

## CBDC web Binus university as an educational media to promote environmental ethics awareness

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**Abstract:** The issue of our environment is never finished being discussed. The environment needs to be discussed because it is related to the future fate of humankind and other species of living things. For us humans, global environmental pollution threatens human health and demands education about ethical attitudes to preserve the natural environment. Ethical education, especially in the current digital era, is very important to support sustainable development in the future. The purpose of this study is to determine the possibility of environmental ethics in the writing of articles on the CBDC Binus University website. This research uses philosophical methods, especially a critical hermeneutic approach to analyze articles on the Character-Building Development Center (CBDC) website of Bina Nusantara University, Indonesia. The finding is that this website precipitates meaningful epistemological knowledge relevant to environmental ethics. The Binus CBDC website promotes environmental ethics, as evidenced by the existence of more than 100 articles written by lecturers and students, which discuss philosophical, religious, legal, and socio-cultural perspectives in preserving the environment. This research provides new insights into efforts to save the environment in the context of higher education and society in the digital era, especially for young people studying at universities to be aware of and carry out environmental love movements that have a real impact on the environment and humans.

**Keywords:** CBDC Web, Environmental Ethics, Media Educational.

### 1. Introduction

The issue of the living environment is an important issue for all nations and mankind as well as of all living creatures on the planet Earth. So is the situation in Indonesia. Environmental pollution is increasingly a concern of the Indonesian people. The Directorate-General for the Control of Pollution and Environmental Damage, Ministry of Environment and Forestry of the Republic of Indonesia show that the water quality index, air quality index and soil quality index have not reached the national targets and that some cities in Indonesia have experienced a decrease in air quality [1]. This indicates that environmental pollution in Indonesia, in the context of land, sea, and air ecosystems, is an important issue that should be the concern of governments, communities, and various elements of this nation. So environmental ethics education has become essential to human beings in today's digital age [2].

As one of the nation's leading elements in the field of education, Binus University is making every effort to promote environmental ethics and a spirit of concern for improving the quality of the living environment. Since its establishment in 2018, the Web Character Building Development Center (CBDC) of Binus University has committed itself to publishing humanitarian social themes to provide ethical

enlightenment to the public of readers at home and abroad. Specifically, CBDC Binus University is committed to providing knowledge and information relevant to the field of environmental ethics to Indonesian society, especially the young generation on campus to thrive in ecological knowledge and awareness as well as a spirit of love for the environment [3].

One of the ways that CBDC Binus University does is to promote and publish environmental ethics content in its exhibition [4]. The CBDC website publishes environmental-thematic writings by lecturers to advance environmental Ethics [5]. It is done to support environmental conservation through the publication of environmental knowledge to support the big idea of sustainable development in the digital age [6].

The aim of this research is to articulate CBDC Web Binus University as a strategic-educational medium that promotes environmental ethics that supports sustainable development. The data that has been published on the CBDC Website of Binus University so far is relevant to environmental ethics [7]. This research is useful both theoretically and practically [8]. It is theoretically useful to increase knowledge of environmental ethics and increase public empathy for the environment. In practical terms, the research encourages people, especially the younger generation, to take ecologically meaningful actions, both personally and socially, to preserve the environment to support sustainable development in the digital age [9].

## 2. Method

This article uses philosophical methods. The critical hermeneutic method is a method of research characteristics of philosophy. The philosopher who consistently developed critical hermeneutic methods was Hans-Georg Gadamer. To understand the text, one must do the fusion of horizons through dialogue using language as a mediation [10]. With a critical hermeneutic approach, researchers are expected to try to interpret and understand the text by considering the social, historical, and cultural context in which the text was made. Critical hermeneutics is usually an interpretative approach commonly used in social science and humanities research Cahyani and Jayanta [11]. This method focuses on the importance of historical, cultural, and social contexts in the process of interpreting texts or cultural phenomena observed. Critical hermeneutics question the structure underlying interpretation and highlight the assumptions hidden in the process of interpretation. This approach aims to understand the deep meaning of a text or phenomenon that is not always clearly revealed on its surface.

## 3. Literature Review

Not enough research has addressed the role of online media in developing environmental ethics and sustainable development in the digital age. Abakare [12] Ethics and The Hesc Research: A Philosophical Exploration. Environmental degradation is a global issue, requiring citizen engagement and a change in attitudes and ethics towards resource use [13]. The Earth Charter's vision of universal responsibility towards environmental protection emphasizes the importance of understanding and addressing environmental injustice. Ghermandi, et al. [14] "Social media data for environmental sustainability: A critical review of opportunities, threats, and ethical use" Shuai, et al. [15]. Stawicka [16] "Sustainable Development in the Digital Age of Entrepreneurship" [17]. Singha "Role of Digital Media in Achieving Sustainable Development in the Arab World" [18]. Wu, et al. [19] "Digital Media and Green Development Path in Asia: Does Digital Financial Inclusion Matter? Lacka, et al. [20]. Rosário, et al. [21] "The Digital Marketing for Sustainable Development" [14]. Gulati "Social and sustainable: exploring social media use for promoting sustainable behavior and demand amongst Indian tourists" [22]. Leuers "Sustainability in the Digital Age-IEEE Technology and Society" [12].

This study investigates the integration of environmental ethics in Indonesian social studies, focusing on secondary school students from different socio-cultural backgrounds. Students believed that environmental ethics are crucial for sustaining life on Earth and strengthened their critical reasoning about environmental conservation. Fios, et al. [23] "Environmental Ethics of Belu Society in Indonesia and Bobonaro Society in Timor-Leste: An Ecological Reflection" Ghermandi, et al. [14]. Heruyono, et

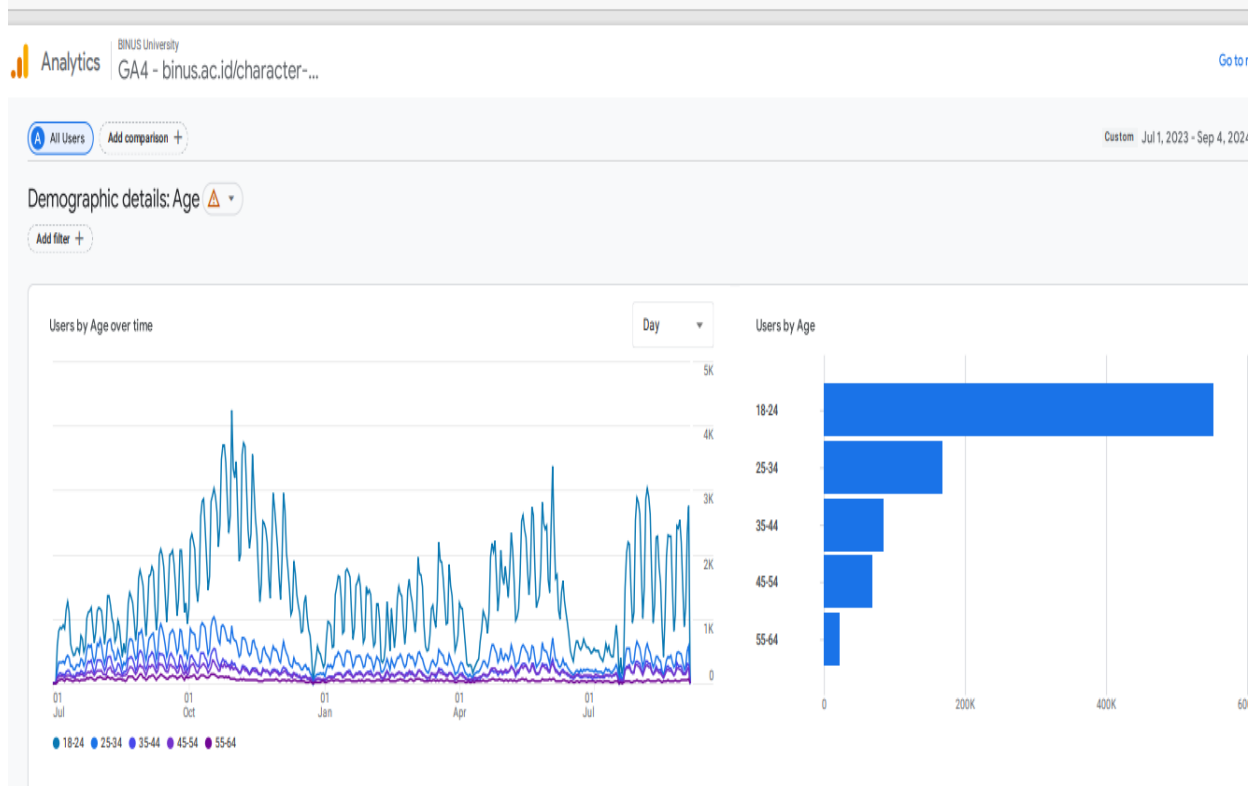
al. [24] “Ecological ethics perspective in fostering environmental awareness in the Bandung eco-camp community” [16]. This study aims to promote environmental consciousness in the Bandung-Indonesia Eco Camp community through non-formal environmental education. It uses secondary data to analyze environmental habitation, and results show that internalizing environmental ethics makes humans aware of their interactions with the environment, making the potential for environmental damage smaller. This contributes to the discussion of changing human perceptions of the environment. Aldiansyah, et al. [25] “Studies on Environmental Ethics for Students in Indonesia” Wu, et al. [19]. Retnowati, et al. [26] “Environmental Ethics in Local Knowledge Responding to Climate Change: An Understanding of Seasonal Traditional Calendar Pranoto Mongso and its Phenology in Karst Area of Gunung Kidul, Yogyakarta, Indonesia”. This study explores the human nature relationship and environmental ethics in the Gunung Kidul Karstic Region, South Java, Indonesia. Farmers face harsh conditions, especially during dry seasons, and struggle to survive. They use local knowledge and resources to sustain their livelihoods and live in harmony with the environment. The study highlights the importance of media sharing knowledge to reach individual and collective participatory environment ethical behavior, considering changing economic, social, and climatic factors in the past decade. Widagatantyas & Liliani “Principles of Environmental Ethics in Indonesian Newspaper Short Stories: An Ecocriticism Study” [27]. The study examines environmental problems and ethics principles in four 2017 Java Post online short stories. Data collection involves recording and classifying words, while analysis uses interpretation and description techniques. Results show problems related to forests, settlements, pollution, and animals, while ethics principles focus on respecting nature [28].

From the above literature review both in the global and Indonesian context, proves that environmental ethics topics are widely discussed by various researchers at home and abroad. But in the context of the title of this research it is something entirely new [29]. Because research on the Web CBDC Binus University has never been done by other researchers before. It is interesting to open new findings and perspectives to enrich environmental ethics studies to support sustainable development in the digital age [30].

#### 4. Result and Discussion

Web Character Building technically designed by the Binus Knowledge Management and Innovation Division in collaboration with the Character-Building Development Center of Binus University in 2018. Every day this website is visited by 200 thousand readers. A high number for the media at the college level in Indonesia. The demographics of these media readers are mostly from Indonesia and other Asian countries, but there are also readers from the European continent, America, Australia, and Africa [31].

Based on the age category, more young people accessing Binus University's Character-Building Development Center website are between 18 and 24 years old. This shows the fact that young people today are happy to use media technology to find new sources of knowledge and information that are useful for their development in a better direction. Meanwhile, the second highest age range who accessed the CBDC website was between 25 to 34 years old, followed by 35 to 44 years old, 45 to 54 years old and finally the age range of 55 to 64 years old. Detailed data can be seen in the graph below. It appears that young people like news and information related to the environment [32].



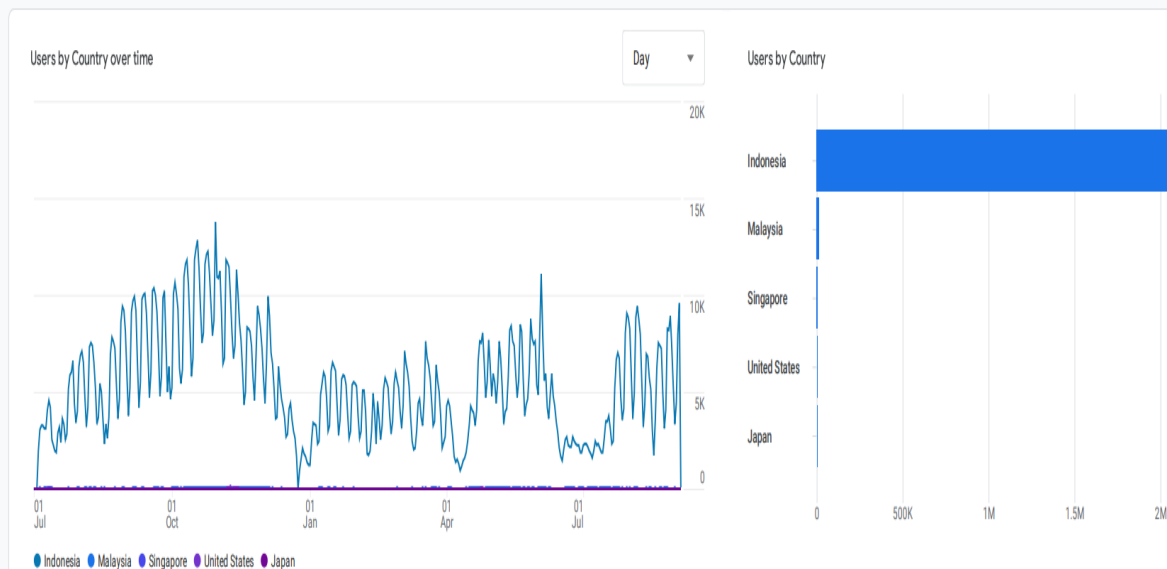
**Figure 1.**  
Demographic details based on age.

The CBDC Website is also widely read by around 144 countries around the world. This is a very large number. The top 5 countries that access the website are Indonesia, Malaysia, Singapore, the United States and Japan. This means that this website has gone international and is accessed by readers from various countries of the world. The detailed graph can be seen below. Citizens from the above countries read information about environmental news from the CBDC website [33].

All Users Add comparison + Custom Jul 1, 2023 - Sep

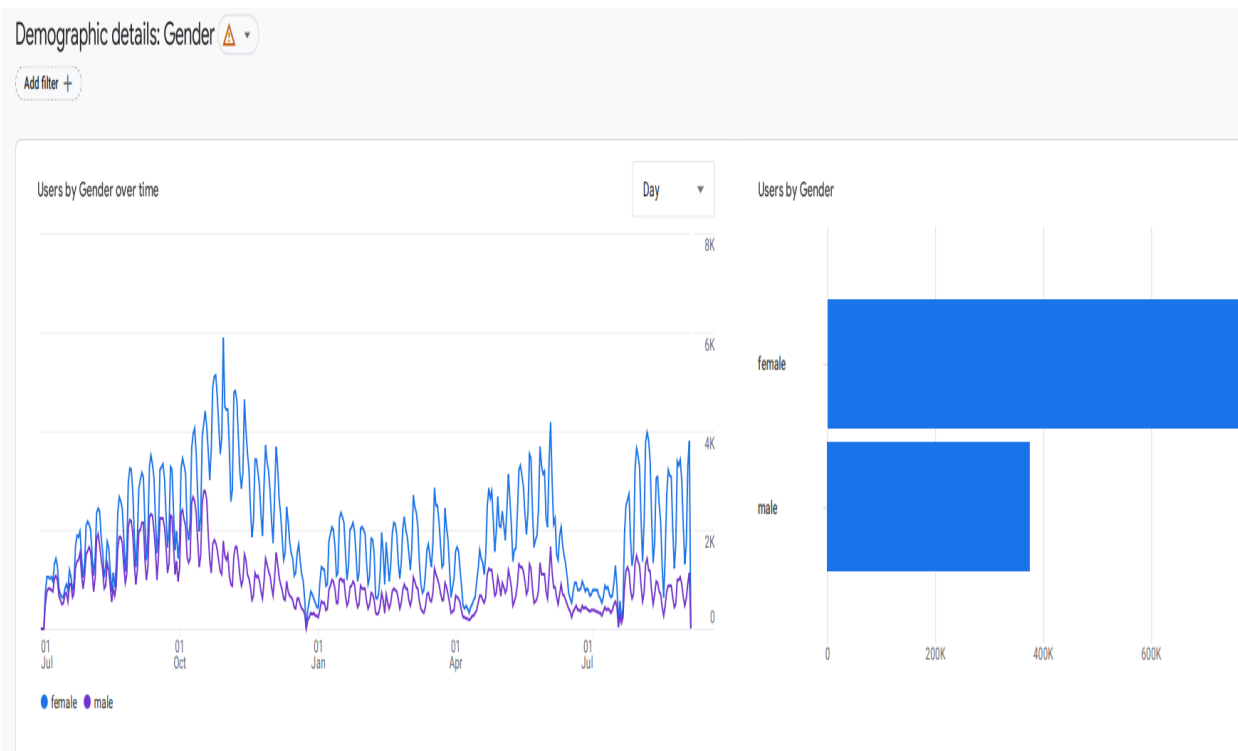
Demographic details: Country 📌

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**Figure 2.**  
Demographic details according to country.

In terms of gender, more women access the CBDC website. This shows that women seek more knowledge and useful information in this media, especially in relation to environmental ethics issues [34].

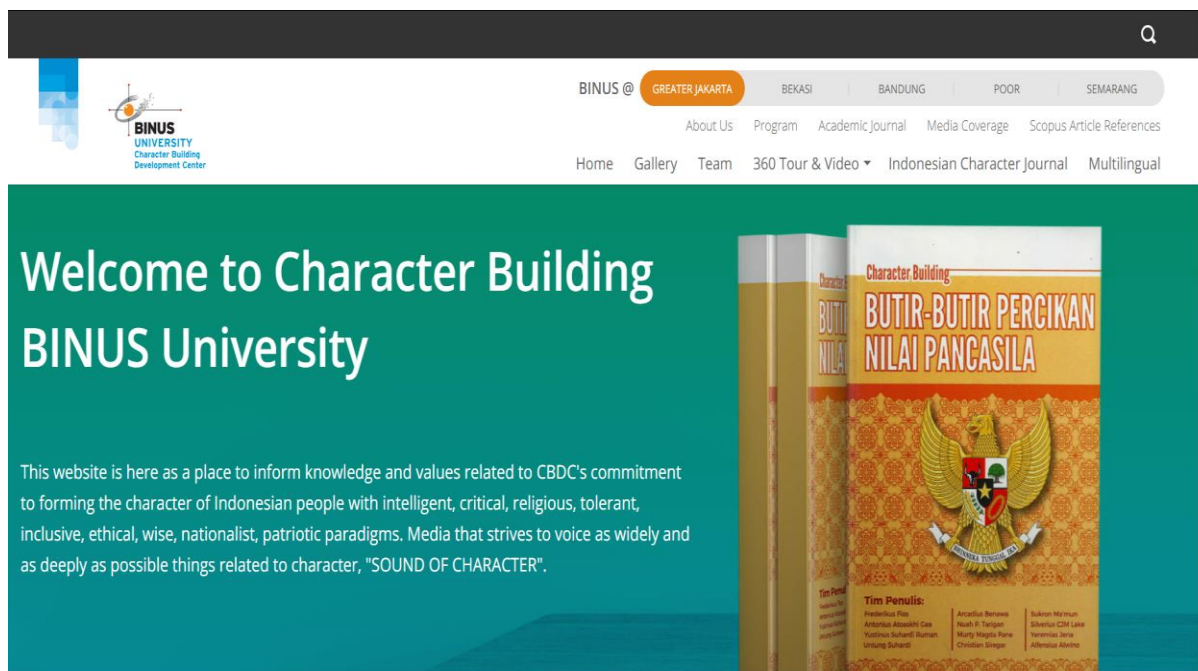


**Figure 3.**  
Demographic details according to gender.

The content of this website is filled by the Character-Building Development Center team in the development of educational material for students, lecturers, and the public in Indonesia. These media are presented to present data, information and knowledge related to the education of human character in the context of the higher education environment. Character education aims at forming man as a creature worthy of dignity, ethics, character, and uniqueness. In classroom lesson activities, lecturers use this website as a reference in active learning interaction and communication [35].

The reason behind this website is that Indonesia still lacks online media that consistently publishes educational content of character especially in higher education or university environments. Many people lack readings of information related to human character, humanity, environment, and other social themes. In Indonesia, not a lot of the media is focused and consistently discussing matters relating to human character in promoting the ideal relationship between human and the environment. That's why the CBDC Web is here to deliver news, articles, and knowledge information relevant to aspects of Character Development including exposing articles and news relevant to the environment and how humans are as individuals interacting with the environment reality [36].

The features of the Web Character Building are title, book, Pancasila, article, sound of character, consultation, gallery, student voice, news, events, academic journal, and video.



**Figure 4.**  
Front of Web Character-Building Binus University.

The content of the Character-Building website contains reflections and opinions of lecturers and students related to the strengthening of moral education based on ethics and religious values of Indonesian society. There is a lot of religious and cultural wisdom in society that inspires the strengthening of environmentally friendly attitudes. Specifically, the web section that promotes environmental ethics in support of sustainable development is on the article menu section. From the search results on this website since its creation until February 2024, there are 100 articles containing environmental Ethics content in it. This number will surely increase in the future with access to more and more readers as well [37].

### Global Environmental Destruction – Character Building

Character Building › global-environmental-damage



11 Jul 2021 ... **Environment** Day) and the establishment of the UN agency that deals with environmental issues, namely the United Nations **Environmental** Program (UNEP). As for...

### One Earth for the Future – Character Building

Character Building › one-earth-for-the-future



2 Mar 2023 ... By: Murty Magda Pane. Entering the beginning of June 2022, I remember World Environment Day , ...

### Environmental Damage, Life Damage – Character Building

Character Building › character-building › 2021/07 › kerus...



11 Jul 2021 ... Therefore, June 5 apart from being World Environment Day (The **Environment** ... **Environmental** Program (UNEP). Life ...

### Be wise in consuming food – Character Building

Character Building › be-wise-in-consuming-food



9 Mar 2021 ... Executive Director of the United Nations **Environment** Program (UNEP) Inger Andersen said, reducing food waste will cut ...

**Figure 5.**

Some lecturer articles covering the subject of the living environment.

The articles posted on the website promote environmental ethics to build an environmentally friendly human personality [38]. Through this website environmental ethics themes are published to give environmental knowledge to readers to care about the environment to support sustainable development. The environmental ethics discussed in these writings are analyzed from a philosophical, theological, religious, psychological, social, cultural, legal, and political perspective. From the analysis of environmental articles posted on the CBDC website, more dominance is on the content of religious-based moral values, cultural practices and social habits lived by humans individually or in groups to create environmental preservation in real everyday life. So, these writings are in line with Aristotle's virtue ethics. Fisher & Dimmock said Aristotle moral philosophy is based around assessing the broad characters of human beings rather than assessing singular acts in isolation [39]. This ethics of Aristotle's wisdom can be a framework of thought for organizing human actions in the social space of today's modern era, in the digital age. It is in line with Papouli's view that says Aristotle's virtue ethics as a conceptual framework for the study and practice of social work in modern times [40]. Aristotle's ethics can be an inspiration for us modern humans, in today's digital age, to organize our mindsets, attitudes and patterns of action to preserve the environment in support of sustainable development. The contribution of Aristotle's virtue of ethical thinking [41] is crucial to the development of ethical thinking in the contemporary era in the context of efforts to enhance environmentally oriented human ethical action [42].



Environmental pollution and environmental damage today are caused by our human fault factor. Therefore, environmental awareness education with environmental ethics based on environmental ethics becomes important and urgent. The CBDC website has become a strategic educational medium to disseminate environmental education information to students, lecturers, and the Indonesian and global public community [43].

We strongly recommend that Binus University's CBDC Website publishers continue to improve their environmental ethics thematic publications to support sustainable development in today's digital age. In addition, it is also necessary to add content and features such as attractive ecological images and involve students and young people as well as the community to encourage increasing and widespread public participation. In the future, it will be necessary to conduct quantitative research on the readers of this website to know the impact and significance of this CBDC web on the addition of their environmental knowledge [44].

## 5. Conclusion

The CBDC website of Binus University is a significant online media that exposes and promotes the values of environmental wisdom and ethics in support of sustainable development through articles written by Binus character building lecturers and students who write articles. Promoting environmental ethics awareness is essential through the Binus CBDC website to foster ecological knowledge, encourage environmental action and support environmental conservation towards sustainable development. The presence of this Binus CBDC website is becoming increasingly important in today's digital age where technological transformation has become something that we cannot reject in the dynamics of human life today. These research recommendations need to be implemented in the future to further strengthen knowledge and practices of environmental ethics in the higher education environment and in the reality of everyday life of Indonesian people.

### Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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## References

- [1] S. Fahad and M. Bulut, "Central bank digital currencies: A comprehensive systematic literature review on worldwide research emergence and methods used," *American Journal of Business*, vol. 39, no. 3, pp. 137-157, 2024. <https://doi.org/10.1108/Ajb-12-2023-0210>
- [2] S. Sahronih, A. Purwanto, and M. S. Sumantri, "The effect of interactive learning media on students' science learning outcomes," in *Proceedings of the 2019 7th International Conference on Information and Education Technology*, 2019, pp. 20-24.
- [3] I. F. R. Iskandar, "Analysis of project-based learning conducted in Bina Nusantara University Bandung," *Innovative: Journal Of Social Science Research*, vol. 4, no. 4, pp. 14405-14416, 2024. <https://doi.org/10.31004/Innovative.V4i4.14808>
- [4] S. Y. Chee, K. K. Kong, and Z. K. Ng, "Factors affecting the willingness to adopt Central Bank Digital Currency (CBDC) among undergraduate students in UTAR," Doctoral Dissertation, UTAR), 2024.
- [5] R. A. Affandi and C. Z. Rifkila, "The power of Bitcoin to attract investment in Underdeveloped Countries: A neoliberal perspective of Nigeria," in *E3S Web of Conferences*, 2023, vol. 426: EDP Sciences, p. 01039.
- [6] R. El Khoury, M. M. Alshater, and M. Joshipura, "RegTech advancements—a comprehensive review of its evolution, challenges, and implications for financial regulation and compliance," *Journal of Financial Reporting and Accounting*, 2024. <https://doi.org/10.1108/JFRA-05-2024-0286>

- [7] K. N. Puriasih and G. A. P. S. Trisna, "Digital comics learning media based on problem based learning in science subjects for fourth grade elementary school," *MIMBAR PGSD Undiksha*, vol. 10, no. 2, pp. 367-375, 2022. <https://doi.org/10.23887/jjggsd.v10i2.48575>
- [8] P. H. Witono and P. Lakonawa, "The growth and impact of the internet on the users: A research on Internet phenomena in Indonesia in 2016," in *2017 10th International Conference on Human System Interactions (HSI)*, 2017: IEEE, pp. 317-321.
- [9] S. Shilina, *Economic, social, and environmental impacts of cbdc: Implications and considerations. In Exploring Central Bank Digital Currencies: Concepts, Frameworks, Models, and Challenges*. Hershey, PA: IGI Global, 2024.
- [10] R. Maxwell and T. Miller, "Ecological ethics and media technology," *International Journal of Communication*, vol. 2, pp. 331-353, 2008.
- [11] N. L. P. Cahyani and I. N. L. Jayanta, "Digital literacy-based learning video on the topic of natural resources and technology for grade IV elementary school," *Jurnal Ilmiah Sekolah Dasar*, vol. 5, no. 3, pp. 538-548, 2021. <https://doi.org/10.23887/Jisd.V5i3.37918>
- [12] C. O. Abakare, *Kantian ethics and the HESC research: A philosophical exploration*. Indonesia: Predestinasi, 2021.
- [13] M. Bednjanec, D. Bednjanec, and T. Galović, "Research on the impact of multimedia content and internet sites on ethics and sustainable development among high school students," in *2024 47th MIPRO ICT and Electronics Convention (MIPRO)*, 2024: IEEE, pp. 416-419.
- [14] A. Ghermandi *et al.*, "Social media data for environmental sustainability: A critical review of opportunities, threats, and ethical use," *One Earth*, vol. 6, no. 3, pp. 236-250, 2023. <https://doi.org/10.1016/J.Oneear.2023.02.008>
- [15] L. Shuai *et al.*, "Influences of digital media use on children and adolescents with ADHD during COVID-19 pandemic," *Globalization and Health*, vol. 17, pp. 1-9, 2021. <https://doi.org/10.1186/S12992-021-00699-Z>
- [16] E. Stawicka, "Sustainable development in the digital age of entrepreneurship," *Sustainability*, vol. 13, no. 8, p. 4429, 2021. <https://doi.org/10.3390/su13084429>
- [17] L. Rong, "Design of ideological and political multimedia network teaching resources integration system based on wireless network," *Scientific Programming*, vol. 2021, no. 1, p. 4293771, 2021. <https://doi.org/10.1155/2021/4293771>
- [18] C. M. Azionya and A. Nhedzi, "The digital divide and higher education challenge with emergency online learning: Analysis of tweets in the wake of the COVID-19 lockdown," *Turkish Online Journal of Distance Education*, vol. 22, no. 4, pp. 164-182, 2021. <https://doi.org/10.17718/Tojde.1002822>
- [19] S. Wu, Z. Wang, C. Su, and W. Zhang, "Digital media and green development path in Asia: Does digital financial inclusion matter?," *Sustainability*, vol. 15, no. 14, p. 11359, 2023. <https://doi.org/10.3390/Su151411359>
- [20] E. Lacka, T. Wong, and M. Y. Haddoud, "Can digital technologies improve students' efficiency? Exploring the role of virtual learning environment and social media use in higher education," *Computers & Education*, vol. 163, p. 104099, 2021. <https://doi.org/10.1016/J.Compedu.2020.104099>
- [21] A. T. Rosário, R. J. Raimundo, and S. P. Cruz, "Sustainable entrepreneurship: A literature review," *Sustainability*, vol. 14, no. 9, p. 5556, 2022. <https://doi.org/10.3390/su14095556>
- [22] D. Houghton *et al.*, "Truth and reconciliation through inquiry-based collaborative learning," in *The Open/Technology in Education, Society, and Scholarship Association Conference*, 2022, vol. 2, no. 1, pp. 1-8.
- [23] F. Fios, N. Martoredjo, and G. Arivia, "Environmental ethics of belu society in indonesia and bobonaro society in timor leste: an ecological reflection," in *IOP Conference Series: Earth and Environmental Science*, 2021, vol. 801, no. 1: IOP Publishing, p. 012010.
- [24] A. Heruyono, H. Herdiansyah, and L. Putri, "Environmental ethics perspective in fostering environmental awareness in the bandung eco-camp community," in *IOP Conference Series: Earth and Environmental Science*, 2021, vol. 802, no. 1: IOP Publishing, p. 012050.
- [25] R. Aldiansyah, I. Ariyansyah, E. Efriani, J. A. Dewantara, S. Sulistyarini, and A. D. Sudagung, "Studies on environmental ethics for students in Indonesia," *Jurnal Pendidikan Sosiologi dan Humaniora*, vol. 14, no. 2, pp. 288-300, 2023.
- [26] A. Retnowati, E. Anantasari, M. A. Marfai, and A. Dittmann, "Environmental ethics in local knowledge responding to climate change: An understanding of seasonal traditional calendar pranotomongso and its phenology in Karst Area of Gunungkidul, Yogyakarta, Indonesia," *Procedia Environmental Sciences*, vol. 20, pp. 785-794, 2014. <https://doi.org/10.1016/j.proenv.2014.03.094>
- [27] K. B. Olawumi, M. P. Mavuso, and X. Khalo, "Integrating environmental ethics in teaching and learning through the use of Ubuntu principles: Review of literature," *Journal of Culture and Values in Education*, vol. 7, no. 4, pp. 149-171, 2024. <https://doi.org/10.46303/Jcve.2024.46>
- [28] K. B. Olawumi and M. P. Mavuso, "Integration of environmental ethics education in the classroom: A review of literature," *International Journal of Environmental Sustainability and Social Science*, vol. 4, no. 4, pp. 1239-1252, 2023. <https://doi.org/10.38142/Ijess.V4i4.741>
- [29] T. M. Kin, A. K. Omar, K. Musa, and A. M. Ghouri, "Leading teaching and learning in the era of education 4.0: The relationship between perceived teacher competencies and teacher attitudes toward change," *Asian Journal of University Education*, vol. 18, no. 1, pp. 65-80, 2022. <https://doi.org/10.24191/ajue.v18i1.17171>

- [30] H. Argadinata and I. Gunawan, "The leadership of Pancasila in education: Foundation for strengthening student characters in the industrial revolution era 4.0," in *the 4th International Conference on Education and Management (COEMA 2019)*, 2019: Atlantis Press, pp. 5-7.
- [31] J. A. Simaremare and N. A. Purba, "Teacher's competence: Applying the problem-based learning model through academic supervision," *International Journal of Asian Education*, vol. 2, no. 4, pp. 559-572, 2021. <https://doi.org/10.46966/ijae.v2i4.203>
- [32] M. D. Sulaksana and K. Yudiana, "Learning circumference and area of building with video media for fourth class students of elementary school," *Jurnal Ilmiah Sekolah Dasar*, vol. 5, no. 4, pp. 697-707, 2021. <https://doi.org/10.23887/Jisd.V5i4.40129>
- [33] D. Darmaji, M. Mustiningsih, and I. Arifin, "Quality management education in the industrial revolution era 4.0 and society 5.0," in *5th International Conference on Education and Technology (ICET 2019)*, 2019: Atlantis Press, pp. 565-570.
- [34] F. P. Damayanti and A. M. Mirfani, "An analysis of digital leadership in the pandemic covid-19 ERA," in *4th International Conference on Research of Educational Administration and Management (ICREAM 2020)*, 2021: Atlantis Press, pp. 156-159.
- [35] S. Ghavifekr and S. Y. Wong, "Technology leadership in Malaysian schools: The way forward to education 4.0-ICT utilization and digital transformation," *International Journal of Asian Business and Information Management*, vol. 13, no. 2, pp. 1-18, 2022. <https://doi.org/10.4018/IJABIM.20220701.oa3>
- [36] T. Karakose, I. Kocabas, R. Yirci, S. Papadakis, T. Y. Ozdemir, and M. Demirkol, "The development and evolution of digital leadership: A bibliometric mapping approach-based study," *Sustainability*, vol. 14, no. 23, p. 16171, 2022. <https://doi.org/10.3390/Su142316171>
- [37] M. R. Yusof, M. F. M. Yaakob, and M. Y. Ibrahim, "Digital leadership among school leaders in Malaysia," *International Journal of Innovative Technology and Exploring Engineering*, vol. 8, no. 9, pp. 1481-1485, 2019. <https://doi.org/10.35940/ijtee.I8221.078919>
- [38] N. L. Andriyani and N. W. Suniasih, "Development of learning videos based on problem-solving characteristics of animals and their habitats contain in IPA subjects on 6th-grade," *Journal of Education Technology*, vol. 5, no. 1, pp. 37-47, 2021. <https://doi.org/10.23887/jet.v5i1.32314>
- [39] S. Hardhienata, Y. Suchyadi, and D. Wulandari, "Strengthening technological literacy in junior high school teachers in the industrial revolution era 4.0," *Journal of Humanities and Social Studies*, vol. 5, no. 3, pp. 330-335, 2021. <https://doi.org/10.33751/Jhss.V5i3.4220>
- [40] N. L. P. J. Dewi and I. W. Sujana, "Learning multimedia based on rpg maker mv material for circumference and area of flat shapes for elementary school students," *Journal of Education Technology*, vol. 5, no. 3, pp. 365-374, 2021. <https://doi.org/10.23887/Jet.V5i2.34462>
- [41] I. Irfandi, F. Faisal, N. I. Hasibuan, and D. D. Panggabean, "The dissemination of technology-based learning media for elementary school teachers in the district of Sijunjung," *Journal of Community Research and Service*, vol. 2, no. 1, pp. 198-205, 2018. <https://doi.org/10.24114/jers.v2i1.10491>
- [42] P. Sari, W. N. K. S. Kusuma, and M. N. Made, "Multimedia-assisted genrative learning model towards Ipa learning satisfaction in students of grade Iv elementary school achievement school year 2020/2021," *Adi Widya: Jurnal Pendidikan Dasar*, vol. 7, no. 1, pp. 38-45, 2022. <https://doi.org/10.25078/Aw.V7ii.777>
- [43] S. Yolanda, R. Winarni, and S. Yulisetiani, "The new way improve learners' speaking skills: Picture and picture learning media based on articulate storyline," *Journal of Education Technology*, vol. 6, no. 1, pp. 173-181, 2022. <https://doi.org/10.23887/jet.v6i1.41452>
- [44] S. Angraini, H. Fitria, and A. A. Setiawan, "The effect of teacher performance and learning media on learning outcomes of elementary school students," *Leadership*, vol. 2, no. 2, pp. 137-146, 2021. <https://doi.org/10.52690/jswse.v2i2.237>