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Protecting Life on Land and Below Water: Using Storytelling to Promote Undergraduate Students' Attitudes toward Animals

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Abstract: The framework of Global Education 2030 Agenda suggests 17 learning objectives for sustainability education. Restoring the human–animal relationship is a core task emphasized by Goals 14 (Life below water) and 15 (Life on land). This study investigated the effect of using storytelling, focusing on the thematic topic of wild animals, as an integrated part of learning about attitude toward wild animals. It addressed the major question: how could the students' perceptions concerning the human–animal relationship be changed? The participants were 31 university students majoring in a variety of subjects. Qualitative inquiry using a personal meaning map (PMM) and online in-depth focus group interview explored the students' perceptions of wild animals and their learning experience. The results showed the students' changing attitudes toward wild animals at the end of the storytelling session. In the focus group interview students reported the process of their storytelling regarding the invention the stories. In conclusion, storytelling, featuring the adoption of multiperspectives, addressed imagination and empathy and promoted an understanding of the ethical relationship between wild animals and human beings. The educational implication of storytelling appealed to a holistic approach, engaging an interdisciplinary classroom practice in defining humanity in relation to the nonhuman world.

Keywords: attitude toward wild animal; education for sustainability; storytelling

1. Introduction

Maintaining ecological, economic, and cultural diversity is the core value underlying the 17 learning objectives of education for sustainability (Sustainable Development Goals, SDGs) proposed in the Global Education 2030 Agenda [1]. The IUCN Red List (International Union for Conservation of Nature) report showed the increasing numbers of threatened species, and there were 25,821 threatened species by 2017 [2]. In the background of this study, a very recent incident is that NOAA (National Oceanic and Atmospheric Administration) issued a final rule to list the Taiwanese humpback dolphin as endangered under the Endangered Species Act (May, 2018) [3]. Due to coastal industrial exploitation, the number of locally beloved "white dolphins" is now less than 70 and is decreasing by two each year. Among the SDGs, Goal 14 (Life below water) and Goal 15 (Life on land) have recognized the preceding environmental educators' concern about the goals of environmental sustainability in restoring humans' connection with wildlife and forging a cultural relationship with nature [1]. UNESCO's (United Nations Educational, Scientific and Cultural Organization) latest report of SDGs provides a holistic approach, suggesting that the effort toward sustainability must reconnect human society's benefit with the ecological benefit. The declaration of SDGs also specifically reflects environmental educators'

efforts, which emphasize the facilitation of a broader understanding of humans–(wild) animals, that would promote a zeal for ecological protection and reconnect the human–nature relationship [4,5]. Taking the social context of Taiwan as an example, similar to many other countries around the world, strict regulations concerning animal protection have been in place for several decades. Regarding the international aspect, policy practice aims to forbid animal exploitation and to execute CITES regulations (Convention on International Trade in Endangered Species of Wild Fauna and Flora); in the local aspect, special efforts have been focused on endemic species' conservation and reinvention. One major explanation of this is that an awareness of the ethical status of the wildlife has yet to be included in the daily experience of the general public [6].

Recent literature has observed that the use of storytelling extends one's understanding of the broken human–animal relationship [7–13]. Storytelling engages post-positivist approaches which combining artistic works and narratives to raise attitudes toward animals [9,11]. The perspective has been promoted by environmental ethics advocators: a renowned environmental philosopher [8] has pointed out the overlap concern between promoting animal welfare and reconstructing environmental ethics. Several studies also observe that teaching approaches that engage the thematic topic of wild animals in promoting sustainability also work on facilitating students' empathy, which is the key to constructing pro-environmental behavior [7,12]. Furthermore, related studies on restoring the subjectivity of animals show that place-based writing, drawing, and sound mapping in the local park brought students an "A-ha" feeling of engagement in tracing animal activities [13]. Also, rap songs, picture books, and dance engage students in giving "voice" to animals [10].

The approach of storytelling, corresponding to the central feature of education for sustainability, engages students' learning in a dialogue that engages both the cognitive and affective domains [14]. The theoretical contention of this study is to promote education for sustainability through featuring the inner values of the wildlife, especially the students' personal meaning-making of the wild animals, as a basis for reconnecting the human–nature relationship. In this study, the narrative form of storytelling, which links the arts, sciences, drama, participatory activities, and reflexive inquiry, is employed to deepen the students' exploration of the life experience of coexisting with the nonhuman world [15].

This study explores the idea of "bonding", which informs the meaning of the human–animal community. This study investigates the implications of students' storytelling and the impact on tellers' changing perceptions of human–animal relationships. It mainly addresses the following two questions: (1) what are the students' attitudes towards wild animals? And (2) what is the influence of storytelling on the students' attitudes toward wild animals?

2. Attitudes toward Animals: From Nonhuman to Human

In the past few decades, scholars from broad fields, including philosophers, social psychologists, scientists, education practitioners, environmentalists and government officials, have engaged in intensive discussions on the distanced human–nature relationship. As Richard Sylvan [16] remarked, a new attitude toward nature needs to be formulated in order to deal with current world issues related to environmental degradation. The new environmental ethics have mainly reconsidered the ethical relationship, which includes the nonhuman world (the wild animal). Leopold [17] notes that land ethics should reject the utilitarian perspective of nature (including wild animals). Animal welfare advocates have addressed that animals have rights [18], sentience [19], and intrinsic value, similar to human beings [17]. These critics reflect on human beings' attitudes toward animals.

Developing a sense of bonding with animals and nature, according to Kellert [20], enables one to develop the affective capacity of altruistic and collaborative behavior. The humanistic bond with animals provides healing power through companionship and affiliation, and provides a foundation for a stable community [20–23]. Nevertheless, "human civilization indeed was virtually synonymous with the conquest of nature" [23] (p. 25), as historian Keith Thomas contemplates the formulation of human privilege and the subjugated natural world. Over the past few centuries, animals have been defined as "properties", "others", "beasts", or "tools", which then led to destruction of the

natural structure. Even though a new sensibility reflecting on humans' treatment of animals (suffering, animal rights) has been promoted for centuries, animal abuse persists in human society because of human need [23]. Protecting animals does not merely involve conserving species but including animal life in the ethical concept when human society pursues development, technological or mental. Kalof et al. [11] classify eight attitudes toward animals under two categories: (1) "human"—*Kinship*, *Sentience/Individuality*; and (2) "nonhuman"—*Pets/Symbols*, *Biological/Wild Nature*, *Commodity/Resource*, *Dangerous*, *Mistreated/Vulnerable*, *Free/Majestic*.

Measuring attitudes toward animals is critical in examining the human–animal relationship [24]. Animal Attitude Scale (AAS), developed by Herzog, Betchart, and Pittman' [25], contained 20 items measured by 5-point-Likert scale. The AAS has been used to study adult's attitudes toward animals [26,27]. Knight, Vrij, Cherryman, and Nunkoosing [28] measured students' attitudes through 4 aspects including their attitude toward using animals for experimentation, using animals in the classroom, using animals for personal decoration, and using animals for entertainment. Kellert's [29] study measured American's attitudes of 26 different animals. George, Slagle, Wilson, Moeller, and Bruskotter [30] found that between 1978 and 2014, Americans' attitudes toward 8 species showed substantive differences (bats, sharks, vultures, rats, wolves, coyotes, raccoons, swans); in 2014, attitudes were significantly more positive toward these species. Nevertheless, the major disadvantage of the above quantitative measures was inadequate to reveal one's interpretations or understandings of animals.

Scholars have been also using the personal meaning map (PMM) to measure attitudes toward animals [11]. The advantage of PMM is that it is a constructivist, relativist instrument that emphasizes learning as a contextual process in which an individual's prior personal experiences interact with the context of the learning experience and produce a unique sketch of one's interpretations or understandings [31]. Dierking et al. [32] noted that the PMM is a highly valid, reliable, and meaningful documentation for investigating the impact of environmental education. In the empirical research, PMM was administered by Falk and Dierking [33] at the beginning of the museum on-site learning and the end of the story-production session to investigate the personal learning experience and meaning-making process. Kalof et al. [34] used PMM to measure museum visitors' perceptions of animals based on a photographic exhibition. Furthermore, Kalof et al. [11] used PMM to measure changes in attitudes about animals in a classroom environment. A well-developed PMM was employed to measure attitudes toward animals in the current study.

3. Artistic Exploration, Interdisciplinary Learning, and Humane Education

The effects of personal storytelling have been recognized by Michelle Drumm [35–37]. Listening and engaging in the storytelling both play important part in mentally empowering the listener and the storyteller. Hearing personal stories engenders greater understanding, empathy, and reflection. On the other hand, storytelling empowers the teller as it encourages personal growth and belief. However, few studies has employed the intervention to investigate its impact on strengthening human–animal relationship.

The hypothesis of this study proposes that students' attitudes toward animals can be heightened through a course design that integrates the environment, the community, and the arts. The interdisciplinary collaboration aims to engage students in multi-dimensional thinking, a competence that enables students to examine the complexity of the problems relating to social sustainability. Christie et al. [9] maintain that the teaching methods of sustainability closely involve the critical understanding process in acquiring knowledge, which is gained from humans' interaction with the world (post-positivist approach), as opposed to passively receiving factual information (positivist approaches). Pedagogies of teaching sustainability emphasize participatory and active learning methods [9], including role play, stimulus activities (drama and reflection), debates and group discussions, case studies, critical reading and writing. Clark and Button [38] proposed the Sustainability Transdisciplinary Education Model (STEM), which stresses that art, science and the community are integrated aspects of learning

sustainable development. The method of STEM identifies that, through engaging in aesthetics education (science and art) and communication with community stakeholders from different areas, students are able to approach real questions regarding the complex nature-human connection. Inter-/transdisciplinary learning collaboration with the arts helps to develop perspectives concerning ethics and values [38,39]. Studies have observed that artistic exploration is effective in initiating critical inquiry into human activities. Adopting the educational implication of the post-positivist approach and transdisciplinary learning, Kalof et al. [11] explored the use of animal portraiture photographs in promoting students' perception of the life and individuality of wild animals. The artistic work of animal portraiture captures the spirit of life and represents the common condition between animals and human beings: life. Through depicting the quality/value of life, the artistic representation neutralizes the boundary between humans and wild animals, thereby channeling the common intrinsic values of life. The study also finds that the use of the artistic work of animal photographs in humane education has generated empathy, increased the perceptions of animal individuality and fostered human–animal kinship [11,40,41].

The aesthetic approach helps one to see the broken human–nature relationships and become more conscious of the need for communication and social skills in order to reconstruct a pro-environmental attitude and behavior [38]. The mental process of storytelling involves a distinct experience of melding together one's cognitive attention, imagination and feelings. Stories raise unanswered questions, and present unresolved conflicts, depicting incomplete journeys or long-term quests for the world's well-being. The mechanism of storytelling engages an analogy with a different time and space; it serves as a vehicle for channeling different attitudes and activates past-present and science-art in dialogue. Storytelling therefore engages a strategy of perspective-taking which is closely related to conflict resolution [39,42].

How to collaborate the subject of wild animals as a pedagogical method of education for sustainability? According to Spannring's [43] observation, exploring the affective relationship between humans and wild animals is the key. Teaching strategies that adopt this objective stress that animals should not be regarded as cultural objects, symbols, or patterns; instead, they should be seen as lives of experience, interest, senses and action [44]. An important learning dimension is to reflect on the estranged human–animal relationship. Oakley [45] considered that recognizing animality as part of human nature renders one humble when treating animals and becoming more aware of the living condition of the nonhuman species. Corresponding to the educational objectives of SDGs, theories discussing pro-environmental action consider the value that informs humans playing a healing role in strengthening the human–nature community [46].

This study has observed a social phenomenon that may suggest an effective method for capturing the public awareness of the lives of wild animals. In recent years, issues related to animal welfare have constantly hit the news headlines and raised extensive public awareness of the need to respond to animal protection and the execution of legal regulations. Something that has caught the public imagination that further promotes collective action is the life stories of the endangered or abused animals reported in the news. The narrative of storytelling displays the power to move an indifferent public not only to care about animals' lives but also to be aware of humans' intervention in the natural environment. The art of storytelling therefore conveys real events, knowledge, comments on human behavior, and communal values. Moreover, it bridges the emotional and intellectual understanding about the interdependence between human beings and their natural community.

4. The Study

The purpose of the study is to examine the effect of storytelling in improving students' attitudes toward animals. A service-learning course of animal storytelling was arranged to improve students' attitudes toward animals. Data on the students' attitudes toward animals was collected at the beginning and end of the course using a personal meaningful map. Online in-depth group interviews were conducted in order to collect the students' discourses on their learning experience.

In this study it is argued that the course section of animal storytelling has the potential to facilitate the students' sense of kinship and sentience in their attitudes toward animals.

5. Method

5.1. Participants

The participants are 31 university students enrolled on a course entitled "Interpretation in the museum: animal studies and environmental education". They were 2nd to 4th year undergraduate students (ranging in age between 18 to 22 years-old), with a variety of major subjects. The distribution of their academic background includes science (10), engineering (13), and social sciences (8).

5.2. The Course of the Story-Telling Performance

The course collaborates with two informal educational institutions (Chimei Museum and Kaohsiung Children's Museum of Art). The teaching team, which included museum experts and university lecturers in the fields of animal science, literature, drama, and socioeconomics, led a series of discussions. The three hours of lectures over a semester contained two major components: museum on-site learning and storytelling practice. Also, as part of the course, a service learning session is arranged to transmute the story production into real world experience through running an interactive storytelling program with local elementary school students. The course organization is based on the five stages of the storytelling process, including: brainstorming, constructing a storyboard, searching for the material, editing and designing interactive activities, and presenting the story [14]. Table 1 shows the course design. Table 2 shows the thematic animals in the original stories composed by the students. Two groups composed stories about foreign animals and global concerns (Moose, Polar Bear), and the other two told stories about endemic animals and local issues (Leopard Cat, Formosan Macaque).

Table 1. Outline of the course units and corresponding stages in the storytelling process.

On-Site Learning and Storytelling Phase	
Unit 1 On-site (in the museum setting) (2 weeks)	Regulations, resources, and educational functions of the animal specimen.
Brainstorming	Students, in groups, decide on the major animal characters and discuss the life connections with the characters (memory, emotions, self-personality, identity, background, etc.).
Unit 2 On-site (2 weeks)	Animals and their ecozone origins: museum exhibition design, animal behavior and social structure.
Constructing Storyboard	Summarize the main idea/thematic meaning of the story. Draft the journey of the story. Write about what life and the surroundings would be like living in the world. Discuss the possible obstacles that the characters might face.
Unit 3 On-site (2 weeks)	Representations of animals in art works.
Searching the material	Collect and research the further material required; for instance, creating and acting out the external and external features of the animal characters, or the conflicts encountered during the journey.
Unit 4 On-site (2 weeks)	Museum and community: Local and worldwide conservation actions.
Editing and designing interactive activities	Design music, poster-drawing, visual images, sound effect, and body-movement interactive activities that enhance the narration. Finalize the storytelling process/production.
Unit 5 Presentation (2 weeks)	Service learning in the museum: Storytelling performance for museum visitors, elementary school students, and local community organizations.

Table 2. Leading the animals and the main ideas of the students' original storytelling efforts.

Group	Thematic Animal	Main Idea of the Plot
G1	Moose	The Moose's Trial: A moose dreamt of joining reindeers to help Santa to make children happy. He embarks on a journey to find Santa and must overcome 3 challenges to qualify for the job.
G2	Polar Bear	Little polar bear and a boy/girl: Little polar bear was separated from his mother polar bear on their way to find food. Little polar bear meets a boy/girl and they face together the changing world they must deal with in order to find their family and way home.
G3	Leopard Cat	The leopard and his forest: An orphan leopard was mentored by a once-wounded elder and learnt survival skills while hunting; both were then protected by the local animal protection organization. The staff of the organization recounts the difficulties encountered by other endangered animals and together they embark on a journey to seek solutions.
G4	Formosan Macaque	The adventure of monkey "Round Head": RH was a little monkey of an endemic species who came up with a local seed-preserving plan in order to recover the over-farmed, barren land. He was caught by an animal smuggler and rescued. Eventually, he got a job at the national park office and taught the public about nature.

5.3. Data Collection Instruments

The personal meaning map (PMM) emphasizes learning as a contextual process in which an individual's prior personal experiences interact with the context of the learning experience and produces a unique sketch of one's interpretations or understandings [31]. This study employed (PMM) to measure students' perceptions of wild animals and their changes of perception [11,33]. Online group in-depth interview were organized to trace the students' perceptional changes. Focus group interviews were organized further to investigate how the development of students' environmental sensitivity and responsibility relates to aspects of interdisciplinary learning. Focus group interviews were used to explore the meaning of individuals' behavior toward a specific topic. Prompted by the characteristics of collective synergy and group dynamics, the focus group discussions produced extensive and insightful information. They enabled the moderator to engage in an interactive exploration with the interviewees on the current research topics [47].

5.3.1. Personal Meaning Map (PMM)

Prior to the PMM pretest, a brief training session was arranged for the students' to practice sketching PMM on a different topic. A post-test was arranged at the end of the storytelling section. In the study, the students were given 30 min in which to sketch the pre- and post-PMM test. Different-colored pens were provided, with two sets of colors for the pre- and post-tests, to write down the key words and explanations. The procedure of the operation of PMM in the study is summarized as follows:

- Pre-test

1. Prepared a blank sheet of paper with the prompt word "Wild Animal" written in the middle of it.
2. Asked the participants to write or draw on the sheet of paper all of the adjectives, verbs, nouns, phrases, and images that came to mind when encountering the wild animal with the blue-colored pen.
3. The participants were encouraged to write, elaborate, and explain their key words, phrases, or images with the green-colored pen.

4. The pretest PMM sheet were then collected and kept for the post-test.

- Post-test

1. The participants were given their own pretest PMM and asked to add to the sheet of paper all of the adjectives, verbs, nouns, phrases, and images that came to mind when encountering the prompt phrase ("wild animal") with the red-colored pen. The students were also allowed to delete the key words they had stated during the pre-test.
2. The participants were encouraged to elaborate and explain their key words and phrases with the black-colored pen. Figure 1 is an example of a student's PMM.

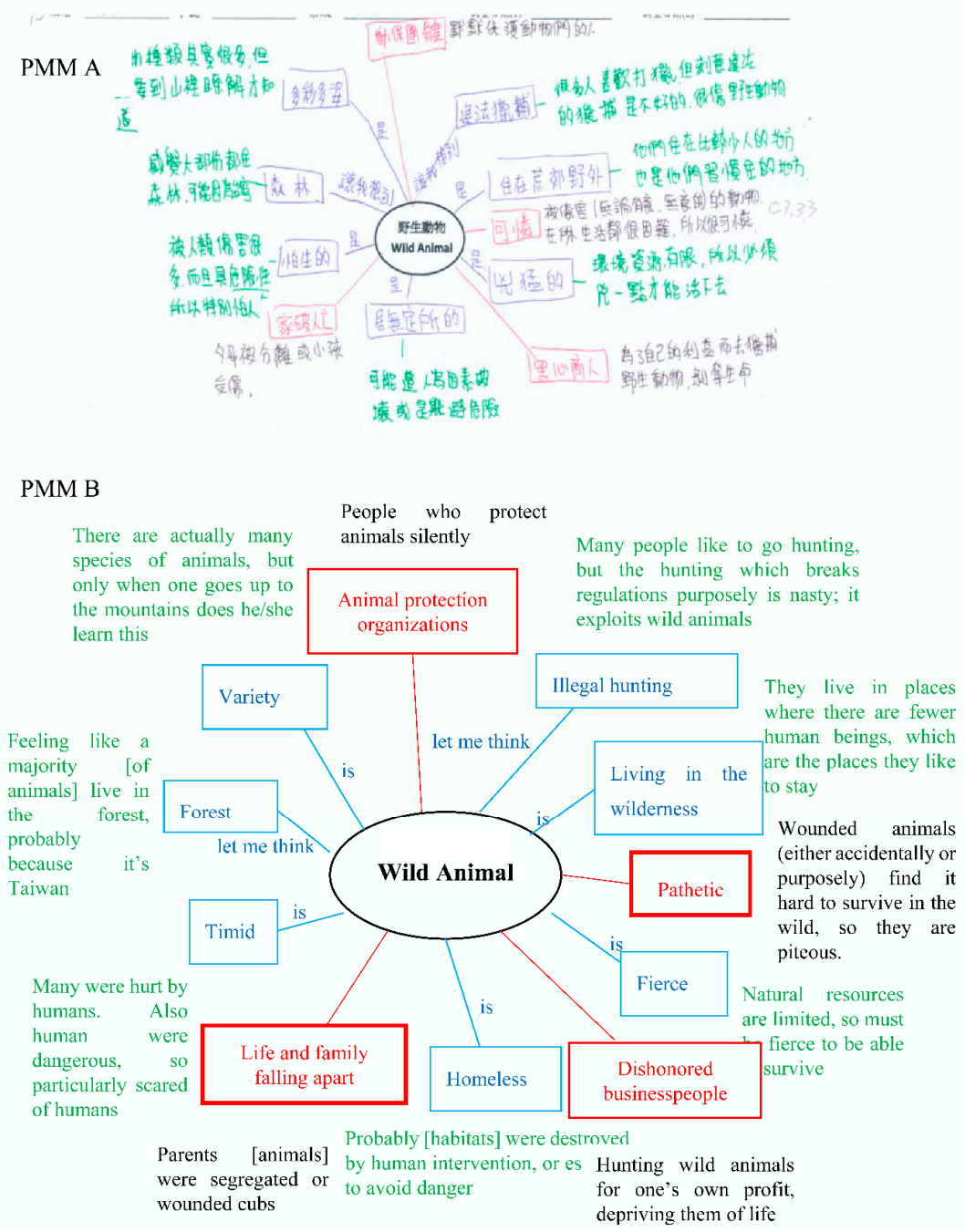

Figure 1. A sample of a student's personal meaning map (PMM A: Original; PMM B: translated in English).

5.3.2. Online In-Depth Focus Group Interviews

Online in-depth focus group interviews were organized further to trace the students' changing personal meaning in the process of storytelling. Four students who showed a significant change in their PMM were invited to talk about their learning experience and perceptions relating to animal kinship. Facilitated by the methodology suggested by Morgan [48], four respondents constituted the appropriate group size. The interviews lasted 90 min, with one course instructor and one teaching assistant acting as the moderators. The coordinators and four students logged on appointed social media (Facebook in the case) at an arranged time. The coordinators played a critical role in deepening interviewees' response. A list of questions (see below) was prepared prior to the meeting to prompt reflection and elicit detailed viewpoints from the respondents. The results of the focus group interview were used to assist the discussion and analysis of the PMM findings.

In this study, a new form of in-depth focus group interview was trialled, using an online synchronized discussion. Using social media is a common way for undergraduate students to exchange dialogue. The interview questions and discussions proceeded as written conversations and the whole process was both saved online and transcribed for future analysis and reference. The interview mainly investigated the learning's impact on the aspects of cognition, attitude and skill. Cognitive changes included animal behavior, ecological environment, and story structuring. Attitude change includes a change in one's perception of wild animals, or engendering the affective dimension of caring, comprehension and sympathy. Skill concerns a change in communication. What caused the change? What engaged the students' affective recognition and awareness? The observation focused on these key aspects to investigate the changing meanings of the human–animal relationship.

The leading questions for the focus group interviews were:

1. Which wild animals do you prefer, and least prefer?
2. Thinking back over the storytelling activity that you've participated in, which section were you most interested in? And which part did you find most difficult?
3. After the storytelling activities, has your perception of wild animals changed? If so, why did you change your perception?
4. What do humans and animals share in common, in your opinion?

5.4. Content Analysis of Students' Attitudes toward Wild Animals

For coding PMM contents, 8 meaning categories of attitude toward animals, developed by Kalof et al. [11], were employed. The scoring table was developed based on the definitions of the meaning categories [11], as shown in Table 3. For each meaning category, the students' PMM was coded by frequency, depth, and emotion, respectively. The key words were coded by frequency. Frequency was the presence or absence of the meaning category in the PMM. The expanding explanations of each key word were coded by depth and emotion. Intensity was the aggregate level of depth and emotion. Depth was the detail and complexity of the descriptors of 'wild animal'. Emotion was the magnitude and strength of the attributes of the descriptors. Two researchers were invited to code the PMMs. The inter-coder reliability for all 24 variables was between 60% and 80% in matched scoring. The final scores for each mismatched scoring were decided after the coders reached agreement.

Table 3. Attitude toward wild animals scoring table and 8 meaning categories [25] (p. 215).

Relationship	Meaning	Description	Yes/No	Intensity	
				Depth	Emotion
Human	Kinship	Terms represented the interpretation of "wild animal" as close to humans and included terms that emphasized the similarities between humans and animals.	0, 1	0~3	0~3
	Sentience/Individuality	Terms associated with animals as thinking, feeling creatures and unique and diverse individuals rather than members of a group or species.	0, 1	0~3	0~3
Non-human	Pets/symbols	Terms included fictional, representational or symbolic animals or mediums and terms that mentioned pets and their attributes, including animals as loving pets, amusements, and cute/infantilized creatures.	0, 1	0~3	0~3
	Biological/wild nature	Terms referenced animals as biological entities participating in biological processes and the natural environment and included terms that conceptualized animals through their physical attributes, their species or group classification, or presence in the wild, natural world.	0, 1	0~3	0~3
	Commodity/Resource	Terms gave meaning to 'wild animal' as a resource for humans, conceptualizing animals primarily through the goods or monetary value they provide or the institutions or activities that use animals.	0, 1	0~3	0~3
	Dangerous	The interpretation of animals as threatening, dangerous or vicious included the words vicious, ferocious, violent, and fear.	0, 1	0~3	0~3
	Mistreat/Vulnerable	Terms focused on animals as vulnerable, innocent, endangered or in need of protection from human cruelty or misunderstanding, and terms that mentioned or endorsed animal rights views or organizations.	0, 1	0~3	0~3
	Free/Majestic	Terms included those that defined animals as possessing admirable traits, animals as beyond human control, animals that elicit care, empathy, and curiosity and animals as superior to humans.	0, 1	0~3	0~3

Note: The score of frequency is 1 if mentioned or 0 otherwise. A four-point scale was used to measure depth and emotion; receiving a zero point in frequency will also mean receiving a zero point for both items. One point was given when a key word was provided with no explanation; two points were given with minimal explanation or two or more key words with no explanation; three points were given when the key words were provided with substantial explanation or elaboration.

6. Results

6.1. Attitude toward Animals

The students' personal meaning maps (PMM) were analyzed using content analysis. Shown in Table 4 are the frequencies of the students' recognition of the eight meanings of the wild animals and their emotional intensity. Kinship and sentience/individuality were grouped under the content of "human" which represents the meanings of animal–human likeness, and the other themes were categorized under the "nonhuman" group.

Table 4. Frequency of students' perceptions of the meaning of wild animals and the emotional intensity in the pre- and post-test.

		Perception (%)			Intensity (0–100)		
Relationship	**Meaning**	**Pre**	**Post**	***p*-Value**	**Pre**	**Post**	***p*-Value**
Human	Kinship	0.16	0.42	0.003	0.52	1.48	0.003
	Sentience/individuality	0.55	0.81	0.003	2.06	3.39	<0.001
Non-human	Pets/symbols	0.13	0.14	0.083	0.39	0.69	0.083
	Biological/wild nature	0.65	0.68	0.325	2.29	2.58	0.026
	Commodity/resource	0.26	0.39	0.043	0.84	1.40	0.042
	Dangerous	0.48	0.48	-	1.77	1.84	0.161
	Mistreat/Vulnerable	0.32	0.58	0.003	1.16	2.42	<0.001
	Free/Majestic	0.29	0.32	0.325	1.13	1.13	0.325

Note: The statistical test uses a paired *t*-test.

As shown in Table 4, in the pretest, 16% of the students regarded wild animal as kinship, 55% as sentience/individuality, 13% as pets/symbols, 65% as biological/wild nature, 26% as a commodity/resource, and 48% as dangerous. It was found that the three most identified meanings of wild animal for the undergraduate students were biological/wild nature (65%), sentience/individuality (55%), and dangerous (48%). **The result indicated that human or nonhuman relationships were recognized by the students before taking the course.**

Also, the 3 meanings with the strongest emotional intensity score were biological/wild nature (2.29), following by sentience/individuality (2.06), and dangerous (1.77), followed by mistreat/vulnerable (1.16), free/majestic (1.13), commodity/resource (0.84), kinship (0.52), and pets/symbols (0.39).

6.2. Storytelling and the Changes

We employed a paired *t*-test to examine the changes in the students' attitudes about the wild animal and emotional intensity between the pre- and post-tests. As shown in Table 4, there were more students in the post-test who regarded wild animals as kinship (16 $\rightarrow$ 0.42, *p*-value = 0.003), sentience/individuality (0.55 $\rightarrow$ 0.81, *p*-value = 0.003), commodity/resource (0.26 $\rightarrow$ 0.39, *p*-value = 0.043), and mistreat/vulnerable (0.32 $\rightarrow$ 0.58, *p*-value = 0.003). Based on the result, we found that, to some extent, the students' attitudes toward wild animals changed significantly from less informed to more informed in both the human and nonhuman meaning categories. Also, the students' emotional intensity had changed. In particular, the students' emotional intensity was increased for kinship (0.52 $\rightarrow$ 1.48, *p*-value = 0.003), sentience/individuality (2.06 $\rightarrow$ 3.39, *p*-value < 0.001), biological/wild nature (2.29 $\rightarrow$ 2.58, *p*-value = 0.026), commodity/resource (0.84 $\rightarrow$ 1.40, *p*-value = 0.042), and Mistreat/Vulnerable (1.16 $\rightarrow$ 2.42, *p*-value < 0.001). **The findings indicated the effectiveness of the storytelling in facilitating their understanding of humans' relationships with wild animals.**

We also examined the effect of the content of the storytelling on both kinship and sentience/individuality. The four groups of students told four different animal stories with different storylines. As shown in Table 5, there was a group difference regarding their change in perception of kinship and sentience/individuality. Fifty percent of the members in group 4 increased the perception of kinship, 29% in group 3, 25% in group 2 and none in group 1. 50% of the members in group 1 increased their perception of sentience/individuality, 25% in group 2, 15% in group 3 and 11% in group 1.

Table 5. Change in kinship and sentience/individuality by groups.

	Kinship (%)			Sentience/Individuality (%)		
Meanings	**Pre**	**Post**	***Change***	**Pre**	**Post**	***Change***
Group 1 (Moose)	0.25	0.25	0	0.38	0.88	0.50
Group 2 (Polar Bear)	0.13	0.38	0.25	0.38	0.63	0.25
Group 3 (Leopard cat)	0.00	0.29	0.29	0.71	0.86	0.15
Group 4 (Formosan Macaque)	0.25	0.75	0.50	0.75	0.86	0.11

6.3. Students' In-Depth Discussion about Their Attitude Change Toward Wild Animals

Regarding the general experience of learning through storytelling activity, the 4 student interviewees' reaction in common was "*excitement*": the writing and performing of the stories caused excitement. The application of storytelling as a learning activity at university was uncommon in the past. The study found that the students enjoyed it very much, as addressed in their responses:

> *"The fun part of the course is that we were all active in finding a way to understand the animals we were going to portray. Even though animals can be seen everywhere, we did not really pay attention to them before."* (A1)

> *"The most interesting thing to me is that we are going to tell the animal story in front of a group of children. I hope that our storytelling is able to broaden their understanding of wild animals and make an impact on them."* (B1)

> *"I enjoy the process of discussion with teammates and the course lecturer about the details of the storytelling. A lot of interaction with the people is what I considered the best part of the course."* (D1)

The PMM results, as shown in the previous section, indicated that the students' attitude toward animals had changed by the end of the storytelling session. We further investigated the connection between storytelling and attitude change. The students' responses in the interview further confirmed our argument that storytelling helped to shift the students' attitudes toward animal kinship. The students' comments showed that both imitation and imagination are the most critical mental activities that lead to students' attitude shift toward a more empathetic and inclusive mentality. Animal storytelling created such a circumstance for students to imitate and imagine about wild animals, as stated:

> *"I felt deeply empathic with wild animals when I was performing an animal. I become an animal but thought like a human being. The first thing that came to my mind was that the animals' world is different from ours. The animals' world is so unfamiliar to me. Hence, when I was playing the animals on the stage, the best I can show is an un-easy human-like animal."* (A1)

7. Discussion

Our study showed that the experience of the students took during a storytelling activity on a service learning course was able to affect and change their attitude toward wild animals. This finding has important implications for conservationists and cross-disciplinary educators. The students' recognition of animal ethics is assumed to be a prerequisite for perceiving animals as worthy of care and protection. Kalof et al.'s study [11] showed similar findings by exposing students to animal portraiture photography, which is an excellent strategy of free-choice learning. In our study, we examined the effect on the exposers themselves who conducted the animal storytelling which shifted their attitude toward kinship. Storytelling subtly exchanged the human and animal places and therefore activated unconscious imitation and imagination that shifted the students' perceptions of wild animals. A statistically significant increase in frequency and intensity (Kinship and Sentience/Individuality responses) indicated that storytelling encouraged the participants to conceptualize animals as conscious

beings with emotional and mental states similar to those of human beings. Our findings were in line with Leopold, Regan, and Singer's initiative of animal well-being. Students' change of their perceptions of wild animals also resulted from their interaction with the team members, the lecturers and the audiences during the process of preparation and performing storytelling. The students reported the changing perceptions occurred during the process of writing and telling the stories. Our findings were in line with the model that Clark and Button [8] proposed the Sustainability Transdisciplinary Education Model (STEM), which stressed that art, science and the community were integrated aspects of learning sustainable development. Through engaging students in aesthetics education (science and art) and communicating with community stakeholders from different areas, students were able to approach real questions regarding the complex nature-human connection. Also, it might be possible that the attitude toward wild animals might increase students' interest and attainment in pursuing biological knowledge.

Within the creation of the story, they experienced affective and cognitive shocks by role-playing animals, feeling empathy with wild animals, acting out the physical movement of wild animals, realizing human similarities or differences from wild animals, and imaging bonding relationships with other animals. The above experiences were all critical in shifting the students' attitudes toward wild animals [49]. Moreover, Kalof et al. [29] argued that it is uncertain how long the empathetic effects can last. Nonetheless, using a storytelling strategy to facilitate environmental communication was a more holistic approach for education for sustainability. The storytelling activities arranged in the study were all time and effort consuming. To be able to tell a good story to the children and public took both the students and instructors a considerable amount of time to plan, experiment, and master verbally and physically the story and action behind the scene. We argued that the strategy of storytelling may exert a relatively long-term learning impact since it intensively engaged personal meaning, time and effort for the input and output. We also argue that the effect of storytelling is still apparent when facing a more controversial sustainable issue.

We also found that the effect of storytelling could be moderated by the animal characters chosen by the students. We found that half of the Moose team members increased their perception in related to Sentience/Individuality. However, the team showed no change in the aspect of Kinship. On the contrary, for the team telling the story about the local animal, Formosan Macaque, half of the members increased their perception related to Kinship, but showed little change regarding Sentience/Individuality. Concerning strengthen human–animal bonding, including a place-based, contextual effect in the storyline might heighten the effect of promoting students' attitudes toward wild animals. This finding was consistent with Serpell's [50] conclusion that the specific attributes of the animal was the key factor that influenced one's attitude toward animals. Based on our findings, we suggest that, when using storytelling as the pedagogy for education for sustainability, it will be more effective to engage the local environment and animal species. In the course related to the study, students and lectures work closely in developing the stories. We also suggest that when using storytelling approach as a pedagogy, since the content of the story has significant effect on the tellers and probably the audience's attitude toward animal, the participation of a facilitator in the stage of story development is important in ensuring the animal story that is free from anthropomorphic.

8. Conclusions

In line with Drumm's summery of the role of storytelling that mainly empowered, encouraged personal growth, and built resilience [35], in the current study, we concluded that telling stories of wild animals correlated to students' changing mentality regarding human–animal relationship. Our study generalized the impact of storytelling and contributed to the literature of storytelling study. Two specific conclusions were drawn in this study: First, being a storyteller had a significant effect in increasing the students' attitudes toward wild animals. The students started to perceive that the similarities between animals and human beings meant that an extending ethical relationship to animals exists. Second, the effect of storytelling could be moderated by the chosen local or international animal

as the main character of the story. A locally related animal as the main character was relatively more effective in foresting the attitude of kinship toward wild animals.

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