



Environmental Literacy for Holistic Asian Elephant Conservation in Thailand

Alongkot Chukaew¹, Wee Rawang², Seree Woraphong³, Kanok Wongtrangan⁴

¹Department of Education, Faculty of Social Sciences and Humanities, Mahidol University, Thailand, Email: alongkot.official@gmail.com

²Department of Education, Faculty of Social Sciences and Humanities, Mahidol University, Thailand, Email: wee.row@mahidol.ac.th

³Department of Education, Faculty of Social Sciences and Humanities, Mahidol University, Thailand, Email: seree.wor@mahidol.ac.th

⁴Former Member of the Thai Parliament, field of interest: Educational Management Thailand, Email: Kanok.wo@gmail.com

*Corresponding author's E-mail: alongkot.official@gmail.com

Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 11 Sept 2023	<p>This research aimed to enhance environmental literacy to support holistic Asian elephant conservation in Thailand. The research design involved a combination of qualitative and quantitative research methods. The current perception of Asian elephants was assessed through questionnaire responses from 400 students and their parents who participated in elephant conservation programmed at Khao Yai Elephant Conservation Centre from 2018 to 2022. Following this, a SWOT analysis was conducted, and an environmental literacy programmed was developed based on research and development, as well as guidelines for holistic Asian elephant conservation. The quantitative data were analysed statistically using percentages (%), mean scores (\bar{x}), standard deviations (SD), and t-tests, whereas the qualitative data were examined using content analysis. The research findings revealed that the majority of participants scored at a moderate level on Asian elephants. Their level of elephant knowledge was found to be low (31.50%), while their level of awareness of elephant conservation (43.18%) was moderate and that of elephant conservation expectation was high (42.25%). The development of environmental literacy was based on system theory and integrating various educational methods. We propose three practical recommendations: (1) Sufficient emphasis should be placed on building environmental literacy before establishing holistic Asian elephant conservation to facilitate sustainable development; (2) encouragement of Asian elephant knowledge and public participation in Thailand is essential; and (3) people's attitudes towards Asian elephant conservation should shift from a singular perspective to a more holistic view that encompasses the well-being of elephants, villagers, and the overall environment.</p>
CC License CC-BY-NC-SA 4.0	Keywords: Asian elephants, environmental literacy, holistic elephant conservation

1. Introduction

The biotic and non-biotic environments are connected (Phra Dhammapitaka, 1996). The conventional concept of species conservation, which focuses on a singular perspective, needs to evolve into a more holistic approach that systematically considers all aspects of nature as making up one interconnected system (King Bhumbol, 2017). This viewpoint aligns with the statements made by Chukaew, the

director of the Thai Elephant Conservation Centre in Khaoyai, Nakhon Ratchasima Province, in north-eastern Thailand. With years of experience in elephant conservation, Chukaew emphasizes that elephant conservation should consider not only the elephants but also other factors (Chukaew, 2015), such as their habitats (Baskaran et al., 1995). An evaluation of population size, particularly indications of declining elephant populations, prompted the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to list the Asian elephant species in Appendix 1 in 1976 and to announce the CITES Monitoring Programmed, known as the Monitoring of the Illegal Killing of Elephants. Furthermore, studies on elephant population sizes have provided insights into their lifespan in various habitats, their ideal living environment, and strategies ensuring the longevity of the entire population. However, these factors must be considered alongside the distribution and density of elephant populations, protected forests designated for elephants, wildlife corridors between conservation areas, and the challenge of human-elephant conflict (De Silva, 1998). Phra Dhammapitaka (1996) states that sustainable development focuses on integration, holistic thinking, and balance. Additionally, environmental actualization and public participation are crucial elements of sustainability (Sathumanatphan, 2018). Therefore, our research objective is to develop an environmental literacy programmed to support the holistic conservation of Asian elephants in Thailand.

2. Literature Review

Environmental Literacy

Environmental sustainability is found not in the environment, but rather in human wisdom, specifically, environmental literacy (Rawang, 2020). Furthermore, sustainability requires both individual and social engagement. Environmental literacy involves personal development before public participation (Bennett, 1984). The development of environmental sustainability encompasses six dimensions: (1) awareness of environmental problems and their causes, (2) attitudes towards handling environmental problems, (3) knowledge of environmental problems and related factors, (4) skills to solve environmental problems, (5) participation in solving environmental problems, and (6) the ability to accurately evaluate and forecast future environmental problems (United Nations Educational, Scientific and Cultural Organization (UNESCO, 1978).

Asian Elephants

Elephas maximus and *Loxodonta africana* originated and evolved from the moeritherium. The Asian elephants originated and were distributed around the Tigris–Euphrates Rivers and extended from western to eastern Asia, encompassing Persia, the Indian subcontinent, Southeast Asia, South Asia, Sri Lanka, Java, Sumatra, Borneo, as well as the north of China reaching the Yangtze-Kiang basin (Mariappa, 1986). In Thailand, there are approximately 8,488–8,857 Asian elephants, including 4,013–4,422 wild elephants living in protected areas such as wildlife sanctuaries, national parks, and some forest parks. There are 4,435 domestic elephants within communities and elephant conservation centres (Sukumar, 1986).

Holistic Conservation

Holistic, integration, and balance are significant characteristics of sustainability (Phra Dhammapitaka, 1996). In philosophy, human wisdom is categorized into three levels: rationality, holism, and changeability (Jumsai Na Ayudhaya, 2003). Holistic conservation refers to the integrated knowledge and actions aimed at promoting a high quality of life for elephants, villagers, and the environment within a community (Chukaew, 2003).

Research Concept

This study's foundation lies in the cognitive theory and system theory. Cognitive theory draws from the ideas of Noam Chomsky, who asserts that human behaviors are influenced by internal mental processes. Chomsky states, 'Human beings are not white cloths which can be changed into any color we apply; they have their own different thoughts, emotions, and feelings. So, learning design should consider the internal difference of human beings' (Erickson, 1998). Philosophers in this group believe that human learning is not only a set of behaviors responding to external stimuli, but a more complex process involving data collection, interpretation, and the establishment of information relationships, which guide subsequent action. Learning, in essence, is an intellectual process that fosters a comprehensive understanding, leading to intellect-based systematic knowledge (Hulse et al., 1981).

Contrarily, system theory (Betalanffy, 1968) posits that genuine systems are open, showcasing their interactions with both internal and external environments while offering both a partial and a holistic perspective. In 1977, Bertalanffy segregated general system theory involving cause-effect relationships into five parts: (1) input, (2) process, (3) output, (4) outcome, and (5) impact.

3. Materials And Methods

The research was conducted at the Khaoyai Thai Elephant Conservation Centre, located in Pakchong District, Nakhon Ratchasima Province, in north-eastern Thailand, from 2018 to 2022. The research design was a combination of qualitative and quantitative research methods. First, a survey was conducted to examine the perception of Asian elephant conservation in Thailand. The survey participants consisted of 400 students and their parents who had participated in elephant conservation programmes. Second, research and development (R&D) techniques were employed to synthesise an environmental literacy programme. This involved developing guidelines for holistic Asian elephant conservation through a series of workshops targeting students, parents, and other stakeholders. In addition, small group discussions were conducted with community leaders, and in-depth interviews were held with local experts and academic technicians specializing in Asian elephant conservation. The quantitative data were analysed statistically using percentages (%), mean scores (\bar{x}), standard deviations (SD), and *t*-tests, whereas the qualitative data were examined using content analysis.

4. Results and Discussion

The research findings focused on three key areas: (1) the present perception of Asian elephants in Thailand, (2) the development process of environmental literacy, and (3) holistic Asian elephant conservation.

Current Perceptions of Asian Elephants in Thailand

The majority of respondents demonstrated a moderate level of perceptions towards Asian elephants on a 5-level scale, with a low level of knowledge about Asian elephants (31.50%), a moderate level of awareness about Asian elephant conservation (43.18%), and a high level of expectations regarding Asian elephant conservation (42.25%) (See Table 1).

Table 1. Participants' Current Perceptions of Asian Elephant Knowledge, Conservation, and Conservation Expectation

Items	Current Perception					Mean (\bar{x})
	Very Low	Low	Moderate	High	Very High	
(1) Asian Elephant Knowledge	131 (32.75)	126 (31.50)	96 (24.00)	37 (9.25)	10 (2.50)	1.89
(2) Asian Elephant Conservation	3 (0.89)	11 (2.66)	170 (43.18)	161 (40.33)	55 (13.69)	3.20
(3) Asian Elephant Conservation Expectation	3 (0.75)	12 (3.00)	73 (1.75)	169 (42.25)	143 (35.75)	4.00
Mean (\bar{x})	11.46	12.39	13.14	33.70	29.31	3.03

Note. The informants' responses indicated an overall moderate level ($\bar{x} = 3.03$) of perception. Specifically, they exhibited a high level of Asian elephant conservation expectation ($\bar{x} = 4.00$), a moderate level of Asian elephant conservation ($\bar{x} = 3.20$), and a relatively lower average level of knowledge about Asian elephants ($\bar{x} = 1.89$).

Table 2 presents the SWOT analysis conducted for Asian elephant conservation in Thailand. The results revealed a distinction between the internal and external parts. In particular, the internal strength encompasses five aspects: (1) elephants are regarded as a symbolic representation of Thailand; (2) Thai people and elephants are parts of national history; (3) the current elephant population has experienced a decline; (4) elephants have a prominent presence in various religious teachings, particularly in Buddhism, the national religion; (5) elephants have provided long-standing benefits to Thailand. The internal weakness covered five aspects: (1) a lack of systematic participation

in Asian elephant conservation; (2) a lack of systematic transmission of knowledge about Asian elephant conservation from previous generations to the present; (3) a limited understanding of elephant conservation leading to a low level of conservation efficiency; (4) outdated laws related to elephant conservation promotion and support in relation to current circumstances; and (5) a general lack of awareness about elephants in society. The external opportunities covered three aspects, including: (1) increasing global emphasis on environmental conservation, (2) the influence of CITES on governmental policies regarding elephant conservation, and (3) elephants being listed as endangered species. The external threat covers four aspects, including: (1) a limited understanding of elephant husbandry in Western cultures; (2) societal value placed on elephant ivory and other elephant parts for ornamental purposes; (3) encroachment upon elephant habitats; and (4) inadequate global knowledge and understanding of elephant conservation, including the context and distinctions between domestic and wild elephants.

Table 2. SWOT Analysis of Asian Elephant Conservation in Thailand

Strength: S	Opportunity: O
<ol style="list-style-type: none"> 1. Elephants are a symbolic representation of Thailand. 2. Thai people and elephants are a part of national history. 3. The decline of the current elephant population. 4. Elephants have a prominent presence in various religious teachings, particularly in Buddhism, the national religion. 5. Elephants have provided long-standing benefits to Thailand. 	<ol style="list-style-type: none"> 1. Increasing global emphasis on environmental conservation. 2. The influence of CITES on governmental policies regarding elephant conservation. 3. Elephants being listed as endangered species.
Weakness: W	Threat: T
<ol style="list-style-type: none"> 1. A lack of systematic participation in Asian elephant conservation. 2. A lack of systematic knowledge transmission about Asian elephant conservation from previous generations to the current generations. 3. A limited understanding of elephant conservation leading to a low level of conservation efficiency. 4. Outdated laws related to elephant conservation promotion and support in present circumstances. 5. A general lack of awareness about elephants in society. 	<ol style="list-style-type: none"> 1. A limited understanding of elephant husbandry in western cultures. 2. Societal value placed on elephant ivory and other elephant parts for ornamental purposes. 3. Encroachment upon elephant habitats. 4. Inadequate global knowledge and understanding of elephant conservation, including the context and distinctions between domestic and wild elephants.

Process of Environmental Literacy Development

As shown in Figure 1, findings of the survey revealed the necessity to determine the current perceptions of elephant conservation before performing the SWOT analysis and preparing the educational input for the learners, curriculum, activities, media and technology, and environmental educators. The educational process involved multimedia lectures in a classroom, operational learning in a laboratory, and outdoor direct learning with elephants to achieve the educational products. The educational products included output-outcome-impact. Environmental literacy served as the primary educational output, encompassing two levels of behaviour—internal and external. The internal behaviour focused on awareness, attitude, and knowledge, while the external behaviour centred on skill, participation, and the ability to evaluate. This environmental literacy served as a basis for holistic Asian elephant conservation resulting in a sustainable environment as the final impact.

In system theory, the environmental literacy development process involves three integrated approaches: (1) multi-media lectures in a classroom, (2) operational or experimental learning in a laboratory, and (3) outdoor direct learning with elephants, as detailed in Table 3. However, it is essential to achieve environmental literacy through the educational process before comprehensive guidelines for holistic Asian elephant conservation can be developed.

Table 3. Environmental Education (EE) Processes for Building Environmental Literacy

EE Approaches	Details
(1) Lecturing - Learning from multimedia lectures in a classroom	<p>1.1 Objective: Learning about the evolution of the Asian elephant and holistic conservation</p> <p>1.2 Content: World Origination Based on Big-Bang Theory, Elephant Evolution, Elephant Ecology, Welfare, Cultures and History, Religion, Management, Conservation Participation and Propaganda.</p> <p>1.3 Procedure: Approximately 50 students learning in a class with multi-media for two hours and taking a pretest before learning.</p> <p>1.4 Evaluation: Evaluation Form and After-Action Review: AAR Technique</p>
(2) Operational Learning - Experimental learning in a laboratory	<p>2.1 Objective: Learning about elephant biology</p> <p>2.2 Content: Elephant Feeding System, Elephant Parasites, Elephant Excretory System, and Elephant Dung.</p> <p>2.3 Procedure: The experimental learning starts with a researcher explaining to 20–30 students in a laboratory about the elephant feeding system, parasites, excretory system, and elephant dung. Later, they prepare saturated brine for separating parasite eggs from elephant dung; take a drop of saturated brine with parasite eggs on a plate and look under the microscope to count and calculate the number of parasite eggs in an elephant.</p> <p>2.4 Evaluation: Evaluation Form and After Action Review: AAR Technique</p>
(3) Direct Learning - Outdoor learning with elephants	<p>3.1 Objective: Learning about elephant behaviour in response to other elephants, human beings, and the surrounding environment.</p> <p>3.2 Content: Elephant behaviors, action, and sound</p> <p>3.3 Procedure: Approximately 30–50 students in a one-hour outdoor class with direct learning with elephants.</p> <p>3.4 Evaluation: Evaluation Form and After-Action Review: AAR Technique</p>

Holistic Asian Elephant Conservation

Holistic Asian elephant conservation involves integrated learning across various fields to support a high quality of life of Asian elephants in Thailand. These include biology, anatomy, ecology, behaviours (ethology), welfare, culture and history, elephants in religion, situations and threats, management, conservation, public participation, and propaganda.

Efficiency Evaluation on Holistic Asian Elephant Conservation

An evaluation was conducted to assess the quality of the innovative process, which was statistically analysed using the Item-Objective Congruence index. The evaluation involved 50 voluntary participants who took part in a three-day operational training programme at the Thai Elephant Conservation Centre. The participants' evaluation was based on the Kirkpatrick Evaluation Model (Kirkpatrick, 2006) and focused on four aspects: (1) satisfaction, (2) learning (attitude, knowledge, skill), (3) behaviour, and (4) public benefits. The data were analysed using a *t*-test. Most of the participants were female (64%), 35–40 years of age (52%), held a bachelor's degree (74%), believed in Buddhism (98%), were company officers (46%), had no experience of elephant conservation (88%), and received elephant news mostly from the mass media (40%). The research findings

indicated that the overall innovation efficiency was very high, with participants reporting very high satisfaction, high learning, very high behaviour, and high public benefits, as presented in Table 4.

Table 4. Efficiency Evaluation of the Environmental Literacy Process for Holistic Asian Elephant Conservation in Thailand

Items	Before		After		Efficiency Levels
	\bar{x}	<i>SD</i>	\bar{x}	<i>SD</i>	
Internal Skills					
1. Satisfaction	7.86	1.47	9.71	0.21	Very high
2. Learning	8.00	1.02	9.71	0.20	High
External Skills					
3. Behaviour	7.50	1.20	9.17	0.35	Very high
4. Public Benefits	7.25	0.86	9.25	0.25	High
Average	7.65	1.13	9.46	0.25	Very high

Low perceptions of Asian elephant knowledge

Knowledge, particularly systematic knowledge, plays a crucial role in environmental literacy (UNESCO, 1978), and is a significant factor in shaping people's attitudes and behaviours (Natsupha, 2014). This aligns with the perspectives of most local experts (in-depth interviews with elephant academic technicians, October 12, 2020), who confirmed that knowledge pertaining to Asian elephants is primarily held with individual mahouts or elephant keepers and local experts who have worked closely with elephants in villages. This knowledge has been passed down through generations.

Environmental perceptions and SWOT analysis

These steps must be performed before developing environmental literacy, similar to Rogers's (2003) statement that innovations are more effective when designed based on understanding of the existing conditions of elephant conservation.

Holistic effects of conservation on elephants, villagers, and the community

Our results are in line with Kupchella's (1993) assertion that holistic management prevents conflict with human health, human activities, and environmental balance. Moreover, holistic concepts require a systematic view and should be integrated into a unified system. Santiapillia and Jackson (1988, p. 1) suggested that Asian elephant conservation should not rely solely on a single view focused on specific species but should be structured based on holistic considerations since elephants cannot exist in isolation; they play a vital role in the survival of forests and other species.

5. Conclusion

This research aimed to develop environmental literacy to support holistic Asian elephant conservation in Thailand. A combination of qualitative and quantitative research methods was applied in the research design. The current perception of Asian elephant conservation was evaluated using a questionnaire administered to 400 students and their parents who had participated in elephant conservation operational programmes. Thereafter, environmental literacy development was undertaken through R&D, as well as developing guidelines for holistic Asian elephant conservation, which involved workshops, small group discussions, and in-depth interviews with local experts and academic technicians at the Thai Elephant Conservation Centre in north-eastern Thailand from 2018 to 2022. The qualitative data were examined using content analysis and the quantitative data were analysed statistically using percentages (%), mean scores (\bar{x}), standard deviations (*SD*) and *t*-tests. After the determination of the current perceptions of Asian elephants and the SWOT analysis, the educational input was prepared for the learners, curriculum, activities, media and technology, and

environmental educators. The educational output included environmental literacy covering internal behaviour (awareness, attitude, knowledge) and external behaviour (skills, participation, the ability to evaluate). The educational outcome was holistic Asian elephant conservation performance involving integrated knowledge and activities to ensure a high quality of life of elephants, villagers, and the environment.

Recommendations

We propose three practical recommendations: (1) Sufficient emphasis should be placed on building environmental literacy before establishing holistic Asian elephant conservation to facilitate sustainable development; (2) encouragement of Asian elephant knowledge and public participation in Thailand is essential; and (3) people's attitudes towards Asian elephant conservation should shift from a singular perspective to a more holistic view that encompasses the well-being of elephants, villagers, and the overall environment.

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Conflict of interest:

The authors declare no conflict of interest.

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