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Elementary Teachers' Environmental Education Cognition and Attitude: A Case Study of the Second Largest City in Taiwan

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Abstract: This study aims to explore the perceptions and attitudes of national elementary school teachers toward environmental education to understand the difference between different teachers' background variables on environmental education cognition and attitude and the correlation between cognition and attitude. This research adopts the questionnaire survey method and takes elementary school teachers from the second largest city in Taiwan, Taichung City, as the research sample. Stratified random sampling was adopted, and 636 questionnaires were distributed. In total, 536 questionnaires were effectively recovered, and the effective recovery rate was 84.27%. The descriptive statistical analysis of sample data, an independent sample T-test, a one-way analysis of variance, Scheffe's comparison test, and Pearson's product-difference correlation were used for analysis. The study results are: (1) Elementary school teachers in Taichung City have good environmental education and teaching cognition and environmental issue cognition. (2) The attitudes toward the environmental education of elementary school teachers in Taichung are positive and active. (3) Senior and experienced elementary school teachers in Taichung City have a high awareness of environmental education due to their participation in many workshops and environmental protection activities. Therefore, there are significant differences in the cognition and attitude of environmental education from elementary school teachers. (4) There is a significant correlation between the cognition and attitude of elementary school teachers in Taichung City toward environmental education. This research shows that teachers with more senior teaching experience have better cognition and attitude toward environmental education.

Keywords: elementary school teachers; cognitions of environmental education; attitudes toward environmental education

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1. Introduction

In the past hundred years, human beings have continuously used the Earth's limited natural resources to satisfy our material appetite. The natural environment has been destroyed to a considerable extent, and the problem of global warming has become increasingly serious. As members of the Earth, we, faced with environmental pollution, cannot keep out of the business. Environmental protection is an issue that many countries attach great importance to. Solid basic education is required to help people build a correct and solid environmental awareness, indicating that the importance of environmental education

is self-evident. In order to solve the environmental problems that we are concerned about, we must face the problems caused by environmental variation and promote environmental education [1].

In 2015, the United Nations adopted the "2030 Agenda for Sustainable Development" and proposed 17 Sustainable Development Goals (SDGs), including three key issues of economy, society, and environment, which have become the common language for promoting sustainable development in the world [2]. Environmental education is seen as a pioneer in environmental protection. The implementation of environmental education can effectively promote the concept of environmental protection and implement environmental protection policies. In Taiwan's environmental protection policy, environmental education occupies a very important part. The implementation of environmental education can be carried out by schools, families, and society [3]. Awareness of the environment can be raised through the educational process. Education is a key element in preventing and addressing environmental problems [4,5]. Environmental problems can only be solved through effective environmental education [6].

Taiwan promulgated the Environmental Education Act in 2010. Article 1 states the purpose of the legislation: "The Environmental Education Act is formulated to promote environmental education, assist citizens to understand the interaction of individuals and society with the environment, and enhance the environmental awareness, environmental ethics, and responsibility of the nation taking as a whole, so as to safeguard the ecological balance of the environment, respect lives, promote social justice, and cultivate environmental citizens and environmental learning communities in order to achieve sustainable development". It also states in Article 19-1 that those who should receive environmental education are: "Institutions, state-run business institutions, high schools and secondary schools, and statutory bodies with over 50% of the funds sponsored by the government shall formulate environmental education programs every year to promote environmental education. All employees, teachers, and students shall attend an environmental education program for more than four hours" [7,8]. Current environmental issues include food security, renewable energy, village development, marine resources, nuclear energy and radiation, and promoting museums to build environmental education fields. As school education has fixed premises and similar educatees in nature, it is easier to implement environmental education in this environment than in family and social education. Teachers are most influential in educating children and youths to be leaders in future environmental advocacy [9]. Therefore, most scholars believe that if environmental education can be implemented in schools, more significant results will be achieved [10]. The Taichung City Government's latest National Environmental Education Action Plan proposes strategies that can be taken further; for example, encouraging enterprises, communities, and various communities to participate in environmental education, establishing an environmental literacy indicator framework to evaluate the effectiveness of environmental education implementation, and adjusting education issues in line with the times [11].

Ham and Sewing mentioned that the effectiveness of environmental education promotion could be seen from the teachers' attitudes toward environmental education and their ability to implement environmental education [12]. If teachers did not pay attention to environmental issues, or their own expertise in environmental education was insufficient, they were less willing to implement environmental education in the school curriculum [13,14]. Xie found that most teachers could not make good use of various teaching methods to implement environmental education or even found it difficult to allocate adequate time for environmental education [15]. In addition, the teachers could not compile teaching materials and produce related materials by themselves, and thus they encountered the problem of insufficient professional ability when carrying out environmental education [16–19].

In terms of green schools, elementary schools have a higher participation rate than junior high schools, and junior high schools have a higher participation rate than senior high schools [20]. Due to academic pressure, teachers and students attach great importance to entrance examinations, which significantly affects schools' willingness to integrate

other important agendas into teaching activities [21,22]. Environmental education is not a subject included in entrance examinations. If teachers are not particularly interested in it, it is often ignored by schools [21,23]. Damerell, Howe, and Milner-Gulland (2013) believe that environmental education is becoming more and more important, mainly in promoting environmental education attitudes, awareness, and knowledge [24]. Through questionnaire analysis, it is found that teachers, media, and school curricula can achieve higher expectations for improving students' environmental awareness. Public schools are important places for cultivating children's environmental agency, and classroom teachers play an important role in this identification process. Teachers who provide opportunities for the development of environmental learning and caring behaviors during school play an important role in developing the next generation of environmental managers [25]. In 2014, our country promulgated the Curriculum Guidelines of 12-Year Basic Education, which clearly defined environmental education as one of the important topics in the new national education curriculum for the future. The connotation of environmental education in the new syllabus planned by the Ministry of Education in 2015 has five themes, including environmental ethics, sustainable development, climate change, disaster prevention and rescue, and the sustainable utilization of energy resources [26]. The elementary school stage is the beginning of the 12-year national compulsory education in our country. It is the best period to promote environmental education. Through the clear definition of the curriculum syllabus, it is very important for elementary school teachers to have a positive attitude toward environmental education. Cognitive learning is the foundation of environmental education. Guided by important concepts, it is convenient for textbook editors, curriculum and instruction designers, and learners to quickly become familiar with current international trends and national policy developments. Domestic literature rarely explores the influence of teachers on students' environmental knowledge, but in the process of education, teachers play a role in guiding students' growth. Teachers' own cognition of environmental ethics has an important influence on the promotion of environmental education in schools. In order to effectively implement environmental education and enable students to have positive environmental attitudes and values, it is necessary for the students to understand teachers' cognition and attitude toward environmental education. Therefore, the purpose of this study is to probe and analyze the current situation of elementary school teachers' cognition and attitudes toward environmental education and explore the correlation between their cognition and attitudes.

2. Literature Review

2.1. Definition of Environmental Education

The term "Environmental Education" first appeared in Paul and Percival's 1947 book Communitas [27]. In 1970, the United States enacted the Environmental Education Act. Environmental education in the Act is defined as: "Environmental education is the education process dealing with humankind's relationship with the natural and human-made surroundings and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, economic impact, and urban and rural planning to the total human environment" [28–30]. Environmental education encompasses socioeconomic, political, and cultural dimensions [31]. Environmental education is a comprehensive discipline with special forms of educational content and methods. For effective environmental education, it is necessary to rely on properly trained personnel [32,33].

In the opinion of Lee, environmental education means that educators, out of concern for our living environment and through curriculum design and actual teaching activities, effectively teach students environmental knowledge including environmental problems that have occurred or may occur in the future [28]. It enables students to care about the surrounding environment, then take care of our environment, and not only have the knowledge to solve environmental problems when faced with difficult environmental problems but also actively face and solve the problems. Environmental education is an educational process that promotes individuals or society to understand the environment and respond

to known or potential environmental problems. It aims to improve learners' environmental knowledge and attitude, improve environmental quality, and promote sustainable environmental development [34–38]. Environmental education and social problems are inseparable [39–41]. Environmental education is for teachers to use relevant teaching resources to teach so that students can understand the environment we live in, and then improve the environment in which to live. It is a kind of life education that trains students to take the initiative to care about the environment and to solve environmental problems [42]. Environmental education often needs to guide students to understand the environment and the land where each grows through courses or teaching materials, so as to cultivate students' positive environmental attitudes and values [43]. Marcinkowski (2010) clearly pointed out in the article [Contemporary Challenges and Opportunities in Environmental Education] that the first challenge in the field of environmental education in the future is to continuously expand opportunities for the professional development of personnel [44]. In order to make environmental education professionally developed, it is recommended that the series of excellence guidelines developed over the years by Simmons lead the team of the North American Association for Environmental Education (NAAEE) [45]. The six major competencies of environmental educators proposed by NAAEE include: (1) Environmental literacy, (2) Foundations of environmental education, (3) Professional responsibilities of environmental educators, (4) Planning and implementing environmental education programs, (5) Promoting learning, (6) Evaluation [46,47]. At present, among the 14 state certification methods for the certification mechanism of environmental education personnel in the United States, most of the NAAEE guidelines for excellence are used as the reference criteria for developing the capabilities of each state [48]. According to the definition of Taiwan's Environmental Education Act, environmental education: "Referring to the adaptation of educational means by which to culminate the citizens to understand their ethnical relationship to the environment, enhance the citizens' environmental protection awareness, skills, attitudes and values, and steer the citizens to emphasize the environment and adopt actions to achieve a civility education process that harbors sustainable development" [49].

2.2. Development of Environmental Education

"Environmental education" originated from the declaration issued by the United Nations Conference on the Human Environment in 1972, which urged people to pay attention to environmental issues. It was mentioned in the conference that every country should pay attention to environmental issues and actively promote environmental education. After the conference, the United Nations Environmental Programme (UNEP) was established; its main task is to promote international cooperation on matters affecting the human environment, formally determine the name of "environmental education", and emphasize its importance. At the same time, 5 June of each year is designated as "World Environment Day", representing that human society has entered a new era of protecting the Earth [50–53]. The 21st Century Agenda (Our Common Future) of the World Commission on Environment and Development (WCED) in 1987 and the Earth Summit in 1992 proposed the 21st Century Agenda, making environmental education a worldwide priority [54]. The United States is the first country in the world to have special legislation on environmental education because the proliferation of environmental pollutants in the United States and international environmental problems have caused serious threats to the health and environmental quality of American citizens [52]. The Belgrade Workshop on Environmental Education was held in 1975, and the Belgrade Charter signed during the Workshop states that we should have the knowledge, technology, attitudes, and other components related to environmental protection to solve the environmental problems that are faced at present and in the future [55–57]. In 1977, the "Intergovernmental Conference on environmental education" held in Tbilisi, Georgia, the former Soviet Union, pointed out in the Tbilisi declaration that environmental education should pay attention to the complex relationship between socioeconomic development and environmental improvement so that learners can acquire knowledge, values, attitudes, and practical skills. In addition to using the

necessary knowledge to interpret the complex phenomena that constitute the environment, they can also participate in and solve expected or known environmental problems in a responsible and effective manner [58]. Environmental education in Brazil began with the environmental protection movement in the early 20th century. It was proposed in 1993 and announced in 1999, and the implementation rules were announced in 2002. The ultimate goal of its legislation is to enable individuals and groups to protect the environment and enjoy a healthy quality of life and sustainable development [59]. In 2009, according to the resolution of the United Nations, 22 April was designated as "International Mother Earth Day" and a non-profit organization connected to the World Earth Day Network (EDN), which promoted "Earth Day" to the world and pushed environmental issues to the world stage [35]. The international expectation of environmental education is not only to promote learners' awareness but also to cultivate their knowledge and ability required for environmental protection through environmental education [60,61].

Although Taiwan is not a member of the United Nations, it is affected by the trend of international environmental awareness and the strong advocacy of environmental education by the news media and non-governmental environmental protection organizations. In 1987, Taiwan established the Environmental Protection Administration, Executive Yuan, and set up the Education Advocacy Section as the unit responsible for environmental education. In the same year, the Executive Yuan approved the "Environmental Policy Program at the Current Stage" and stated that it would promote environmental education to enhance the public's awareness of environmental protection and accelerate the cultivation of environmental education talents to facilitate the development of environmental protection science and technology. Taiwan's research and development in environmental education have gone through more than 20 years [62,63]. The Environmental Protection Administration, Executive Yuan formulated an official environmental education plan document in 1988, which, by reference to the definition of the Belgrade Charter, defines environmental education as an educational process that instructs people to explore or learn about three areas related to the environment, namely, knowledge, skills, and willingness, and can generate behavior [64].

Since 2010, Taiwan, the United States, Brazil, Japan, South Korea, Malaysia, and the Philippines have paid attention to environmental education and successively formulated relevant special laws to implement environmental education, maintain environmental ecology, respect life, promote social justice, cultivate environmental citizens and environmental learning communities, and achieve the goal of sustainable development [53,65]. McKeown-Ice (2000) conducted a survey of 715 public and private higher education institutions in the United States to investigate their current efforts around environmental education teacher preparation. The results showed that most felt that their course teachers were inadequately prepared in this regard [66]. Takahiro Yamanoi et al. conducted a 2021 survey of 363 elementary school teachers and 259 junior high school teachers in Tochigi Prefecture, central Japan, to investigate which environmental and personal factors determine nature-based education in elementary and middle schools. The results show that to promote nature-based education in schools, it is important to improve teachers' nature relevance and ecological knowledge, as well as provide more green spaces within schools [67]. Sukma et al. conducted an environmental education survey of 128 elementary school teachers in Padang, Indonesia in 2020. The results show that, at the elementary level, science learning is the learning that can best be integrated with environmental education [68]. Shaho Karami et al., in 2018, conducted a survey of teachers' attitudes toward the environment and teachers' readiness for students' environmental education using 127 elementary school teachers in 10 elementary schools in Tehran's. The results show that most elementary school teachers' attitudes toward the environment and teachers' preparation for students' environmental education are very insufficient. Therefore, it is very important to strengthen the environmental education training of elementary school teachers [69].

Environmental education in Taiwan: Kao and Chang mentioned that a nine-year consistent environmental education goal is to stimulate students' environmental awareness

and sensitivity through teaching activities in various fields, enrich their environmental knowledge, and cultivate their environmental values so that they have the ability to solve environmental problems when faced with local environmental problems and can become an environmentally literate citizen [70]. The nine-year consistent curriculum contains six major issues, namely, gender equality education, environmental education, information education, human rights education, career development education, and maritime education. Environmental education, which has been listed as a major issue in the nine-year consistent curriculum, is a global environmental protection thought and trend, caring for the living environment of the next generation. It includes the connotation of "personal development, social justice, and environmental protection" and is in line with the concept of education reform [71].

At present, three "learning goals" are proposed in the explanatory document of the 12-year National Education for Environmental Education Course [72], namely, recognizing and understanding the environmental crises and challenges facing human survival and development: Climate change, resources, biodiversity loss, and social and environmental injustice; thinking about the meaning of personal development, national development, and human development; carrying out green, simple, and sustainable life actions. In the core literacy of the 12-year national education course, the core literacy of environmental education is composed of five learning themes: Environmental ethics, sustainable development, climate change, disaster prevention, and the sustainable use of energy resources. Environmental education should enable students to actually carry out real environmental actions; in addition to having environmental cognition, students accepting environmental education are expected to finally have the ability to solve environmental problems and adopt practical actions and become global citizens who are responsible for the environment [73].

2.3. Environmental Cognition

Cognition is defined as an individual's understanding, awareness, and views toward an object, even including the individual's attitude toward the object, namely, the facts, knowledge, and beliefs about the object [74]. Cognitive learning is also the foundation to guide environmental education [75,76]. Environmental cognition, also known as environmental awareness, is the psychological process of human beings' understanding of the environment through environmental conservation activities and is also a channel for human beings to acquire knowledge [77,78]. Environmental cognition is a human's view toward the surrounding environment. It is produced through cognitive function, which summarizes principles by relying on various perceptions, so as to establish knowledge to guide behavior development and achieve adaptation to changing environments [79]. In the opinion of [80], the main purpose of environmental education is to increase the environmental knowledge of the educatees. Although many scholars doubt whether increased environmental knowledge can change personal environmental attitudes and behaviors, with measurements based on environmental knowledge, at least the effectiveness of environmental education in the cognitive field can be known. Chang believes that individual environmental cognition is a process of sensory stimulation, attention, recognition, and perception, and finally enters the memory to form cognition [81]. Lin believes that environmental cognition is the extent to which people think they understand the overall environment and related issues [82]. Chiang et al. proposed that environmental education can increase the depth of students' environmental cognition, trigger the change in environmental attitude, and enhance the willingness of environmental behavior [83]. Environmental cognition is a process in which people store, understand, and recombine environmental stimuli [84].

The purpose of environmental cognition is to encourage human beings to recognize and care about the environment and related problems, and have appropriate knowledge, technology, motivation, and commitment individually or as a whole to solve current problems and prevent new problems from occurring. Therefore, in order to solve environmental problems, the priority is to strengthen people's environmental cognition [85]. Environ-

mental cognition can also be called environmental awareness, which is the psychological process of a human being's understanding of the environment through environmental conservation activities [86]. Shiu and Jeng mentioned that environmental cognition can be regarded as an important process for achieving natural resource protection and maintaining ecological balance and sustainable development, a kind of interaction between environmental knowledge, and a skill of action strategy execution [87]. When existing problems are perceived by individuals, and through the interaction between humans and the natural environment, the sense, appreciation, and exploration of the environment can be cultivated, and the value of a responsible attitude toward the natural environment can be subsequently developed. Environmental cognition is the process of people storing, understanding, and reorganizing environmental stimuli. It not only involves the essential elements of the environment but also involves events, emotional attributes, and symbolic meanings of individuals or groups.

Through environmental cognition, the effect of environmental education in the cognitive field can be understood. The closer environmental knowledge is to daily life, the richer the students' knowledge. Environmental education must take root in the education of students at an early age and assist students in establishing basic environmental knowledge from school environmental education-related courses. When they can practice the knowledge in their daily lives, a comprehensive environmental education may be achieved [88]. The content of environmental education in elementary schools includes environmental awareness and sensitivity, knowledge of environmental concepts, environmental values and attitudes, and environmental action skills and environmental action experience. To achieve the goals of environmental education, elementary school teachers themselves need to increase their knowledge of social culture and natural environment, so that they can use different teaching strategies to teach students and effectively evaluate students' learning effectiveness and possess sufficient knowledge to respond to students' needs so that students can have a meaningful learning experience and acquire systematic knowledge.

2.4. Environmental Attitude

Attitude means an individual's persistent and consistent tendency toward people, things, and the surrounding world [89]. Attitude can be predicted from external behaviors, but its connotation is not limited to external behaviors [90]. The term environmental attitude originated from the International Conference on Environmental Education in Tbilisi in 1977 [91,92]. Hines et al. (1987) define environmental attitudes as a combination of beliefs about particular circumstances in the environment, the environment as a whole, or people or things directly related to the environment, which include overall assessments of approval or disapproval, like or dislike [93]. Weigel and Weigel (1978) believed that the environmental attitude measurement method can understand the individual's degree of concern for environmental quality and the tendency of solving strategies [94]. Caron (1989) believes that environmental attitude is the degree of commitment and support of individuals to environmental things [95]. In the opinion of Can and Hongbing [96], environmental attitude, which has a significant influence on and even dominates human behaviors, shows a significant positive influence on the behavior of customers' attitudes, knowledge, and abilities. Environmental attitudes are human beings' psychological responses and performances regarding people, things, and substances under general or special situations based on the experience they have learned in the past or the contacts and experiences they have experienced from the environment, including concerns for the environment and motivation and belief in action [97].

The connotation of environmental attitude should be dominated by environmental ethics and include natural resources, environmental development, environmental protection, ecological relations, and environmental responsibility [98]. Environmental attitude is the combination of beliefs about people and things directly related to the entire environment or special environmental situation, which includes psychological responses such as approval or objection, or like or dislike based on the overall assessment, and is a

behavioral tendency with consistency and persistence [93]. Environmental attitude is an individual's attitude toward the environment or environment-related issues and is mostly formed through learning in the process of socialization [90].

In the opinion of Chen and Chuang, environmental attitudes are defined as persistent and consistent beliefs about the environment as a whole or people and things related to the environment, including consent and opposition to or disliking and liking people and things related to the environment [99]. They mentioned that environmental attitude is the process whereby individuals or groups show behavior based on environmental cognition, emotions, motivations, and other factors. In the opinion of Weigel, the individual's degree of concern for environmental quality and tendency in choosing solution strategies can be understood through the environmental attitude [94]. Hungerford et al. (1985) pointed out that when individuals acquire more environmental knowledge, they will have a more positive environmental attitude, have a higher awareness of environmental perception, and are more willing to show positive environmental behaviors in activities [100]. The research of Wang et al. (2009) shows that environmental attitudes can positively influence environmental behaviors [101]. Chang et al. (2011) also pointed out that the higher the individual's awareness of the environment, the easier it is to produce responsible environmental behaviors [102]. Ou et al. (2012) studied the environmental attitudes and environmental behaviors of senior elementary school children, and the results showed that children with more positive environmental attitudes had more positive environmental behaviors [103]. In addition, Ou and Chen (2013) discussed environmental knowledge, attitudes, and behaviors with tourists in Sichongxi Hot Spring Area. The results show that environmental attitudes have a positive impact on environmental behaviors [104]. Wang and Chen (2018) took environmental education course students as research objects and found that place attachment indirectly affects environmental behavior through the mediating effect of environmental attitudes [105]. Lin (2019) took elementary school teachers in Tainan City as the research object, conducted an eco-tourism survey, and found that the environmental attitudes of elementary school teachers from different backgrounds were significantly different [106]. Tsay (2018) found that there were significant differences between elementary school teachers' eco-tourism cognition and environmental attitude based on the survey of elementary school teachers' eco-tourism cognition and environmental attitude in the Hualien area [107]. Zhuang (2011) investigated the environmental cognition, environmental attitude, and environmental issues of nuclear power generation with Taoyuan elementary school teachers as the research object and found that the environmental cognition and environmental attitudes of elementary school teachers with different backgrounds were significantly different [108]. Iozzi synthesized the literature research on environmental education for many years and found that when implementing environmental education, the two levels of cognition and attitude should be balanced. However, because personal attitudes are learned and nurtured in youth, attitudes are more important than cognition in elementary and secondary school [109].

3. Methodology

3.1. Participants and Sampling Process

This study uses national elementary school teachers in Taiwan's second-largest city as research participants. According to the Taichung City Government's 2022 data, there are 29 administrative districts in Taichung City. Taichung City has 29 administrative districts classified into four areas based on geographical environment and historical development, namely, the original Taichung City (Central District, East District, West District, South District, North District, Xitun District, Nantun District, and Beitun District), Shanxian District (Fengyuan, Dongshi, Shigang, Xinshe, Heping, Tanzi, Daya, Shengang, and Houli), Haixian District (Dajia, Qingshui, Shalu, Wuqi, Daan, Waipu, Longjing, and Dadu), and Tun District (Dali, Taiping, Wufeng, and Wuri) [110]. There are 536 people in this study, excluding principals and kindergarten teachers attached to elementary schools. The overall sampling distribution is consistent with the parent group and is representative of the

sample [111,112]. Table 1 shows the descriptive statistics of the personal background variables of the research sample. The gender is mostly female, accounting for 74.3%; the age is mainly 40–45 years old, accounting for 45.3%, and the teaching experience is mainly more than 16 years, accounting for 42.4%.

Table 1. Teacher background information analysis table. (n = 536).

Teacher Background Variables	Options	*n*	Percentage (%)
Gender	Male	138	25.7
	Female	398	74.3
Age	30 years old or younger	61	11.4
	31–40 years old	182	34.0
	41–50 years old	243	45.3
	51 years old or older	50	9.3
Years of teaching experience	5 years or less	77	14.4
	6 to 10 years	77	14.4
	11 to 15 years	155	28.9
	16 years or more	227	42.4
Current position	Tutor	275	51.3
	Subject teacher	104	19.4
	A teacher and concurrently holding an administrative position	157	29.3
Major	Related major	75	14.0
	Non-related major	461	86.0
Average number of relevant study hours per year	4 h or less	276	51.5
	5 to 10 h	167	31.2
	11 h or more	93	17.4
Number of participations in environmental protection-related activities within three years	0	279	52.1
	1–5	225	42.0
	6 or more	32	6.0

3.2. Measures

This study uses a scale developed by several scholars and published in academic papers as our measurement tool. The scale was reviewed and revised by four scholars and experts with doctoral degrees. All questionnaires were conducted in traditional Chinese.

3.3. Environmental Education Cognition

The scale developed by Chung (2021) was used in this study [113], which was revised to measure the environmental education cognition scale of elementary school teachers. Environmental education and teaching cognition mean the cognition that teachers have toward environmental education curriculum issues defined in the curricula of the Twelve-Year Basic Education. Environmental education issues are divided into five objectives and five topics, including Environmental Ethics, Sustainable Development, Climatic Change, Disaster Prevention and Response, and the Sustainable use of Energy Resources. They are used to understand that the environmental education curriculum can be integrated into other related subjects or be used in other alternative curricula, and to create the cognition that environmental education is interdisciplinary, cross-origin, has a global perspective, etc. [114]. Environmental issues cognition means the cognition of teachers toward the 2021 National Environment Protection Proposal approved by the Executive Yuan in Taiwan, which responds to the Agenda 2030 sustainable development of the United Nations (UN) and meanwhile considers the domestic environmental protection development trends and critical issues, including the concepts in five dimensions and 13 environmental issues items such as: Climate Action, Environmental Quality, Natural Conservation, Green Economy, and Partnership for Sustainable Development [115]. The new scale consists of two parts: (1) environmental education and teaching cognition with 14 questions, with an example of the items: "I understand that there are five issues in the environmental education of Twelve-Year Basic Education; I understand that interdisciplinary or cross-origin instruction can be

used in environmental knowledge". (2) Environmental issues awareness 13 questions, with an example of the items "I understand the major content of the global environmental problems (ex. climate changes and sustainable development); I understand the environmental protection related issues of United Nations (ex. biodiversity and low-carbon policy)". There are 27 questions on the scale, which are answered in the form of a Likert 5-point scale [116] (for example, very disagree = 1, very agree = 5). The higher the score, the higher the subject's environmental education cognition. The Cronbach's α coefficient of the cognitions of environmental education is 0.93. The results of exploratory factor analysis extracted two factors (environmental education and teaching cognition, and environmental issue cognition) which could explain 57.36% of the total variance, with the factor loading of each item between 0.82 and 0.91.

3.4. Environmental Education Attitude

This study is based on the environmental attitude scale of Lee (2002), Yen (2003), Mai (2003), Chang (2009), and Huang (2012) and develops an environmental education attitude scale that is consistent with the measurement of elementary school teachers [117–121]. The new scale consists of two parts: (1) there are nine questions in the evaluative response part, with an example of the items: "I am happy to implement environmental education in the classroom". (2) There are 13 questions in the part of behavior tendency, with an example of the items: "I am willing to use the network, digital teaching multimedia and other resources to carry out environmental education teaching activities". There are 22 questions on the scale, which are answered in the form of a Likert 5-point scale [116] (for example, strongly disagree = 1, strongly agree = 5). The higher the score, the higher the subjects' attitude toward environmental education. The Cronbach's α coefficient of the attitudes toward environmental education is 0.91. The results of exploratory factor analysis extracted two factors (evaluative response and behavioral tendency) which could explain 54.17% of the total variance, with the factor loading of each item between 0.82 and 0.92.

3.5. Research Hypothesis

The research hypotheses of this study are as follows:

H1. *There are significant differences in the cognition of environmental education among elementary school teachers in Taichung City with different backgrounds.*

H2. *There are significant differences in attitudes toward environmental education among elementary school teachers in Taichung City with different backgrounds.*

H3. *There is a positive correlation between elementary school teachers' cognition of environmental education and their attitude toward environmental education.*

3.6. Data Analysis Method

In this study, a cross-sectional questionnaire was used, and we used the Statistical Package for Social Sciences (SPSS; version 26) for primary analysis, including descriptive analysis, independent samples t-test, one-way ANOVA, and Pearson product. To explore the relationship between teachers' cognition in environmental education and attitude toward environmental education, the statistical test level is set at 0.05.

4. Results Analysis

4.1. Analysis of Cognitions and Attitudes toward the Environmental Education

Teachers' levels of agreement or conformity with various dimensions of cognitions and attitudes toward environmental education were divided based on average points: A score of 4.50 points or higher on average means "very good", a score between 3.50 and 4.49 points on average means "good", a score between 2.50 and 3.49 points means "acceptable", a score between 1.50 and 2.49 points means "bad", and a score of fewer than 1.50 points

on average means "very bad". The "environmental education and teaching cognition" and "environmental issue cognition" of environmental education in this study have an average score between 3.99 and 4.02 points, indicating that Taichung City elementary school teachers have a good level of cognition of environmental education, as shown in Table 2.

Table 2. Summary table of the current status of various dimensions of cognitions of environmental education (n = 536).

Factor Dimension	Number of Questions	M	SD	Ranking
Environmental education and teaching cognition	14	3.99	0.52	2
Environmental issue cognition	13	4.02	0.56	1
Overall cognitions of environmental education	27	4.01	0.50	

Taichung City elementary school teachers' attitude toward environmental education had an overall average score of 4.29 points, indicating that Taichung City elementary school teachers had a good attitude toward environmental education, as shown in Table 3.

Table 3. Summary table of the current status of various dimensions of attitudes toward environmental education (n = 536).

Factor Dimension	Number of Questions	M	SD	Ranking
Evaluative response	9	4.34	0.47	1
Behavioral tendency	13	4.26	0.51	2
Overall attitudes toward environmental education	22	4.29	0.46	

4.2. Analysis of Gender-Caused Differences in the Elementary School Teachers' Cognitions of Environmental Education

On the whole, it can be seen from Table 4 that the overall difference in cognitions of environmental education between the elementary school teachers of different genders do not reach a significant level (t = 0.888, $p > 0.05$), indicating that there is no significant difference in the cognitions of environmental education between the elementary school teachers. In terms of each dimension, it can be seen from Table 4 that the difference in the dimension of environmental education and teaching cognition" between the elementary school teachers of different genders does not reach a significant level (t = 0.614, $p > 0.05$), and the difference in the dimension of "environmental issues cognition" between the elementary school teachers of different genders does not reach a significant level (t = 1.018, $p > 0.05$).

Table 4. Summary table of t-test of cognitions of environmental education of the elementary school teachers with different genders (n = 536).

Factor Dimension	Gender	Number of People	M	SD	*t*	*p*
Environmental education and teaching cognition	Male	138	4.02	0.54	0.614	0.539
	Female	398	3.99	0.52		
Environmental issue cognition	Male	138	4.06	0.61	1.018	0.309
	Female	398	4.01	0.54		
Overall	Male	138	4.04	0.53	0.888	0.375
	Female	398	4.00	0.49		

4.3. Analysis of Gender-Caused Differences in the Elementary School Teachers' Attitudes toward Environmental Education

It can be seen from Table 5 that the overall difference in attitudes toward environmental education among elementary school teachers of different genders does not reach

a significant level (t = −0.996, $p > 0.05$), indicating that there is no significant difference in attitudes toward environmental education between the elementary school teachers of different genders. In terms of each dimension, it can be seen from Table 5 that the differences in the dimension of "evaluative response" among the elementary school teachers of different genders do not reach a significant level (t = −1.696, $p > 0.05$), and the difference in the dimension of "behavioral tendency" among the elementary school teachers of different genders does not reach a significant level (t = −0.454, $p > 0.05$).

Table 5. Summary table of *t*-test of attitudes toward environmental education of the elementary school teachers with different genders. (n = 536).

Factor Dimension	Gender	Number of People	M	SD	*t*	*p*
Evaluative response	Male	138	4.28	0.48	−1.696	0.090
	Female	398	4.36	0.46		
Behavioral tendency	Male	138	4.25	0.51	−0.454	0.650
	Female	398	4.27	0.51		
Overall	Male	138	4.26	0.47	−0.996	0.320
	Female	398	4.31	0.46		

4.4. Analysis of Differences in the Elementary School Teachers' Cognitions of Environmental Education Caused by Years of Teaching Experience

On the whole, it can be seen from Table 6 that the overall difference in cognitions of environmental education among elementary school teachers with different years of teaching experience reaches a significant level (F = 6.530, $p < 0.001$), indicating that there is a significant difference in cognitions of environmental education between the elementary school teachers with different years of teaching experience. After the post-event comparison, it was found that the elementary school teachers with more than 16 years of teaching experience (M = 4.10) have significantly better cognition of environmental education than those with 5 years of teaching experience (M = 3.92) and those with 6 to 10 years of teaching experience (M = 3.84). In terms of various dimensions, the difference in the dimension of "environmental education and teaching cognition" among the elementary school teachers with different years of teaching experience reaches a significant level (F = 8.421, $p < 0.001$). After post-event comparison, it was found that the elementary school teachers with more than 16 years of teaching experience (M = 4.11) had significantly better cognition of environmental education than those with less than 5 years of teaching experience (M = 3.91) and those with 6–10 years of teaching experience (M = 3.79). The difference in the dimension of "environmental issue cognition" among elementary school teachers with different years of teaching experience shows significance (F = 3.335, $p < 0.05$). However, after post-event comparison and verification, it was found that there is no significant difference among the groups.

4.5. Analysis of Differences in the Elementary School Teachers' Attitudes toward Environmental Education Caused by Years of Teaching Experience

On the whole, it can be seen from Table 7 that the overall difference in attitudes toward environmental education among elementary school teachers with different years of teaching experience reaches a significant level (F = 5.327, $p < 0.01$), indicating that there is a significant difference in attitudes toward environmental education among elementary school teachers with different years of teaching experience. After the post-event comparison, it was found that the elementary school teachers with more than 16 years of teaching experience (M = 4.37) had significantly better attitudes toward environmental education than those with 6 to 10 years of teaching experience (M = 4.14). In terms of various dimensions, it can be seen from Table 7 that the difference in the dimension of "evaluative response" among the elementary school teachers with different years of teaching experience reaches a significant level (F = 4.864, $p < 0.01$). After the post-event comparison, it was found that the

elementary school teachers with more than 16 years of teaching experience (M = 4.42) had significantly better evaluative responses than those with 6–10 years of teaching experience (M = 4.22). The difference in the dimension of "behavioral tendency" among the elementary school teachers with different years of teaching experience reaches significance (F = 4.972, $p < 0.01$). After the post-event comparison, it was found that the elementary school teachers with more than 16 years of teaching experience (M = 4.33) had significantly better behavioral tendencies than those with 6 to 10 years of teaching experience (M = 4.08).

Table 6. Analysis table of differences in cognitions of environmental education caused by different years of teaching experience. (n = 536).

Factor Dimension	Item				Analysis of Variance						Post-Event Comparison
	Years of Teaching Experience	Number of People	M	SD	Source of Variation	SS	*df*	MS	F	*p*	
Environmental education and teaching cognition	(1)	77	3.91	0.53	Between group	6.787	3	2.262	8.421 ***	0.000	(4) > (1),(2)
	(2)	77	3.79	0.56	Within group	142.916	532	0.269			
	(3)	155	3.97	0.52	Subtotal	149.703	535				
	(4)	227	4.11	0.49							
Environmental issue cognition	(1)	77	3.93	0.57	Between group	3.167	3	1.056	3.335 *	0.019	
	(2)	77	3.89	0.56	Within group	168.406	532	0.317			
	(3)	155	4.03	0.58	Subtotal	171.573	535				
	(4)	227	4.09	0.54							
Overall	(1)	77	3.92	0.50	Between group	4.794	3	1.598	6.530 ***	0.000	(4) > (1),(2)
	(2)	77	3.84	0.51	Within group	130.183	532	0.245			
	(3)	155	4.00	0.50	Subtotal	134.976	535				
	(4)	227	4.10	0.47							

1. n = 536; * $p < 0.05$; *** $p < 0.001$. 2. Years of teaching experience: (1) 5 years or less; (2) 6 to 10 years; (3) 11 to 15 years; (4) 16 years or more.

Table 7. Analysis table of differences in attitudes toward environmental education caused by different years of teaching experience (n = 536).

Factor Dimension	Item				Analysis of Variance						Post-Event Comparison
	Years of Teaching Experience	Number of People	M	SD	Source of Variation	SS	*df*	MS	F	*p*	
Evaluative response	(1)	77	4.27	0.39	Between group	3.202	3	1.067	4.864 **	0.002	(4) > (2)
	(2)	77	4.22	0.45	Within group	116.726	532	0.219			
	(3)	155	4.30	0.51	Subtotal	119.928	535				
	(4)	227	4.42	0.46							
Behavioral tendency	(1)	77	4.21	0.52	Between group	3.865	3	1.288	4.972 **	0.002	(4) > (2)
	(2)	77	4.08	0.51	Within group	137.863	532	0.259			
	(3)	155	4.28	0.53	Subtotal	141.728	535				
	(4)	227	4.33	0.48							
Overall	(1)	77	4.24	0.42	Between group	3.417	3	1.139	5.327 **	0.001	(4) > (2)
	(2)	77	4.14	0.45	Within group	113.770	532	0.214			
	(3)	155	4.29	0.50	Subtotal	117.187	535				
	(4)	227	4.37	0.44							

1. n = 536; ** $p < 0.01$. 2. Years of teaching experience: (1) 5 years or less; (2) 6 to 10 years; (3) 11 to 15 years; (4) 16 years or more.

4.6. Correlation Analysis of Teachers' Cognitions and Attitudes toward Environmental Education

In terms of the correlation between cognitions of and attitudes toward environmental education, this study calculated the correlation coefficient using Pearson's product-moment correlation coefficient based on the two scales of the cognitions of and attitudes toward environmental education. The correlation between the cognitions of and attitudes toward environmental education is shown in Table 8.

Table 8. Analysis table of the correlation between the elementary school teachers' cognitions of and attitudes toward environmental education. (n = 536).

Factor Dimension		Environmental Education and Teaching Cognition	Environmental Issue Cognition	Overall Cognitions of Environmental Education
Evaluative response	Pearson correlation	0.597 **	0.583 **	0.643 **
	Significance (two-tailed)	0.000 **	0.000 **	0.000 **
Behavioral tendency	Pearson correlation	0.592 **	0.607 **	0.653 **
	Significance (two-tailed)	0.000 **	0.000 **	0.000 **
Overall attitudes toward environmental education	Pearson correlation	0.632 **	0.636 **	0.690 **
	Significance (two-tailed)	0.000 **	0.000 **	0.000 **

** $p < 0.01$.

5. Discussion

This study divided elementary school teachers' cognitions of environmental education into two dimensions: "Environmental education and teaching cognition" and "environmental issue cognition" for analysis and exploration. According to our study findings, the overall current cognitions of environmental education of Taichung City elementary school teachers is "good", which indicates that Taichung City elementary school teachers' cognitions of environmental education are above the medium level. There are significant differences in the environmental education cognition of elementary school teachers with different background variables. This is consistent with the research of many scholars [84,106–108,113]. In comparison, their "environmental issue cognition" is relatively higher, indicating that Taichung City elementary school teachers attach importance to environmental issues and pay attention to the surrounding environmental problems and the information on environmental protection-related issues. The main reason is closely related to our country's Environmental Education Law. The law expressly stipulates that all employees, teachers, and students should participate in environmental education for more than 4 h before 31 December each year and submit an online report to the competent authority before 31 January of the following year. This is to report the implementation results of environmental education for the current year. Additionally, annual lectures on environmental protection issues increase awareness of environmental protection issues. There are significant differences in the environmental education attitudes of elementary school teachers with different background variables. This is consistent with the research of many scholars [84,106–108,113]. The results of this study also show that the overall attitudes toward the environmental education of Taichung City elementary school teachers are above the medium level. In comparison, their evaluative response is the most positive dimension, indicating that Taichung City elementary school teachers are aware of the seriousness of the current environmental problems. They believe that every student should receive environmental education, are willing and glad to implement environmental education in the classroom, and believe that the implementation of environmental ed-

ucation is conducive to environmental protection. There are "flexible learning courses" in elementary schools, including cross-domain integration or thematic inquiry courses, community activities and skills courses, and special-needs courses, all of which provide opportunities for the integration and promotion of environmental education. For example, courses combining environmental issues and reading literacy, and outdoor teaching of practical visits to geographical history and humanistic social learning.

Teaching experience plays a positive role in the overall cognition of environmental education. Older elementary school teachers with longer teaching experience, due to the accumulation of teaching experience, are proficient in teaching content and can devote more attention to current major issues, which is very conducive to the promotion of environmental education. The "evaluative response", "behavioral tendency", and overall environmental attitude of older and experienced teachers are more positive. Elementary school teachers with longer teaching experience, due to the accumulation of life experience, have a deeper feeling for the variation of the environment and a higher willingness to implement environmental education than younger teachers.

Taichung City elementary school teachers' overall cognitions of environmental education and overall attitudes toward environmental education are significantly positively correlated. The results of this study show that the elementary school teachers' cognitions of and attitudes toward environmental education are moderately correlated; the better the cognition, the more positive the attitude toward environmental education. This study explored the factors that affect teachers' environmental education cognition and attitude as teachers have an influence on environmental education cognition and attitude, and the cognition and attitude also interact with each other.

6. Limitations and Future Recommendations

The process of this study is rigorous, but there are still the following limitations. Therefore, suggestions for future related research are provided. In terms of research objects, the research object of this study is only limited to elementary school teachers. It is suggested that future research can be conducted on teachers of junior high school and senior high school and university professors to understand their differences. In addition, elementary school teachers each have different areas of expertise. Research to explore the differences in environmental education cognition and attitudes among teachers in different fields and subjects will serve as a reference for the future cross-domain or professional community and lesson plan sharing. Environmental education is a necessary education for citizens of the whole country, and in the future, it can be extended to different occupational attributes to explore the similarities and differences in depth. In terms of research methods, due to the urgency of the COVID-19 epidemic in Taiwan at the time of implementation of the study, this study collected online questionnaire data anonymously, and could not conduct further consultation and problem-solving for elementary school teachers. It is suggested that future researchers may collect data by using paper-based questionnaires and follow up. This study uses quantitative research to collect and analyze the data of various variables. It is suggested that future research can be qualitative at the same time to increase the reliability and validity of inference.

7. Conclusions

The results of this study show that teachers with more senior teaching experience have better cognition and attitude toward environmental education. It is recommended to choose teaching methods and teaching aids through group discussion and sharing under the leadership of experienced teachers so as to improve the teaching ability of environmental education [122–124]. The environmental education curriculum needs to be integrated and flexible to facilitate teaching. Through the integration of the curriculum, the teaching is activated, and students are motivated to learn. In addition, teachers' behaviors and attitudes related to the environment are important and they are future role models for students, as students' behaviors are influenced by teachers' behavior [125]. Teachers' basic

awareness, knowledge, attitude, skills, and participation in environmental education are the keys to determining the success of environmental education in elementary schools. Therefore, environmental education is one of the most important projects of teacher education [126,127]. In addition, teachers can be leaders in environmental education because they can influence peers, schools, and other school community members to improve teaching and learning practices that improve student learning and achievement.

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