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Ecoliteracy digital short stories among students in Indonesia

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ABSTRACT

Issues about climate change and its mitigation are crucial around the world. Universities play a vital role in addressing climate change by educating students on protecting and preserving the environment. Literary works and stories about the environment are texts to educate students in environmental care. This study explored students' attitudes toward caring for the environment through digital short stories. A mixed method with an explanatory sequential design was used in the study. Questionnaires were used as data collection instruments. The sample of this research is students at the Indonesian language and literature study program Universitas Negeri Makassar, Indonesia (N=60). The research results show that students acquire constructive mindsets toward environmental care from the digital short stories presented to them, particularly concerning the negative impacts of deforestation, as indicated by their support for tree planting and replanting. The findings of this study implied that using digital environmental short stories inspires the establishment of attitudes that aid in mitigating climate change.

Introduction

Environmental education needs for the millennial generation, from students in schools to universities. Much environmental damage is occurring in various countries due to the conversion of tropical forest land to plantations. It causes the extinction of various types of flora and fauna and assists with global warming. In less than two centuries, environmental change has increased dramatically due to the uncontrolled exploitation of natural resources, thus disrupting the ecological balance (Garito et al., 2023). Short stories are an alternative to various mediums, including novels, films, podcasts, and articles, to raise awareness of the importance of preserving nature because short stories that impart ethical values about caring for the environment are invaluable narratives that inspire positive attitudes toward environmental care and encourage the development of attitudes that help in the preservation and protection of nature. Proficiency in understanding digital short stories

significantly impacts one's environmental stewardship traits (Juanda et al., 2024). Environmental care education can be integrated into teaching literature through short stories. Short stories containing various moral values, including the value of environmental care, can be read online on various platforms and social media.

Ecoliteracy or ecological literacy is increasingly confirmed as an essential component of science education, deepening students' understanding of the complex interrelationships in our ecosystems. By integrating eco-literacy into the science curriculum, educators can enhance students' perspectives on environmental conservation concerns and foster a sense of responsibility towards the natural world. This approach equips students with the knowledge of ecological principles and environmental challenges and encourages critical thinking and problem-solving skills. In a rapidly changing world, environmental concerns are paramount, and incorporating eco-literacy toward science education empowers students to make informed decisions and take actions that contribute positively to environmental sustainability. Through this holistic approach, science education transcends traditional boundaries, fostering a generation of environmentally conscious and scientifically literate individuals.

Research on eco-literacy for students has been carried out by many researchers, including (Badiani et al., 2023; Dai et al., 2023; Dewi et al., 2019, p. 34; Droubi et al., 2023; Eneji & Kori, 2023, p. 377; Fru & Africa, 2023, p. 539; Ho & Seow, 2023, p. 330; Hung et al., 2023; Jagger, 2023, p. 210; Jaime et al., 2023; Jantassova et al., 2023; Kusá et al., 2014; Lucas-Palacios et al., 2023; Panaou, 2023, p. 672; Piras et al., 2023, p. 135; Praet et al., 2023; Rogers & Hamilton-McKenna, 2023, p. 605; Sharma et al., 2023; Y. Xie et al., 2023; Yilmaz et al., 2023). Literary texts are produced in various books for young readers, and they must not lose the pleasure of reading and social/global awareness (Panaou, 2023). Critical engagement with literature for young people can deepen and broaden their understanding of and interaction with texts (Jaime et al., 2023; Rogers & Hamilton-McKenna, 2023). The claim about exploring eco-humanism as an educational paradigm to enhance environmental care in today's world is intriguing and warrants further explanation. Ecohumanism, as a philosophical perspective, emphasizes the interconnectedness between humans and the environment, promoting a holistic approach to environmental issues that considers both ecological and human well-being. In order to elaborate on this claim, it is essential to delve into how ecohumanism can be integrated into educational practices across different levels of education, namely primary, secondary, and tertiary.

Primary Education: At the primary level, students can be introduced to basic concepts of ecohumanism through age-appropriate activities and lessons. It could involve fostering an appreciation for nature, teaching environmental conservation practices, and encouraging empathy towards other living beings. Through hands-on experiences, storytelling, and interactive learning, young learners can understand the importance of their relationship with the environment and develop a sense of responsibility toward caring for it. Secondary Education: In secondary education, students can deepen their understanding of ecohumanism by exploring complex environmental issues and their social implications. They can engage in critical discussions about sustainability, environmental justice, and the ethical considerations involved in human interactions with the environment. Additionally, secondary education can provide opportunities for students to participate in environmental projects, research initiatives, and community-based activities that promote eco-humanistic values and practices. Tertiary Education: At the tertiary level, ecohumanism can be integrated into various academic disciplines and fields of study, including environmental science, ecology, sociology, and philosophy. Students can critically examine the intersections between human society and the natural world, considering environmental challenges' ethical, cultural, and political dimensions. Tertiary education can also emphasize interdisciplinary approaches to environmental issues, encouraging collaboration across disciplines to develop holistic solutions (Dewi et al., 2019; Ho & Seow, 2023; Jantassova et al., 2023). Utilizing ecohumanism in literature classes is not a novel concept (Wiyatmi et al., 2023, p. 252). Educators fail because of a lack of resources to teach environmental education as a curriculum that does not accommodate teaching environmental education constructively. Lack of student interest adds to the challenges of educators when teaching

environmental education (Fru & Africa, 2023). Learning theory based on Kolb's experiences can provide a holistic model for marine debris education, developing a beach cleanup curriculum based on marine debris learning experiences (Hung et al., 2023). By acknowledging these shared traces of conceptual and philosophical currents, educators can better understand the broader context in which environmental education operates and can draw upon a rich tapestry of ideas to inform their teaching practices and curriculum development (Eneji & Kori, 2023; Jagger, 2023; Piras et al., 2023). Individuals are agents who influence the environment and adopt cultural norms (Badiani et al., 2023; Praet et al., 2023; Y. Xie et al., 2023). Environmental education positively affects environmental care, environmentally friendly willingness, and student volunteerism (Sharma et al., 2023). Environmental education in the natural environment is more effective than education in the classroom (Yilmaz et al., 2023).

Several researchers have conducted literature and environmental research (Beggs & Dalley, 2023; Chen, 2023; Lord et al., 2023; Lupinacci et al., 2023). The inspiration comes from well-known fairy-tale characters (mermaids, vampires, and witches) in the empirical context of power generation, sustainable travel, and plastic pollution in the United Kingdom (Lord et al., 2023). The curriculum introduces an ecocritical pedagogy that critically addresses and thinks about the currently dominant power/knowledge frameworks that shape classrooms, schools, and communities (Lupinacci et al., 2023). In Australia, New Zealand, Canada, and the United States, indigenous peoples and their ecological knowledge are involved in confronting threats such as forest fires, floods, and storms (Beggs & Dalley, 2023).

Based on several previous studies, research on environmental care character education involves instilling values, attitudes, and behaviors that promote responsible stewardship of the environment. It emphasizes the development of personal character traits and ethical principles that guide individuals to respect, protect, and sustain the natural world for students through digital short story literacy, which still needs to be conducted. There have been many short stories as part of the prose genre on the theme of environmental phenomena, narrating various natural disasters, such as smog, pollution, and floods. Until now, no studies have been conducted on educating students on environmental care using those short stories in schools or universities. To close the gap in previous research, the researchers focused on the case of students at Universitas Negeri Makassar and their attitudes towards caring for the environment and literacy through digital short stories with environmental themes.

This research focuses on the question: How can using digital short stories as a medium for eco-literacy learning improves students' understanding of the environment? The novelty of this research is applying an ecocritical approach to literary works in the digital short story genre. The research significantly contributes to students, curriculum development, and policymakers. This research can enhance students' understanding of the importance of eco-literacy and environmental care through innovative and engaging methods, specifically digital short stories. From a curriculum development perspective, these findings support eco-literacy integration into educational curricula, demonstrating how digital literacy and environmental education can be combined to create a more holistic and relevant learning approach to current global challenges. For policymakers, this research offers important insights into how education can be an effective tool for promoting environmental care and social responsibility, encouraging them to adopt policies that support the implementation of such learning approaches in educational institutions. Thus, this research contributes not only to improving students' competencies but also to the development of a more adaptive and sustainable education system.

Literature Review

Environmental Education

Environmental education enhances awareness, comprehension, and personal competencies in identifying, comprehending, and safeguarding the environment. For instance, the aesthetic evaluation of mountainous terrains fosters insights into the Anthropocene epoch (Krieger, 2023, p. 64). Through environmental education, individuals are given knowledge about the relationship between humans and the environment and its impacts (Abdullah et al., 2022, p. 19; Akimov et al., 2023; Ivarsson, 2023). This study (Kroufek et al., 2023, p. 1) concerns student satisfaction in outdoor environmental education programs in the Czech Republic. Environmental education involves developing attitudes, values, and environmental responsibility so that individuals become agents of change who actively preserve nature (Chataika, 2023, p. 404; Kusá et al., 2014). The evolution of cross-cultural narrative exploration, which has evolved alongside the intermingling of diverse life experiences and traditions, is depicted through artistic expression such as oral storytelling and visual representations. This narrative thread is deeply intertwined with themes of environmental stewardship and care (He, 2023, p. 392). The short story encompasses diverse environmental elements, including pollution, wilderness, apocalypse, habitat, wildlife, and the Earth (Juanda & Azis, 2023).

In terms of knowledge, individuals learn various concepts, facts, and principles about the environment. Research (Randez, 2023, p. 1) shows that they understand ecosystems, biodiversity, pollution, global warming, and other environmental issues. Individuals are trained to use practical skills in protecting the environment, such as recycling, energy saving, and sustainable use of resources. In terms of attitudes and values, individuals develop positive attitudes, such as respect, responsibility, and concern for the environment (Panaou, 2023). They internalize the values of sustainability in human relations with nature (Rogers & Hamilton-McKenna, 2023, p. 605). It is reflected in five interrelated aspects in the case of Yueyang Tower as a literary tourist spot, including the moral function of literature, the emphasis on the moral character of the writer, the moral conclusions from nature that are usually expressed in literature, the inculcation of the moral self of visitors, and society, and places. as a moral symbol (Yu & Xu, 2018, p. 292). "Environmental education is a trail of conceptual and philosophical currents, both historical and emerging, that flow through and mix in curriculum, pedagogy, and practice"(Dewi et al., 2019; Droubi et al., 2023; Jagger, 2023). Community citizens are empowered to act better in their society, which could apply to many activities other than environmental (Ho & Seow, 2023).

Ecocriticism is a critical approach that combines literary studies with concern for environmental and ecological issues. In ecocriticism, literature reflects the complexity of the relationship between humans and their environment (Chen, 2023; P. Xie et al., 2023). Ecocriticism examines how literature represents conflict, sustainability, and ecological diversity (Beggs & Dalley, 2023). Four main lines characterize environmental literature and drive the character of caring for the environment, namely non-human natural components, natural legitimacy, responsibility to nature, and natural dynamics (Buell, 2005). In ecocriticism, critics analyze literary works of various genres and periods, focusing on environmental themes (Chen, 2023). The ecocritical critic is concerned with the language and literary style used to celebrate, reflect on, or criticize the relationship between humans and nature and human actions' impact on the planet (Sahoo et al., 2023, p. 2060; Yang et al., 2023).

Digital Literature

Digital literature uses technology and digital media to create, disseminate, and consume literary works. Digital literature empowers youth to interpret and emotionally engage with the texts they encounter by assuming diverse identities and roles, participating in interconnected learning environments, and shaping their reading experiences and perceptions of fiction (Santa María et al.,

2022). Ecological literacy aims to enhance individual understanding and motivation to address environmental concerns sustainably (Sigit et al., 2023, p. 357; Juanda & Afandi, 2024). In today's digital age, literature transcends traditional physical formats like books or magazines, becoming essential for critical literacy and fostering students' ability to derive meaning within a global educational environment (Zhang, 2023). Digital media allows people to find information online effectively; digital literacy is essential in human progress, and poverty mitigation goesoes hand in hand (Ali et al., 2023).

Digital literature opens new spaces for writers to express themselves and tell their stories innovatively (De Felice et al., 2023; Xiao et al., 2023). The Story Thinking practical model builds on and complements existing models to incorporate storytelling elements and highlight the contributions of writing practitioners (Marshall et al., 2023, p. 1). They use blogs, websites, or social media to publish their works that extend from information literacy (Gao, 2023, p. 1). Digital literature changes how readers consume literary works (Gulya & Fehérvári, 2023, p. 1). In digital format, readers can easily access literary works via smartphones, tablets, or e-readers (Laeli et al., 2022).

The digital literacy model consists of two components: (1) a Digital Literacy Framework (SPDLF) and (2) a digital literacy tool (Reddy et al., 2023). Through dramatic space, the viewer mentally participates in the world of moving images (Weng, 2011). Based on the Multidimensional Curriculum Model (MdCM), middle school students effectively develop scientific and creative. Novel and literacy subjects identify and incorporate cognitive, social-emotional, and teaching-learning application factors that influence learning (Lee & George, 2023; Vidergor, 2023). Students have high literacy interests (Juanda & Fitriani, 2023).

Research on digital literary literacy has been carried out by researchers (Ali et al., 2023; Baker et al., 2023; Chung, 2023, p. 344; Encabo-Fernández et al., 2023; Juanda & Fitriani, 2023; Laeli et al., 2022, p. 139; Lee & George, 2023; Reddy et al., 2023; Strouse et al., 2022, p. 1; Vidergor, 2023; Weng, 2011, p. 706; Zhao et al., 2023; Zvereva, 2020). Research on digital and print literacy shows that readers are more interested in reading digital literature (Strouse et al., 2022). Research on cultural literacy through digital narratives includes characters and story morals such as empathy for inclusion and student tolerance (Baker et al., 2023). The literary activity talks about culture and politics as a form and practice of digital literature for internet users in Russia (Zvereva, 2020). High online reading usage rates offer a different perspective on online reading teaching.

Methods

Research Design

This research used a mixed method with an explanatory sequential design of quantitative and qualitative analysis. Content analysis and interpretation of the meaning of digital short stories were the qualitative aspects of this study, while students' responses to the questionnaire were the quantitative part. Researchers studied aspects of stewardship personality as a single variable for descriptive statistical analysis. Mixed method design permits the breadth and depth of understanding of the subject matter and enables data collection within a short period (Palinkas et al., 2015; Warfa, 2016).

The research began by drafting a research instrument related to environmental care based on Buell's concept of ecocriticism. The concept involves aspects such as nature's non-human component, legitimacy, responsibility towards nature, and dynamics of nature. Furthermore, the researcher provided reading materials in the form of web-based digital short stories with the natural environment theme to students who became research subjects. After the students had read the short stories, the researcher administered a specially designed questionnaire to collect data on their perceptions of the environmental issues that appeared in the short stories. Quantitative data from this questionnaire became one of the primary data sources in this study. In addition, the researcher also collected qualitative data by selecting several short stories that became the focus of the study and

conducting a thorough analysis of the short stories. This qualitative data was then juxtaposed with the quantitative data obtained from the respondents through a questionnaire based on nine items.

The research process was carefully designed to ensure that each step was closely related to the research objective, which was to reveal the impact of digital short stories on students' eco-literacy. By incorporating quantitative and qualitative data, this study aims to understand better how digital short stories can effectively increase students' environmental care and literacy. This study represents a comprehensive attempt at answering the research questions posed in the context of education and environmental care.

Population and Sample

The study population (N=400) comprised all bachelor's degree students in Indonesian Language and Literature Education at Universitas Negeri Makassar. An n=60 sample was taken using a purposive sampling technique from this population, as shown in Table 1. The sampling was based on the criteria: active students at Universitas Negeri Makassar, engaged in Indonesian language and education.

Table 1

Distribution of students by gender

Gender	n	%
Male	11	18.333
Female	49	81.666
Total	60	100

Data Collection and Instruments

The research instrument included a Likert scale. The questionnaire was adapted from Buell's (2005) ecocritical concepts, which include nonhuman components of nature, natural legitimacy, responsibility to nature, and nature dynamics. Environmental aspects of the short stories consist of concern for living things, ecosystems, and the physical environment, concern for nature as local wisdom, application of environmental education and environmental ethics, participation in social service activities, obviation of environmental degradation, and adaptation to environmental change. The digital short story reading material used was the short story Tragedi Asap or 'Smoke Tragedy' on the web, and then students filled out a questionnaire.

Some short stories in Indonesia with environmental themes include: (1) Pengelana Laut "The Sea Voyager" by Linda Christanty, (2) Laut Mengambil Cintaku "The Sea Takes My Love" by Jemmy Piran, (3) Musnahnya Hutan Larangan "The Destruction of the Forbidden Forest" by Bahagia, (4) Tragedi Asap "The Smoke Tragedy" by Gigih Suroso, (5) Macet "Traffic Jam" by Alif Febriyantoro, (6) Pemanggil Kematian "Death Summoner" by Jemmy Piran, and (7) Tuan Budiman Tersesat di Hutan "Mr Budiman Gets Lost in the Forest" by Hari TS. Researchers chose the short story Smoke Tragedy because this topic is highly relevant in Indonesia and neighboring nations. Many forests are converted into palm oil plantations by Indonesians and foreigners. The forests are burned until the smoke reaches Singapore and Malaysia.

The short story Tragedi Asap by Gigih Suroso tells the story of Siti Hajar, a mother of three who lives in the Bumi Bertuah area surrounded by oil palm plantations owned by Tuan Hadi and other foreigners. The short story depicts the transformation of the ecosystem from dense forest to oil palm and rubber plantations, as well as how the local community sells their land for short-term economic gain. One day, a tragedy arises when the forbidden forest in the area is burned, resulting in thick smoke that blinds the population and makes it difficult for Siti and her children to breathe. This tragedy resulted in the death of 50 people, including Siti's three children and Ani, her friend's child.

Meanwhile, Mr Hadi and his family, who were suspected of being responsible for the forest fire, suffered a fatal accident in a hotel fire while on vacation. This short story highlights the paradox of inherent fairness and the damaging impact of environmental exploitation on local communities. This short story was initially published in the Analisa newspaper and then online through the Ruang Sastra website (https://ruangsastra.com/18674/tragedi-asap/). The data was collected using the questionnaires via Google Forms (https://docs.google.com/forms).

Table 2

Questionnaire of environmental care (ENV)

Dimensions	Indicator	Code	Statement	Scale
Nonhuman Components of Nature	Flora and fauna	ENV_CARE1	As the protagonist Siti Hajar did for forest animals, I care for animals and plants in the surrounding environment.	1 = Never 2 = Rarely 3 = Sometimes
	Ecosystem and Physical Environment	ENV_CARE2	I protect the ecosystem and physical environment by not littering like the protagonist Siti Hajar did.	4 = Often 5 = Always
Natural Legitimacy	The Embodiment of Nature as the Central Subject	ENV_CARE3	I apply the value of religiosity or local wisdom that nature has a Creator or Guardian, as did the protagonist Siti Hajar, who considers the forbidden forest sacred.	
Responsibility to Nature	Environmental Education and Ethics	ENV_CARE4	I carry out the principles of education and environmental ethics by preserving and keeping the environment clean as the protagonist Siti Hajar who keeps the forest green.	
	Concern and Participation	ENV_CARE5	I care about and actively participate in social service activities when disasters such as fires, floods, and other parts occur through donations, such as the characters Siti and Ani, who help each other during a forest fire.	
	Sustainable Society Representation	ENV_CARE6	I participate in social activities by cooperating with the characters Siti and Ani, who join with volunteers to extinguish forest fires.	
Nature Dynamics	Ecological Process	ENV_CARE7	I pay attention to the life of animals in the wild (e.g., forest) by not engaging in poaching like the protagonist Siti Hajar did to forest animals.	
	Environmental Degradation	ENV_CARE8	I try to prevent environmental degradation, such as forest fires or other activities like the protagonist Siti Hajar who prevents people from logging forests.	
	Adaptation to Environmental Changes	ENV_CARE9	I follow local environmental regulations or policies to deal with environmental degradation, like the protagonist Siti Hajar who can survive forest fire disasters.	

Validity and Reliability of Instrument

The instrument's validity was measured using the probability correlation value (p-value) and the Pearson Correlation coefficient with the help of the Jamovi 2.3.28 software program. The validity test is carried out by measuring the correlation between the variables to be measured and the items in the questionnaire that have been designed. By comparing the results of this correlation, the researcher

can determine the extent to which the questionnaire can be considered valid for measuring the variable in question. A significant correlation between the variables and the planned measurement items strengthens the validity of the questionnaire. The shown in Table 3.

Table 3

Instrument validity testing

Item \ Variable	ENV_CARE
ENV_CARE1	0.723***
	< 0.001
ENV_CARE2	0.692***
	< 0.001
ENV_CARE3	0.664***
	< 0.001
ENV_CARE4	0.709***
	< 0.001
ENV_CARE5	0.761***
	< 0.001
ENV_CARE6	0.827***
	< 0.001
ENV_CARE7	0.542***
	< 0.001
ENV_CARE8	0.761***
	< 0.001
ENV_CARE9	0.804***
	< 0.001

Table 3 above shows that all item correlation coefficient values are satisfactory and statistically significant at the 0.01 level with values between 0.542 – 0.827, more significant than the Pearson r value of 0.3301 (df = 58); this instrument is valid. In addition, the p-value shows <0.001 (p<0.05). The questionnaire is considered valid. In addition, the Cronbach's Alpha value of the questionnaire is 0.881. Since the computed Cronbach's Alpha value of 0.881 > 0.70. The instrument is declared reliable and can be trusted.

Data Analysis

The collected data were analysis using the software program Jamovi 2.3.28. Descriptive statistical analysis was performed to measure the mean score, standard deviation, and frequency of participants' responses. Qualitative data was coded into themes and used as excerpts in the discussion.

Findings

The environmental care character variable (ENV_CARE) is presented based on the percentage of response frequency. The 9 statement items on these variables are presented in Table 4.

Table 4

Student Response attitudes towards caring for the environment

Item	Students Response									
	Never		Rarely		Sometimes		Often		Always	
	n	%	n	%	n	%	n	%	n	%
ENV_CARE1	0	0.0	7	11.7	21	35	20	33.3	12	20.0
ENV_CARE2	0	0.0	2	3.3	13	21.7	26	43.3	19	31.7
ENV_CARE3	1	1.7	4	6.7	18	30.0	24	40.0	13	21.7
ENV_CARE4	0	0.0	0	0.0	19	31.7	27	45.0	14	23.3
ENV_CARE5	1	1.7	7	11.7	23	38.3	18	30.0	11	18.3
ENV_CARE6	1	1.7	6	10.0	18	30.0	23	38.3	12	30.0
ENV_CARE7	2	3.3	4	6.7	11	18.3	21	35.0	22	36.7
ENV_CARE8	2	3.3	7	11.7	16	26.7	24	40.0	11	18.3
ENV_CARE9	1	1.7	5	8.3	24	40.0	21	35.0	9	15.0

The ENV_CARE1 item in Table 4. indicates that students often care about the animals and plants in the surrounding environment as the protagonist Hajar does (mean score = 3.62; SD = 0.940). Based on the short story "Tragedi Asap," Hajar the form of caring for living things is to let them live freely without disturbance. In the short story character Indra contradictory cleans up the undergrowth that disturbs the life of the tree. *Still, there used to be dense forest there, fortunately there was Indra, he brought a machete to cut down the thicket ("Masih, di sana dulu masih hutan lebat, untungnya ada Indra, dia membawa parang untuk menebas semak belukar" – Suroso, 2019.*

The ENV_CARE2 item indicates that students often protect the ecosystem by not littering like the behavior of the protagonist Siti Hajar (mean score = 4.03; SD = 0.823). This is illustrated in the citation below, which shows the concern of the figures, Siti Hajar and Ani, for the forest so that the ecosystem is maintained. *We stared at the area of land in the Sorcerer's Bui area, formerly thickets, dense forests inhabited by many animals ("Kami menatap luas lahan di daerah Bui Bertuah ini, dulu semak belukar, hutan lebat yang dihuni banyak binatang") – Suroso, 2019.*

The ENV_CARE3 item suggests that students often apply religious values or local wisdom, as did the protagonist Siti Hajar, who considers forbidden forests sacred (mean score = 3.73; SD = 0.936). This is supported by the citation provided by the author, which highlights the belief that every action will be rewarded by a higher power. *How dare they burn the forbidden forest, said Ani, the perpetrators of the burning of the forbidden forest have been taken by God ("Beraninya mereka membakar hutan terlarang,"ujar Ani, pelaku pembakaran hutan terlarang sudah diambil Tuhan") – Suroso, 2019.*

The ENV_CARE4 item indicated that students often practice ethical from environmental education by maintaining and maintaining a clean environment, like the main character Siti Hajar who keeps the forest green (mean score = 3.92; SD = 0.743. The short story excerpt below applies the principles of environmental education and ethics to stay green. *Ahh, who said, how can the forest be cleaned, just let it stay green ("Ahh, kata siapa, mana boleh hutan itu dibersihkan, biarkanlah saja dia tetap hijau") – Suroso, 2019.*

ENV_CARE 5 item indicated that students often actively participate in social service activities when disasters, such as fires, floods, etc., occur through donations, such as the characters Siti and Ani who help each other when a forest fire occurs (mean score = 3.52; SD = 0.983). Based on the excerpt from the digital short story below, one form of social service activity is collecting as much as possible to give to people who need it more.

> *They told me that the oil palm harvests this time was very successful, for that they would give 500 thousand Rupiah or USD32 for everyone who came. "Mereka bercerita bahwa panen sawit kali ini sangat berhasil, untuk itu mereka akan memberikan uang 500 ribu Rupiah untuk semua yang datang.") – Suroso, 2019.*

The ENV_CARE6 item suggests that students often participate in collaborative community endeavors as the figures Siti and Ani who participate with volunteers in extinguishing forest fires (mean score = 3.65; SD = 0.971). In the digital short story excerpt below, the protagonist Siti Hajar helps volunteers save her children and residents from forest fires. *They are all the same as me caught in the smoke. Who dares to set fire to the forbidden forest, they are not allowed to enter ("Mereka semua sama sepertiku terjebak asap. Siapa yang berani membakar hutan terlarang, masuk saja tidak boleh")* – Suroso, 2019.

The ENV_CARE7 item suggests that students often pay attention to animal life in the wild (for example, forests) by not engaging in poaching like the protagonist Siti Hajar did to forest animals (mean score = 3.95; SD = 1.064). This is related to the quote below.

> *There is only one forest, until now it is still a forest. There are lots of tigers, jungle people, bears and other animals that don't bother you ("Hanya ada satu hutan, sampai sekarang masih tetap hutan. di sana banyak harimau, orang hutan, beruang dan binatang-binatang lain yang tak mengganggu")* – Suroso, 2019.

The ENV_CARE8 item that students often try to prevent environmental degradation, such as forest fires or other activities, such as the protagonist Siti Hajar who prevents people from logging in the forest (mean score = 3.58; SD = 1.030). This is related to the quote from the digital short story below, where the protagonist Siti Hajar is worried about her land being turned into oil palm plantations, causing an environmental crisis. *Just try first Abah doesn't sell his land to Mr. Hadi, maybe my luck will be even better ("Coba saja dulu Abah tidak menjual lahannya ke Tuan Hadi, mungkin nasibku lebih baik lagi")* – Suroso, 2019.

The ENV_CARE9 item suggests that students often follow local environmental regulations or policies to deal with environmental degradation, like the protagonist Siti Hajar who was able to survive forest fires (mean score = 3.53; SD = 0.911). This relates to the digital short story excerpt below, which describes the obedience of the protagonist Siti Hajar. *I don't want to believe it, even though Abah and the old people are gone, the forest still cannot be cut down ("Aku tak ingin percaya, meski Abah dan orang orang dulu sudah tidak ada, tetap saja hutan itu tidak boleh ditebang")* – Suroso, 2019.

Overall, student responses to the caring of nature the environment are presented in Figure 1 below.

Figure 1

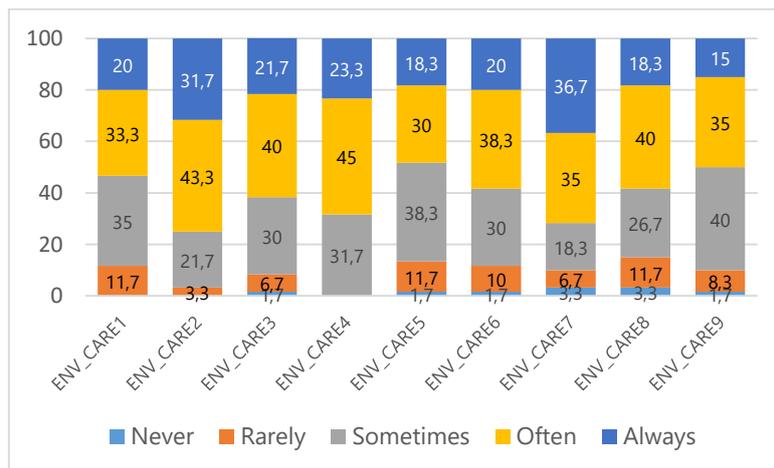*Percentage of student responses towards environmental care character*

Figure 1 shows data on environmental care (ENV CARE) with various categories from ENV CARE1 to ENV CARE9. Each environmental care category has different levels of engagement. Digital short stories can be an effective environmental education tool by incorporating interactive and engaging content that raises awareness about environmental issues. In the context of the image above, digital short stories can explore the various scenarios represented by each "ENV CARE" category in

narrative form. By immersing readers in interactive narratives that reflect different levels of environmental engagement - from never to always - digital short stories can foster empathy and inspire action towards more sustainable practices.

Discussion

In this study, students demonstrated an understanding of the negative impacts of logging through the short story. However, it is important to clarify that the story did not necessarily form their attitudes; rather, it provided a context for measuring pre-existing attitudes. Specifically, the story facilitated the measurement of students' concern for the environment, particularly regarding the necessity of replanting after logging activities. The author of the short story narrates matters relating to the character caring for the environment so that the reader appears to be a character who cares for the environment based on the short story. This finding aligns with the fact that literary texts with multicultural themes can be applied in secondary education settings (Dai et al., 2023; Kusá et al., 2014). However, it is essential to highlight that the relevance of these findings to our research context is in environmental education and the use of digital stories to raise environmental awareness among university students. The findings suggest the potential for utilizing digital stories with environmental themes as practical learning tools in secondary education. It is vital to introduce young readers to the production of literary texts and ensure that young readers worldwide do not overlook the fun andialnoticedareness contained in books (Panaou, 2023). In the context of the current findings, this underscores the importance of providing young readers greater access to digital stories with environmental themes. Hence, it provides fun and enriches their understanding of global environmental issues. Critical engagement with literature for young people can deepen and broaden students' understanding and interaction with texts and their everyday world (Jaime et al., 2023; Rogers & Hamilton-McKenna, 2023). Environmental education positively affects environmental care, environmentally friendly willingness, and student volunteerism (Sharma et al., 2023). Research shows that environmental education conducted in natural environments is more effective than classroom education (Yilmaz et al., 2023).

The satisfaction of students or learners plays a crucial role in the effectiveness of outdoor environmental education initiatives. While the evaluation often focuses on students' knowledge, attitudes, and behaviors, there is comparatively less research dedicated to student satisfaction (Ivarsson, 2023). Environmental education aims not only to impart knowledge but also to instill attitudes, values, and a sense of responsibility towards nature, empowering individuals to actively engage in environmental conservation (Chataika, 2023; Kusá et al., 2014). Understanding environmental issues such as ecosystems, biodiversity, pollution, and global warming is fundamental (Randez, 2023). Furthermore, there are underlying principles of sustainability, equity, and justice in human-nature relationships (Rogers & Hamilton-McKenna, 2023). These moral values are often conveyed through literature, serving as moral guides and educational tools in environmental discourse (Yu & Xu, 2018; Jagger, 2023). To enhance environmental awareness, training in digital short story writing focusing on environmental themes is recommended, aligning with Ormancı's advocacy for improving writing skills in this domain (Ormancı, 2023).

This study is in line with the research findings by Strouse et al. (2022) who showed higher reader interest in reading digital literature than print. This can be explained by the ease of access and flexibility offered by digital literature, which also has the potential to increase reader engagement in digital environmental stories, in line with the findings of the current study. Research on cultural literacy through digital narratives includes story characters and morals such as empathy for inclusion and tolerance of students (Baker et al., 2023). The current findings are relevant because digital stories that reinforce values such as empathy and tolerance can be an effective tool in shaping positive

attitudes and behaviors related to the environment among university students. The high usage rate of online reading suggests different views on teaching reading online. Participants mentioned the lack of digital literacy in reading and strategies for future reading classes. It is relevant to the current findings as it highlights the importance of paying attention to digital literacy in the context of environmental learning through digital short stories. It also emphasizes the need for effective strategies in teaching reading environmental stories online (Chung, 2023; Encabo-Fernández et al., 2023; Laeli et al., 2022; Zhao et al., 2023). The proposed novel and literacy subjects identify and incorporate cognitive, social-emotional, and teaching learning application factors that influence learning (Lee & George, 2023; Vidergor, 2023). Based on students' enthusiasm in participating in the activities held, it can be concluded that students have a high interest in literacy; it's just that they don't have a platform or space that can accommodate their interests (Juanda & Fitriani, 2023).

Digital literature enables young people to construct meaning and feelings in the literature they read and write through multiple identities and roles, engage in connected learning, and influence reading and experience fiction (Santa María et al., (Santa María et al., 2022). Increased awareness of environmental care arises from understanding a phenomenon, including environmental phenomena originating from digital text stimulation with environmental themes. Karataş et al. (2022) argue that there is an increased awareness of scientific literacy after reading questions related to scientific literacy from the science literacy scale (SLS) instrument. In this digital era, literature is no longer limited to physical forms of writing, such as books or magazines (Zhang, 2023). Digital literature allows writers to express themselves and tell their stories innovatively (De Felice et al., 2023; Xiao et al., 2023; Gulya & Fehérvári, 2023, p. 1). With digital formats, readers can easily access literary works via smartphones, tablets, or e-readers (Laeli et al., 2022). Hence, it should highlight the importance of providing explicit practice for pre-service teachers using online reading strategies (Laeli et al., 2022).

This short story is about environmental phenomena narrated by the author. Environmental aspects in short stories consist of concern for living things, concern for ecosystems and the physical environment, concern for nature as a central subject (local wisdom and religiosity values), application of environmental education and environmental ethics, participation in social service activities, cooperation participation, prevent environmental degradation, and adaptation to environmental change. Other studies have found that the inspiration from wellknown fairy-tale characters (i.e., mermaids, vampires, and witches) translates to energy and social science research in the empirical context of electricity generation, sustainable travel, and plastic pollution in the UK (Lord et al., 2023). The curriculum offers the opportunity to introduce an ecocritical pedagogy that critically addresses and rethinks the currently dominant power/knowledge frameworks that shape classrooms, schools, and communities (Lupinacci et al., 2023). In Australia, Aotearoa, New Zealand, Canada, and the United States, indigenous peoples and their ecological knowledge increasingly fight natural—and socially constructed—threats such as wildfires, floods, and storms (Beggs & Dalley, 2023).

Four main lines characterize environmental literature and drive the character of caring for the environment, namely non-human natural components, natural legitimacy, responsibility to nature, and natural dynamics (Buell, 2005). They look at how the authors describe the relationship between humans and nature, how nature is affected by human activities, and how these relationships affect the balance of ecosystems (Chen, 2023) and invite us to inspire positive changes in attitudes and behavior towards nature (Sahoo et al., 2023, p. 2060).

Conclusion and Implications

This study explored the students value character on caring for the environment and literacy through digital short stories with environmental themes. The students acquire the character value of caring for the environment in this short story, namely, understanding the negative impacts of logging,

so they care about replanting. In addition, students have made efforts to prevent environmental degradation by preventing parties from carrying out environmental destruction activities. Furthermore, the respondents tend to be at an average response close to 4 (frequent scale) that they have implemented the character of caring for the environment. This shows that they often apply these principles based on digital short stories read on the web.

Environmental themed digital short stories are significant in building student character, especially in caring for the environment. The findings show that students exposed to these digital short stories tend to understand the negative impacts of deforestation and actively care about efforts to replant forests. In addition, they also tend to take preventive actions against environmental damage by avoiding or overcoming activities that damage the environment. This study's results also revealed that using digital short stories with environmental themes can improve environmental care literacy among university students. They are more likely to apply the character of environmental care in their daily lives after reading these stories. It shows great potential in using digital short stories as an educational tool to promote environmental care. In addition, the findings provide impetus to consider improving the language and literature teaching curriculum in higher education by including more environmentally themed materials. It can produce a generation of college students who are more concerned about the environment and better prepared to face future environmental challenges. This study also shows the potential to be applied to university students in various countries that often experience natural disasters. Building environmental care and a caring character can be an essential step in preparing them for disasters and maintaining the sustainability of the environment around them. The implication of this finding for practice is the need to integrate environmental issues into the educational curriculum and develop more digital story-based educational materials. In addition, environmental care literacy can also contribute to environmental conservation efforts. Further research for researchers in various environmental and educational contexts can help more deeply understand the impact of environmentally-themed digital stories. The global implication of this study is that digital short stories can effectively promote environmental care globally and prepare communities for natural disasters.

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References

Abdullah, F., Ishak, N. A., & Ahmad, M. Z. (2022). Unpacking Determinants of MiddleSchool Children's Direct Nature Experiences (DNEs): An Island Perspective. *International Journal of Learning, Teaching and Educational Research*, 21(10), 19–49. https://doi.org/10.26803/ijlter.21.10.2

Akimov, N., Kurmanov, N., Uskelenova, A., Aidargaliyeva, N., Mukhiyayeva, D., Rakhimova, S., Raimbekov, B., & Utegenova, Z. (2023). Components of education 4.0 in open innovation competence frameworks: Systematic review. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(2), 100037. https://doi.org/10.1016/j.joitmc.2023.100037

Ali, A., Raza, A. A., & Qazi, I. A. (2023). Validated digital literacy measures for populations with low levels of internet experiences. *Development Engineering*, 8, 100107. https://doi.org/10.1016/j.deveng.2023.100107

Badiani, F., Willard, A., & McNamara, R. (2023). Bleeding cultures a cross-cultural exploration into the behavioral outcomes of tight and loose cultural contact zones. *Current Research in Ecological and Social Psychology*, 4, 100128. https://doi.org/10.1016/j.cresp.2023.100128

Baker, M. J., Pallarès, G., Cedar, T., Brandel, N., Bietti, L., Schwarz, B., & Détienne, F. (2023). Understanding the moral of the story: Collaborative interpretation of visual narratives. *Learning, Culture and Social Interaction*, 39(April), 100700. https://doi.org/10.1016/j.lcsi.2023.100700

Beggs, L., & Dalley, C. (2023). Wildfire bureaucracy: The affective dimensions of state engagement with Indigenous peoples in southeast Australia. *Geoforum*, 138, 103675. https://doi.org/10.1016/j.geoforum.2023.103675

Buell, L. (2005). *The Future of Environmental Criticism: Environmental Crisis and Literary Imagination*. Wiley-Blackwell.

Calafato, R., & Simmonds, K. (2022). Linkages between literary response, aesthetic competence, and literary competence in the EFL classroom. *Studies in Educational Evaluation*, 75(October), 101214. https://doi.org/10.1016/j.stueduc.2022.101214

Chataika, T. (2023). *Inclusive education policies and practices in Malawi and Zimbabwe* (R. J. Tierney, F. Rizvi, & K. B. T.-I. E. of E. (Fourth E. Ercikan (eds.); pp. 404–417). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.12033-0

Chen, W. (2023). On boat: A magnificent panorama of River Basin in Tang Dynasty. *Heliyon*, 9(1), e12771. https://doi.org/10.1016/j.heliyon.2022.e12771

Chung, J. (2023). Korean University Students' Attitudes, Perceptions, and Evaluations of Asynchronous Online Education in Korean Higher Education. *International Journal of Learning, Teaching and Educational Research*, 22(5), 344–358.

Dai, Z., Xiong, J., Zhao, L., & Zhu, X. (2023). Smart classroom learning environment preferences of higher education teachers and students in China: An ecological perspective. *Heliyon*, 9(6), e16769. https://doi.org/10.1016/j.heliyon.2023.e16769

De Felice, F., De Luca, C., Chiara, S. Di, & Petrillo, A. (2023). Physical and digital worlds: implications and opportunities of the metaverse. *Procedia Computer Science*, 217, 1744–1754. https://doi.org/10.1016/j.procs.2022.12.374

Dewi, N., Siswanto, F. A. J., & Anggraini, F. R. R. (2019). Using short fiction to teach business and environmental ethics. *International Journal of Learning, Teaching and Educational Research*, 18(10), 34–47. https://doi.org/10.26803/ijlter.18.10.3

Droubi, S., Galamba, A., Fernandes, F. L., de Mendonça, A. A., & Heffron, R. J. (2023). Transforming education for the just transition. *Energy Research & Social Science*, 100, 103090. https://doi.org/10.1016/j.erss.2023.103090

Encabo-Fernández, E., Albarracín-Vivo, D., & Jerez-Martínez, I. (2023). Evaluative research on the critical thinking of primary school students. *International Journal of Educational Research Open*, 4, 100249. https://doi.org/10.1016/j.ijedro.2023.100249

Eneji, C. O., & Kori, C. (2023). Products Evaluation of Environmental Education Curriculum/Program Implementation in the University of Calabar, Nigeria. *International Journal of Learning Teaching and Research*, 22(4), 377–413.

Fru, R. N., & Africa, S. (2023). Educators' Perceptions and Approaches to Environmental Education and Pro-Environmental Behaviour in South African Secondary Schools. *International Journal of Learning Teaching and Research*, 22(5), 359–373.

Gao, H. (2023). Translanguaging and Spatial Repertoire: Academic Information Literacies of Multilingual International Doctoral Students. *Linguistics and Education*, 101167. https://doi.org/10.1016/j.linged.2023.101167

Garai, J., & Ku, H. B. (2023). An ethnographic study on the impacts of Covid-19 pandemic on indigenous people and their coping strategies in Bangladesh. *International Journal of Disaster Risk Reduction*, 86(March 2022), 103553. https://doi.org/10.1016/j.ijdrr.2023.103553

Garito MA, Caforio A, Falegnami A, Tomassi A. (2023). Environmental education on the European Green Deal. *Energy Reports*, 9(February), 340-354. https://doi.org/10.1016/j.egyr.2023.06.001

Gulya, N., & Fehérvári, A. (2023). The impact of literary works containing characters with disabilities on students' perception and attitudes towards people with disabilities. *International Journal of Educational Research*, 117, 102132. https://doi.org/10.1016/j.ijer.2022.102132

He, M. F. (2023). *Cross-cultural narrative inquiry—cross-cultural lives* (R. J. Tierney, F. Rizvi, & K. B. T.-I. E. of E. (Fourth E. Ercikan (eds.); pp. 392–405). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.03068-2

Ho, L.-C., & Seow, T. (2023). *Informal environmental citizenship education* (R. J. Tierney, F. Rizvi, & K. B. T.-I. E. of E. (Fourth E. Ercikan (eds.); pp. 330–336). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.08055-6

Hung, L.-Y., Wang, S.-M., & Yeh, T.-K. (2023). Kolb's experiential learning theory and marine debris education: Effects of different stages on learning. Marine Pollution Bulletin, 191, 114933. https://doi.org/ 10.1016/j.marpolbul.2023.114933

Ivarsson, L. (2023). Principals' perceptions of gifted students and their education. Social Sciences & Humanities Open, 7(1), 100400. https://doi.org/10.1016/j.ssaho.2023.100400

Jagger, S. (2023). Exploring currents and confluences in environmental education (R. J. Tierney, F. Rizvi, & K. B. T.-I. E. of E. (Fourth E. Ercikan (eds.); pp. 210–219). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.08037-4

Jaime, M., Salazar, C., Alpizar, F., & Carlsson, F. (2023). Can school environmental education programs make children and parents more pro-environmental? *Journal of Development Economics*, 161, 103032. https://doi.org/10.1016/j.jdeveco.2022.103032

Jantassova, A., Nurutdinova, A., Boranbayeva, A., Nurlin, A., & Bekisheva, S. (2023). Problems of legal regulation of natural and natural-anthropogenic complexes with special status. *Environmental Development*, 46, 100848. https://doi.org/10.1016/j.envdev.2023.100848

Juanda, & Afandi, I. (2024). Assessing text comprehension proficiency: Indonesian higher education students vs ChatGPT. *XLinguae, 17(1)*, 49–68. https://doi.org/10.18355/XL.2024.17.01.04

Juanda, J., Afandi, I., & Yunus, A. F. (2024). Digital Short Story Literacy and the Character of Environmentally Concerned Students. *Journal of Language Teaching and Research*, 15(2), 415–427. https://doi.org/10.17507/jltr.1502.10

Juanda, & Azis. (2023). Dolphin Conservation in Pengelana Laut Short Story: Greg Garrard's Ecocriticism Study. *Theory and Practice in Language Studies, 13(9)*, 2303–2312. https://doi.org/10.17507/tpls.1309.17

Juanda, A., & Fitriani, A. N. (2023). PKM Penguatan Literasi Sekolah melalui Mading Sastra Siswa SDN 149 Amessangeng Soppeng Sulawesi Selatan. *Jurnal Bidik*, 3(2), 1–7.

Karataş, F. Ö., Orçan, F., Çelik, S., Uludüz, Ş. M., & Bektaş, B. T. (2022). Perception and Reality: Two Dimensions of Scientific Literacy Measures. *Journal of Turkish Science Education*, *19*(1), 129–143. https://doi.org/10.36681/tused.2022.114

Krieger, P. (2023). International Journal of Geoheritage and Parks Preserving geodiversity in Mexican hyper urban con fl ict zones: A geo-aesthetic approach. *International Journal of Geoheritage and Parks*, 11(1), 64–81. https://doi.org/10.1016/j.ijgeop.2022.08.010

Kroufek, R., Cincera, J., Kolenaty, M., Zalesak, J., & Johnson, B. (2023). "I had a spider in my mouth": What makes students happy in outdoor environmental education programs. *Evaluation and Program Planning*, 99, 102326. https://doi.org/10.1016/j.evalprogplan.2023.102326

Kusá, J., Sladová, J., Kopecký, K., & Mlčoch, M. (2014). Multicultural Literary Education and its Didactic Aspects. *Procedia - Social and Behavioral Sciences*, 112, 300–308. https://doi.org/10.1016/j.sbspro.2014.01.1168

Laeli, A. F., Setiawan, S., & Anam, S. (2022). EFL Pre-service Teachers' Online Reading Strategy Use and their Insight into Teaching Reading. *International Journal of Learning, Teaching and Educational Research*, 21(10), 139–160. https://doi.org/10.26803/ijlter.21.10.7

Lee, T., & George, J. (2023). Future worldbuilding with synthetic biology: A case study in interdisciplinary scenario visualization. *Futures*, 147, 103118. https://doi.org/10.1016/j.futures.2023.103118

Lord, C., Ellsworth-Krebs, K., & Holmes, T. (2023). 'Telling tales': Communicating UK energy research through fairy tale characters. *Energy Research & Social Science*, 101, 103100. https://doi.org/10.1016/j.erss.2023.103100

Lucas-Palacios, L., Trabajo-Rite, M., & Delgado-Algarra, E. J. (2023). Heritage education in initial teacher training from a feminist and animal ethics perspective. A study on critical-empathic thinking for social change. *Teaching and Teacher Education*, 129, 104153. https://doi.org/10.1016/j.tate.2023.104153

Lupinacci, J., Edwards-Schuth, B., Happel-Parkins, A., & Turner, R. (2023). *Ecocritical pedagogies and curriculum* (R. J. Tierney, F. Rizvi, & K. B. T.-I. E. of E. (Fourth E. Ercikan (eds.); pp. 202–209). Elsevier. https://doi.org/10.1016/B9780-12-818630-5.08045-3

Lutfauziah, A., Al Muhdhar, M. H. I., Suhadi, S., & Rohman, F. (2023). Curriculum development for environmental education at an Islamic boarding school. *Journal of Turkish Science Education*, *20*(3), 490–503. https://doi.org/10.36681/tused.2023.028

Marshall, H., Wilkins, K., & Bennett, L. (2023). Story thinking for technology foresight. *Futures*, 146(February), 103098. https://doi.org/10.1016/j.futures.2023.103098

Ormancı, Ü. (2023). The effect of journey to literature survey and review training on the research competencies of master students. *Journal of Turkish Science Education*, *20*(4), 750–765. https://doi.org/10.36681/tused.2023.042

Panaou, P. (2023). *Children's literature in Greece and Cyprus* (R. J. Tierney, F. Rizvi, & K. B. T.-I. E. of E. (Fourth E. Ercikan (eds.); pp. 672–677). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.07068-8

Piras, S., Righi, S., Banchelli, F., Giordano, C., & Setti, M. (2023). Food waste between environmental education, peers, and family influence. Insights from primary school students in Northern Italy. *Journal of Cleaner Production*, 383(November 2021), 135461. https://doi.org/10.1016/j.jclepro.2022.135461

Praet, E., Baeza-Álvarez, J., De Veer, D., Holtmann-Ahumada, G., Jones, J. S., Langford, S., Dearte, J. M., Schofield, J., Thiel, M., & Wyles, K. J. (2023). Bottle with a message: The role of story writing as an engagement tool to explore children's perceptions of marine plastic litter. *Marine Pollution Bulletin*, 186(114457), 1–14. https://doi.org/10.1016/j.marpolbul.2022.114457

Randez, R. A. (2023). Using the listening guide method for short story construction: Redefining researcher and participant through immanence. *Research Methods in Applied Linguistics*, 2(2), 100057. https://doi.org/10.1016/j.rmal.2023.100057

Reddy, P., Chaudhary, K., & Hussein, S. (2023). A digital literacy model to narrow the digital literacy skills gap. *Heliyon*, 9(4), e14878. https://doi.org/10.1016/j.heliyon.2023.e14878

Rogers, T., & Hamilton-McKenna, C. (2023). *Critical literary perspectives on children's and young adult literature* (R. J. Tierney, F. Rizvi, & K. B. T.-I. E. of E. (Fourth E. Ercikan (eds.); pp. 605–619). Elsevier. https://doi.org/10.1016/B9780-12-818630-5.07069-X

Sahoo, G., Majid Wani, A., Prusty, M., & Ray, M. (2023). Effect of globalization and climate change on forest – A review. *Materials Today: Proceedings*, 80, 2060–2063. https://doi.org/10.1016/j.matpr.2021.06.113

Santa María, L., Aliagas, C., & Rutten, K. (2022). Youth's literary socialisation practices online: A systematic review of research. *Learning, Culture and Social Interaction*, 34, 100628. https://doi.org/10.1016/j.lcsi.2022.100628

Sharma, N., Paço, A., & Upadhyay, D. (2023). Option or necessity: Role of environmental education as transformative change agent. *Evaluation and Program Planning*, 97, 102244. https://doi.org/10.1016/j.evalprogplan.2023.102244

Sigit, D. V., Ristanto, R. H., Nurrismawati, A., Komala, R., Prastowo, P., & Katili, A. S. (2023). Ecoliteracy's contribution to creative thinking: a study of senior high school students. *Journal of Turkish Science Education*, 20(2), 356–368. https://doi.org/10.36681/tused.2023.020

Strouse, G. A., Chesnut, S. R., Newland, L. A., Mourlam, D. J., Hertel, D., & Nutting, B. (2022). Preschoolers' electrodermal activity and story comprehension during print and digital shared reading. *Computers & Education*, 183, 104506. https://doi.org/10.1016/j.compedu.2022.104506

Suroso, G. (2019). Tragedi Asap. Ruang Sastra. https://ruangsastra.com/18674/tragediasap/

Vidergor, H. E. (2023). Teaching futures thinking literacy and futures studies in schools. *Futures*, 146, 103083. https://doi.org/10.1016/j.futures.2022.103083

Weng, V. M. (2011). Re-imagining painting in digital fiction time, colour, and space in recent experimental moving images. *Procedia Computer Science*, 3, 706–713. https://doi.org/10.1016/j.procs.2010.12.117

Wiyatmi, W., Suryaman, M., Sari, E. S., & Dewi, N. (2023). Ecofeminist pedagogy in literary learning to cultivate environmental ethics awareness. *Journal of Turkish Science Education*, 20(2), 252–265. https://doi.org/10.36681/tused.2023.014

Xiao, M., Amzah, F., & Rong, W. (2023). Experience of Beauty: Valuing Emotional Engagement and Collaboration in Teacher-Child Storytelling Activities. *International Journal of Learning, Teaching and Educational Research*, 22(2), 165–187. https://doi.org/10.26803/ijlter.22.2.10

Xie, P., Xu, Y., Tan, X., & Tan, Q. (2023). How does environmental policy stringency influence green innovation for environmental managements? *Journal of Environmental Management*, 338, 117766. https://doi.org/10.1016/j.jenvman.2023.117766

Xie, Y., Chen, Z., Tang, H., Boadu, F., & Yang, Y. (2023). Effects of executives' proenvironmental education and knowledge sharing activities on eco-friendly agricultural production: Evidence from China. *Journal of Cleaner Production*, 395, 136469. https://doi.org/10.1016/j.jclepro.2023.136469

Yang, Z., Xue, B., Liu, B., Tian, J., Sun, X., & Huo, Q. (2023). City profile: Hainan Tibetan Autonomous Prefecture, a water tower city toward sustainability. *Cities*, 134, 104198. https://doi.org/10.1016/j.cities.2023.104198

Yilmaz, S., Vural, H., & Yilmaz, H. (2023). Effects of botanical gardens on student environmental perception. *Ecological Informatics*, 73, 101942. https://doi.org/10.1016/j.ecoinf.2022.101942

Yu, X., & Xu, H. (2018). Moral gaze at literary places: Experiencing "being the first to worry and the last to enjoy" at Yueyang Tower in China. *Tourism Management*, 65, 292–302. https://doi.org/10.1016/j.tourman.2017.10.017

Zhang, Z. (2023). Pedagogical variations of critical literacies practices in a secondary transnational education program. *Linguistics and Education*, 101185. https://doi.org/10.1016/j.linged.2023.101185

Zhao, C., Liu, Z., & Zhang, C. (2023). Real or fictional? Digital entrepreneurial narratives and the acquisition of attentional resources in social entrepreneurship. *Journal of Innovation & Knowledge*, 8(3), 100387. https://doi.org/10.1016/j.jik.2023.100387

Zvereva, V. (2020). Trolling as a Digital Literary Practice in the Russian Language Internet. *Russian Literature*, 118, 107–140. https://doi.org/10.1016/j.ruslit.2020.11.005