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Generation Z and Ecological Literacy: Building a Conscious and Sustainable Future

Hayatul Khairul Rahmat[1,2*], Nurhasan Syah[1], Eri Barlian[1], Indang Dewata[1], Ade Fajrian[3], Rinny Meidiyustiani[4] and Barokat Mamah[5]

[1]Doctoral Program of Environmental Science, Graduate School, Universitas Negeri Padang, Padang, Indonesia
[2]Department of Disaster Management, Faculty of Economics and Business, Universitas Budi Luhur, DKI, Indonesia
[3]Department of Molecular Biotechnology, Faculty of Biochemistry, Biophysics, and Biotechnology, Jagiellonian University, Krakow, Poland
[4]Department of Accounting, Faculty of Economics and Business, Universitas Budi Luhur, DKI, Indonesia
[5]Department of Mathematics and Computer Science, Faculty of Science, Chulalongkorn University, BKK, Thailand
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*hayatul.khairulrahmat@budiluhur.ac.id

ABSTRACT

This study aims to define the concept of ecological literacy for Generation Z. Then, the author tries to elaborate on the concept of ecological literacy and the concept of environmental awareness to promote ecological knowledge with education on the environment for Generation Z. Using literature review methods, the result of this research is Generation Z is particularly at risk due to the rise of digital technology and the decline of environmental ethics. Awareness of fragile ecosystems from a young age is fundamental to sustainable living. Therefore, educational curricula should be shaped with an emphasis on the idea that cultural diversity should be linked to ecological adaptation, and thus an overall team approach to environmental and ecosystem cognition. However, this requires interdisciplinary collaboration, partnership building and accountability requirements, linked to international agreements on biodiversity, climate change and the rights of indigenous peoples, including equitable benefit sharing.

Keywords: Ecological literacy; Environmental awareness; Environmental degradation; Generation Z.

1. INTRODUCTION

Basic environmental problems such as climate change, environmental pollution, and degradation of natural resources are not only the responsibility of the government and environmental management agencies, but more than that, all elements of society have a great responsibility and contribution to environmental sustainability (Fauzi *et al.* 2023; Halid and Baso, 2022). Elements of society are not limited to adults or parents; from an early age, starting from children and adolescents, it is important to understand and apply the value of environmental awareness. Knowledge of environmental awareness can shape behavior that reflects one's personality toward the surrounding environment (Chen *et al.* 2018; Nugroho, 2022). Environmental awareness is part of the commitment of the entire community. The correlation is very clear between the sustainability and welfare of human life and the quality of the environment; the better the quality of the environment, the better the welfare (Baddianaah *et al.* 2023; Cheng and So, 2015). Efforts to instill the value of environmental awareness as a behavior that can be reflected in everyday life are obtained through education. Environmental awareness is supported by the development of environmentally conscious knowledge through eco-literacy or ecological literacy.

Ecological literacy is the ability to understand ecological concepts and processes and apply this knowledge in everyday life (Long *et al.* 2014). This literacy includes an understanding of the interactions between living organisms and their environment, the impact of human activities on ecosystems, and the importance of conserving natural resources. Ecological literacy provides a strong foundation for individuals to make responsible decisions and take actions that support environmental sustainability (García, 2019; Putri, 2018). With a good understanding of ecology, individuals can identify environmentally friendly daily activities such as energy saving, recycling, and the use of sustainable products. In addition, they will be more likely to support policies and initiatives that aim to protect the environment, making ecological literacy an important element in shaping an environmentally conscious society. Understanding ecological concepts and processes as well as the ability to apply them in daily life is key in shaping environmentally conscious behavior among the younger generation.

Previous research shows education has an important role in improving students' environmental literacy, where students are at a critical phase in the formation of values and behaviors (Quijano *et al.* 2023). Other researchers integrate Islamic values in ecology learning to create an educational ecosystem that is

holistic and responsive to environmental issues and increase the ecological awareness of each student (Heidari and Heidari, 2015). The provision of ecological knowledge can help students understand the importance of maintaining the balance of the ecosystem and the negative impact of behaviors that damage the environment (Treviño, 2022). In addition, practical programs such as environmental hygiene projects, tree planting, and plastic waste reduction campaigns can provide hands-on experience that reinforces their theoretical learning. In the Indonesian context, improving ecological literacy among students is crucial, given the environmental challenges faced by the country (Code, 2019; Putri, 2018). Today's students are at a critical stage of value and behavior formation where they begin to develop a more complex understanding of the world around them and can integrate new knowledge into their daily lives.

Effective education on ecology and the environment can shape students' mindset and behavior towards environmental responsibility and care. Practical teaching programs such as environmental hygiene projects, tree planting, and plastic waste reduction campaigns can provide hands-on experiences that reinforce students' theoretical learning. Researchers' previous studies integrated ecological materials in the curriculum and provided opportunities for students to participate in real activities; students not only gained knowledge but also formed attitudes and behaviors that support the preservation of nature (Gallagher *et al*. 2000). Students' ecology learning is not far from a basic understanding of various topics such as the water cycle, food chain, biodiversity, and how human activities, ranging from deforestation, pollution, and even climate change can reduce the balance of ecosystems while negatively affecting the lives of living things on earth. Ecology learning can be through interesting activities for students, namely ecotourism with field activities such as visiting national parks, wildlife observation, or science projects that involve observing and analyzing the local environment. Ecotourism bridges learning to recognize ecosystems directly to contribute experience and increase awareness of behavior towards the surrounding environment (Koizumi and Chakraborty, 2016).

Ecological literacy is one of the important factors that can enhance efforts to raise environmental awareness of ecological systems (Hume and Barry, 2015; Williams *et al*. 2021). Children of the current and future generations, such as Generation Z, through the concept of ecological literacy, have a significant relationship intertwined with their identity as digital natives. A brief explanation of the concept of ecological literacy, which presents the increasing ecological issues and awareness to the public, is given at the beginning. Generation Z tends to have easier and faster access to information than other generations because they are the digital generation. Digital technology can reduce ecological literacy by promoting passive consumption over active environmental engagement, leading to detachment from nature. They have more space to share information in virtual communities compared to other generations. Educators can integrate cultural diversity into ecological adaptation education by incorporating local ecological knowledge and diverse cultural perspectives on sustainability. This fosters inclusive learning and highlights the interconnections between culture and environment. In this context, ecological literacy is effective in expanding the perception of knowledge and sensitivity of the digital generation towards nature and ecological systems.

Furthermore, this paper tries to explore the concept of ecological literacy for Generation Z. Then, the author tries to elaborate the concept of ecological literacy and the concept of environmental awareness to promote ecological knowledge with education of environmental for Generation Z.

2. METHODOLOGY OF RESEARCH

This research uses the library method. This library research is carried out by collecting various reading references that are relevant to the problem under study. Then, understanding is carried out in a careful way to obtain research findings. In analyzing the data, the author uses the method of content analysis, namely the data obtained and then compiled so as to facilitate the discussion of existing problems (Long *et al.* 2014; Mushwani *et al.* 2024; Zed, 2002).

3. UNDERSTANDING ECOLOGICAL LITERACY FOR GENERATION Z

Defined by a group of renowned environmentalists, ecological literacy encompasses understanding how natural systems operate and using this understanding in lifelong sustainability practices. Essentially, this means not only knowing about ecosystems but also integrating this knowledge into everyday decisions (Ryazanova *et al*. 2020). Participants should not look at environmental issues in isolation but should see the interconnectedness of the natural and man-made aspects around them. Furthermore, ecological literacy is an agreement with principles that guide policymaking regarding human interventions in the environment. Ecological literacy also offers tools to examine the impact of any decisions taken in private transactions, but also those of a public or collective nature (García, 2019; Johns *et al.* 2024). If this understanding is more firmly rooted in society, it will be the foundation for a proactive society. Knowledge of environmental interdependencies will steer decisions toward more sustainable outcomes and actively prevent environmental damage in the long run.

Ecological literacy can be defined as an achievement in understanding the biophysical and ecological relationships between oneself and the surrounding environment, emphasizing the essential requirements of living systems thinking, environmental justice, and sustainable practices (Long *et al.*, 2014; Sasson, 1979). Ecological literacy has a complex and diverse structure. There are biological, physical, and chemical attributes, as well as cognitive and emotional links to the world around complex living systems. On the one hand, the biophysical properties and health of humans depend on the biotic and abiotic environments in which they live. On the other hand, these environments also actively contribute to social lifestyle choices and everyday emotional experiences, which shape broader quality-of-life standards. Several core components, training methods, and engagements are currently applied to the understanding of ecological literacy. Some works take a simplified perspective on the subject, focusing primarily on biological and chemical views, such as elemental cycles. However, this fails to capture the multifaceted and mutually reinforcing properties associated with the concepts discussed. Ecological literacy is broadly concerned with the ecology of the human lifeworld, including a complex understanding of key environmental subsystems such as forests, farmland, or urban areas (Code, 2019; Reid *et al.*, 2010; Rigolon, 2012). This critical method is further articulated through the practice of decoding dominating social or environmental codes, reflecting broader studies of power and the eco-semiotics of government.

Meanwhile, confronting the hazards of a powerless environment enables an understanding of environmental justice by observing vulnerable social groups. These inharmonious cases arise from a large gap between urban ecological planning and environmental safety, resulting in adverse spatial consequences. Such interpretive practices involve a combination of trust, biological reasoning and third-party explanations in what follows. This results, simultaneously, in an understanding of the respective environmental knowledge or behavior. In the urban context under discussion, this may involve civilly negotiating to reconcile plans to avoid species extinction between afforestation policies and personal agricultural habits. In this case, all the explanatory theories are connected into a unified whole, where knowledge of systems thinking, environmental justice and sustainable practices materialize into responsible actions. In general, these practices or training techniques related to ecological literacy do not have a profound impact on cognitive diversity in daily life interactions. This in turn broadly emphasizes the potential for educational strategies that involve a broader integration of the components discussed, with a focus on the contextual dimensions outlined above. Critically from a professional-academic perspective, this also involves creating educational curricula or action plans that address broader issues of environmental science in a networked world full of local specificities. Specifically, regarding the educational policies outlined above, it is also advisable to, where possible, test the theories with the Generation Z people they are specifically talking to.

4. THE URGENCY OF ENVIRONMENTAL EDUCATION FOR GENERATION Z

As ecological challenges continue to grow around the world, the advancement of environmental awareness is becoming increasingly urgent, especially among the next generation. Therefore, incorporating ecological literacy into educational programs will be crucial in driving Generation Z's environmental engagement. Generation Z would greatly benefit from an increased focus on ecological literacy through educational programs, a strategic move to enrich their environmental awareness and behavioral patterns, especially in terms of a highly connected urban lifestyle. There is a need to provide Generation Z with a better background in ecological understanding to support and encourage highly sustainable cities of the future. This need can be crucially addressed through education and by expanding interest in ecological concepts, exploration and knowledge.

Raising ecological awareness involves how individuals interact and perceive the environment around them through cognition, emotion, and behavior at both individual and collective levels. Important in this regard is the spread of knowledge-based literacy that generally leads to improved environmental quality and quantity, and subsequently, behavior-based literacy (Gould *et al.* 2018; Magagula, 2020). Knowledge-based literacy is better than behavior-based literacy, and elements of both forms of environmental literacy have the potential to greatly impact, facilitate, or limit the reproduction of further knowledge and heavier behaviors. Original urban plans and designs can be made inappropriate for many animals, leading to human-friendly interactions and therefore reduced public concern and conservation attitudes.

Generation Z, born from the mid-1990s to the late 2000s, grew up in an environment where digital technology was rapidly changing; therefore, it is no surprise that this generation is the most internet-savvy generation. With their fluency in using the internet, Generation Z is also more concerned about global environmental and social issues (Filimão *et al.* 2023; Nzau *et al*. 2022). Despite being the most technologically advanced, Generation Z is the same age when Generation X and Millennials' concern for the environment is in sharp decline. Most respondents were Generation Z, mainly from major cities in Indonesia as the target group. As the most polluting generation born in the heyday of plastic manufacturing in the 90s, Generation Z must act to solve the earth's crisis. It is estimated that around

45,000 tons of plastic waste are generated every day during the COVID-19 pandemic.

In Western societies, ethical consumption-which includes purchasing environmentally friendly products, reducing product packaging, and food, among others-has been adopted by an increasingly concerned population since the 2010s. Not only is it shared with the same perspective shared by Generation Z, but with its system of efficacy towards the proliferation of digital gadgets, Generation Z has an even stronger concern for these issues. Generation Z's heightened concern for sustainability issues also includes concern for how social media influences. The target market that focuses on Generation Z also perpetuates the consumptive culture that ultimately creates a large amount of plastic waste on earth. On the other hand, the positive role model of "Green YouTubers" whose majority of content is about the earth, environment, and sustainability can be an alternative to improving living habits.

5. FACTOR AFFECTING ENVIRONMENTAL AWARENESS FOR GENERATION Z

Generation Z (born after 1996) is currently one of the youngest generations, shaping and being shaped by transitional socio-economic policies and climate change activism (Campisi *et al*. 2024; Liu *et al.* 2023). Already gaining critical mass, Generation Z contemporarily exhibits high levels of environmental anxiety and engages in highly diverse forms of activism and pro-sustainability habits. This generation exhibits distinctive and dynamic attitudes towards sustainable practices and environmental concerns, the causes, manifestations and consequences of which can be understood by examining various factors. On the one hand, works using an activist approach claim that Generation Z is the most ecological generation ever. Many encourage taking an optimistic look at their considerable engagement with sustainability habits, online environmentalism, and even acts of civil disobedience. Some highlight the percentage of vegetarians, vegans, or active efforts to reduce meat consumption in Generation Z nutrition (Brymer and Davids, 2013; Skanavis, 1999). Others emphasized its vocal involvement in online campaigns, its high number of tweets related to the climate crisis, and its ability to mobilize previous generations in protest activities.

Comparisons between Generation Z's concern for the well-being of the planet and the Silent Generation's engagement about nuclear threats during the Cold War have been drawn. Nevertheless, most scientific production, as well as press and public discourse, is not very emphatic (Liu *et al.* 2023; Ritter *et al.* 2019). Therefore, it is important to adopt a broader and more nuanced perspective by considering Generation Z's specific contradictions, as well as the various reasons that explain its (low) sense of ecological citizenship. With cohesive argumentation, it is argued that Generation Z is both the most ecological generation and an equal copy of its predecessors. Offers a robust discussion that sees Generation Z's activism and engagement as well as its style and claims on ecological issues as a reflection of broader changes and incongruities in (post) modern environmental behaviors and concerns. As such, it is the distinctive heterogeneity and complex biographical environmental awareness that defines the sustainable practices and concerns of this younger generation for the planet.

6. STRATEGIES TO PROMOTE ECOLOGICAL LITERACY FOR GENERATION Z

Ecological literacy among Generation Z can effectively promote environmental awareness. There is great concern among experts and researchers about developing strategies that can emphasize ecological learning in Generation Z. Significantly, educating the Generation Z population is a better way to facilitate better participation in Generation Z, especially in environmental issues. Significantly, educating the Generation Z population is a better way to facilitate better participation in Generation Z, especially in environmental issues. Due to their enthusiasm in enacting social change, empowering and employing Generation Z is indispensable. Generation Z will be the next leaders in neighborhoods, metropolises, and at the international level. This age group will take on a significant function in seeking follow-up processes and influencing actions at the international level and in the implementation of local plans and actions to meet the needs of the UN 2030 agenda (Do *et al.* 2015; Wallis and Lonsdorf, 2010). Therefore, adopting appropriate ways of teaching and knowledge of the psychological characteristics of Generation Z relating to the learning of such knowledge is important, not only to help acquire the related knowledge and technical skills needed, but also to bridge the knowledge bottleneck of the management industry that teaches reverse resource turnover for potential breakthroughs. Scientists can apply pressure that requires Generation Z to come up with global solutions, especially in the areas of environment and health. In this transformative endeavor, it is important for Generation Z to internalize and embrace four contrasting concepts: pushing, sharing, transforming and uniting. These concepts offer one way to break the fossilized patterns and behavioral conformity of Generation X (Griffiths *et al.* 2022; Jung *et al.* 2023; Katalinić, 2007).

7. CONCLUSION

Cultivating environmental awareness among the next generation will require ecologically literate educators who are able to effectively embed ecological principles across disciplines and teaching methods. Generation Z is particularly at risk due to the rise of digital technology and the decline of environmental ethics. Awareness of fragile ecosystems from a young age

is fundamental to sustainable living. Therefore, educational curricula should be shaped with an emphasis on the idea that cultural diversity should be linked to ecological adaptation, and thus an overall team approach to environmental and ecosystem cognition. However, this requires interdisciplinary collaboration, partnership building and accountability requirements, linked to international agreements on biodiversity, climate change and the rights of indigenous peoples, including equitable benefit sharing. Based on recommendations from ecological educators, protection systems for native forests, peat swamps, marshes, grasslands and traditional water bodies are being established. In this context, a network of systems to demarcate these natural landscape forms is being developed, expanding passage for animals to create populations consistent with the habits and development of pristine ecosystems.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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