts of environmental education for sustainable development include four pillars: the concept of sustainable development, the concept of environmental education, the concept of lifelong learning and the concept of education for citizen development (Department of Environmental Quality Promotion, 2008).

In addition, the concept of lifelong learning is one of the principles of environmental education, identified in the Belgrade Charter that environmental education is a lifelong learning process that should be started from the early childhood level and continued to all levels of formal and informal education. However, even though Thailand has been carrying on environmental education for >3 decades since 1978, environmental education was included in primary education and lower secondary education curriculums. They included the content of environmental education for the first time in life experience and science subjects and till 2002, the new curriculums emphasized building up awareness, knowledge, understanding and experiences in management, maintenance and use of balanced natural resources and environment, it was found that the performance on environmental education in Thai formal education still lacked the indictors for promotion of environmental education that supported lifelong learning. Accordingly, the researchers were interested in development of environmental education indicators for lifelong learning based on basic education contexts. The purposes were to use these indicators for identification of policies, strategies, management planning, as well as evaluation of success and problems in environmental education to facilitate and lifelong learning and to fulfill the principles of environmental education proposed in the Belgrade Charter and the concepts of environmental education for sustainable development. The purposes of this research was therefore to development and verify the indicators of environmental education for lifelong learning.

MATERIALS AND METHODS

This research comprised the sample groups, the phases and steps in conducting as shown in Fig. 1. The sample groups in this study included 317 administrators and teacher in royal honored environmental creative award winner schools and provincial environmental education centers and 25 experts in environmental education, environment, education and lifelong learning, derived through the purposive sampling. The research procedures included two phases:

Phase 1: The development of the environmental education indicators for lifelong learning, including the following steps:

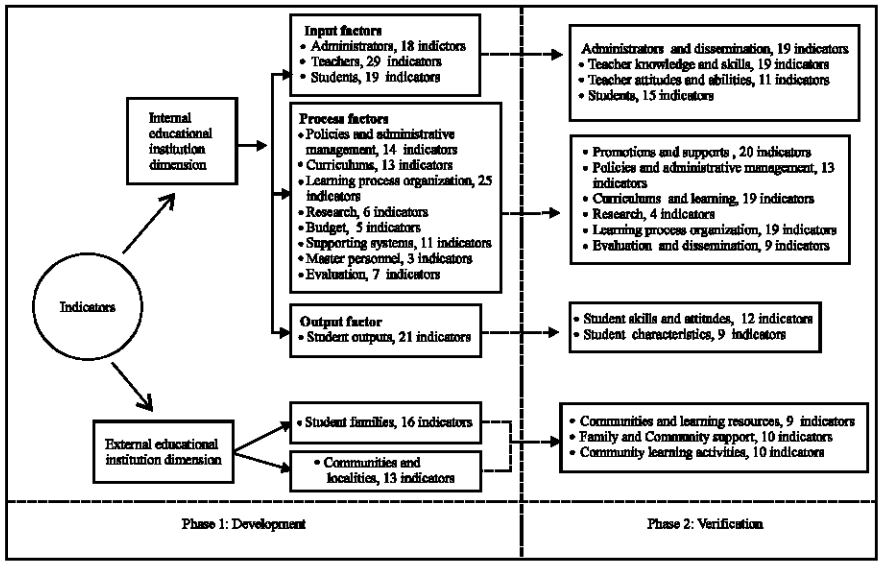

Fig. 1: Development and verification of environmental education indicators for lifelong learning

Step 1: Built the framework in identifying factors and development of the indicators of environmental education for lifelong learning based on textbooks, educational documents and related research on environmental education and lifelong learning, both in Thai and English and the in-depth interviews of school administrators and teachers from royal honored environmental creative award winner schools.

Step 2: Identified the factors and indicators from the interview of 17 experts (from the total of 25) with the expertise in environment, environmental education, education and policy making.

Step 3: Identified the quality criteria for screening the indicators through the in-depth interviews of five experts and screening the indictors through the questionnaire responded by 18 experts.

Steps 4: Weighted the importance of the indicators through the questionnaire responded by 17 experts (from the same group of 25 experts).

Phase 2: The verification of the quality of environmental education indicators forlifelong learning, including the following steps:

Step 1: Verified the quality of the development indicators through the questionnaire, responded by 371 school administrators and teachers, including 194 from royal honored environmental creative award-winner schools and 177 from provincial environmental education centers. The data were then analyzed by the method of Exploratory Factor Analysis (EFA) for testing the validity of indicators.

Step 2: Verified the reliability of the indicators with the stability values by comparing weighted factors of each indicator between royal honored environmental creative award-winner schools and the provincial environmental education centers, with the values of the factors >0.05 (<0.05) regarded as the high level of the stability between 0.05-0.01 the moderate level and >0.01 the low level (Samretphou, 2004).

RESULTS AND DISCUSSION

The analysis of both phases revealed as follows:

Phase 1: The development of the environmental education factors and indicators for lifelong learning identification of factor and indicators, it was found that the results of the factors and indicators were divided into two dimensions, namely the internal institution and the external dimensions. In the internal institution dimension, there were 12 factors namely administrators, teachers, learners, policies and curriculum management, learning process organization, research, budget, supporting system, master personnel, evaluation and student outputs with 171 indicators. And in the external institution dimension, there were two factors with 29 indicators. The five factors with the most numbers of indicators included teachers, learning process organization, students, outputs and school administrators, respectively as show in Table 1.

Development of the environmental education indicators: The results of screening the indicators based on five quality criteria: validity, utility, understandable, appropriate-ness and feasibility. When considered the Index Of Consistency (IOC) value of 0.75 and above, it was found that the factors with the numbers of indicators at the highest level of weighed importance in the first five order included teachers, students outputs, learning process organization, school administrators and student's families, accounted for 19, 15, 13, 12 and 8, respectively as shown in Table 2.

Phase 2: Verification of the quality of environmental education indicators for lifelong learning. The verification of the quality of the indicators through the exploratory factor analysis revealed that there were some adjustment of the statements related to the factors and groupings of the indicators into inputs, process and output of both internal and external educational institution dimensions. It was found in the internal educational institution dimension that the inputs factors included administrators and dissemination, teacher attitudes and ability, students

Table 1: Developed factors and numbers of indicators of environmental education for lifelong learning in the internal and external educational institution dimensions

Factors	No. of indicators
Internal educational institution dimension	
School administrators	18
Teachers	29
Students	19
Policies and management	14
Curriculums	13
Learning process organization	25
Research	6
Budget	5
Supporting system	11
Master personnel	3
Evaluation	7
Student outputs	21
Total	171
External educational institution dimension	
Student families	16
Communities/localities	13
Total	29
Grand total	200

Table 2: Factors and the weighted indicators of environmental education for lifelong learning in the internal and external educational institution dimensions

Factors	Weighted indicators	
	Highest	High
Internal educational institution dimension		
School administrators	12	6
Teachers	19	10
Students	8	11
Policies and management	7	7
Curriculums	4	9
Learning process organization	13	12
Research	2	4
Budget	1	4
Supporting systems	6	5
Master personnel	2	1
Evaluation	4	3
Student outputs	15	6
Total	93	78
External educational institution dimension		
Student families	8	8
Communities/Localities	3	10
Total	11	18
Grand total	104	96

Table 3: Factors, indicators and the high stability indicators in the internal and external educational institution dimensions

Factors	Indicators	High stability indicators
Internal educational institution dimension		
Input		
Administrators and dissemination	19	8
Environmental teacher attitudes and abilities	19	3
Students	15	4
Environmental teacher knowledge and skills	11	5
Process		
Promotions and supports	20	6
Policies and administrative management	13	6
Curriculums and learning	19	3
Research	4	3
Learning process organization	19	7
Evaluation and dissemination	8	2
Output		
Student skills and attitudes	12	6
Student characteristics	9	6
Total	168	59
External educational institution dimension		
Communities and learning resources	9	2
Family and community supports	10	5
Community learning activities	10	2
Total	29	9
Grand total	197	68

and environment teacher knowledge and skills. The process factors included promoting and supporting, policies and administrative managements, curriculum and learning, research, learning process organization, evaluation and dissemination and the outputs factors included student skills and attitudes, student characteristics. And in the external educational institution dimension there were three factors, including community and learning resources, family and community supports and family learning activities. Altogether, there were 15 factors and 197 indicators.

When the stability of the indicators was verified, it was found 68 indicators with high stability, the internal educational institution dimension there were 59 indicators of 12 factors with high stability and in the external educational institution dimension there were 9 indicators of 3 factors.

The factors with the numbers of indicators at the high level of stability in the first five order included administrators and dissemination, policies and administrative management, student skills and attitudes, student characteristics, environment teacher knowledge and skills, family and community supports and students as shown in Table 3.

The development of factors and indicators of environmental education for lifelong learning were divided into two dimensions, namely the internal and external educational institution dimensions. There were 12 factors and 171 indicators in the internal educational institution dimension, including administrators, teachers, students, policies and administrative management, curriculums, leaning process organization, research, budget, supporting systems, master personnel, evaluation and student outputs and there were 2 factors and 29 indicators in the external educational institution dimension, including student's families and communities/localities. The factors with the most numbers of indicators in the first five order including teachers, learning process organization, student outputs, school administrators and student families, respectively.

The selection of the indicators, based on five quality criterions and the Index Of Consistency (IOC) values of 0.75 and above. It was found that the factors with the first five highest numbers of weighted indicators included teachers, student outputs, learningprocess organization, school administrators and students.

In addition, there were 22 indicators failing to meet the quality criteria. Most of these were rated by the experts as lacking suitability, utility and feasibility to be used in schools such as too complicated scientific equipments, water quality analysis sets and soil quality analysis sets. The science equipments that should be those needed no higher skills such as the thermometers used as tools in the greenhouse effect testing set (Thai Environmental Institute, 2007; Grant and Littlejohn, 2001). The indicators failed to meet the quality criteria in the factor of school administrators were such as administrator's attention, modeling and clear resolution in environmental education activities for promotion of lifelong learning. In regard to the teachers, the indicators failed to meet the criteria were such as teachers knowledge, management ability, interest in new knowledge to develop attitudes, skills and awareness of

students and so on. When considering the ratio of the number of indicators and the number of samples as suggested by James (1992) of 1:5 or more, it was found from this research that the ratio was only 1:2.75 which was lower.

However, Gardagnolii and Velicer (1988) suggested that the exploratory factor analysis be used and if it yielded the weighted values above 0.60 more than four of them, the significant of ratio of the number of indicators and the number of sample was reduced. According to the exploratory factor analysis resulted in the research, it was found that there were 127 weighted indicators with the value >0.60. It showed that the indicators were acceptable. However, there were some adjustment of factor statements and regroupings of the indicators.

The factors of the internal educational institution dimension were grouped into inputs, processes and outputs.

There were three factors in the external educational institution dimension, there were factors for the inputs, including administrators and dissemination, environment teacher attitudes and abilities, students, environment teacher knowledge and skills; factors for the processes including promotions and supports, policies and administrative management, curriculums and learning, research, learning process organization and evaluation and dissemination and factors for the outputs including student skills and attitudes and student characteristics and in the external educational institution dimension, there were factors including communities and learning resources, family and community supports and family learning activities. There were altogether 15 factors and 197 indicators.

However, when verifying the reliability with the stability through the split-half method (Samretphou, 2004) and with two groups of the sample from royal honored environmental creative award-winner schools and provincial environmental education centers and comparing the indicators with high stability of both sample groups (Hair *et al*., 1995), it was found that there were 68 indicators with the high stability. In the internal educational institution dimension of all 12 factors, there were 59 indicators and the external educational institution dimension of all three factors, these were 9 indicators. The factors with high stability indicators in the first five order included administrators and dissemination, learning process organization, promotions and supports, policies and administrative management, student skills and attitudes, student characteristics, environment teacher knowledge and skills, family and community supports and students.

CONCLUSION

In this study, the development of environmental education indicators for lifelong learning based on the experts, comprised two dimensions, namely the internal and the external educational institution dimensions, with 14 factors and 200 indicators, when the quality of the indicators was verified through the exploratory factor analysis, adapted the factor statements and regrouped the indicators, it was found 15 factors and 197 indicators. However, there were 68 indicators with high stability, these indicators also had high validity and reliability and could be used as the environmental education indicators for lifelong learning and evaluation of success and problems in performance of general education systems.

ACKNOWLEDGEMENTS

The researchers wish to thank the General Environmental Conservation Public Company Limited (GENCO), Faculty of Environment and Resource Studies, Mahasarakham University and Research Support Unit, Mahasarakham University, for the financial support of this research project. Also, Associate Professor Dr. Sunthorn Kohtbantau is thanked for his kindness and consideration to finalize the completeness of this academic research.

REFERENCES

Department of Environmental Quality Promotion, 2008. Draft of principle environmental education for sustainable development. Ministry of National of Resources and Environments. http://www.deqp.go.th/main/.

Gardagnoli, E. and W. Velicer, 1988. Relation of sample size to the stability of component patterns. Psychol. Bull., 103: 265-275.

Grant, T. and G. Littlejohn, 2001. Greening School Grounds: Creating Habitats for Learning. New Society Publishers, Gabriola Island, BC, Canada.

Hair, J.F., R.E. Anderson, R.L. Tatham and W.C. Black, 1995. Multivariate Data Analysis with Readings. Vol. 336, Prentice-Hall International, Englewood Cliffs, NJ., pp: 398-400.

James, S., 1992. Applied Multivariate Statistical for the Social Science. 2nd Edn., Lawrence Erlbaum, New Jersey, USA., pp: 384.

Ozden, M., 2008. Environmental awareness and attitudes of student teachers: An empirical research. Int. Res. Geogr. Environ. Educ., 17: 40-55.

Samretphou, N., 2004. Development of Educational Indicators for Lifelong Learning. In: Research and Curriculum Development, Dissertation, D. (Ed.). Graduate School, Srinakha-Rinwirot University, Bangkok, pp: 201.

Tarttong, K., 2007. A Study of Suitable Environmental Education Process for Thai School Context. Khon Kaen University, Khon Kaen, Thailand, pp: 40-43.

Thai Environmental Institute, 2007. School for Better Climate. TEI, Thailand, ISBN: 9789748479194, pp: 49-55.