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Sociobiological Literacy in Global Citizenship Education: A Conceptual Review of 21st Century Social Challenges

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ABSTRACT

This study aims to examine the development of sociobiological literacy as an interdisciplinary approach that integrates biological-evolutionary and social science perspectives to strengthen global citizenship education in facing contemporary social issues. The method used is a literature study with qualitative-descriptive analysis of selected national and international scientific literature from 2021 to 2025, focusing on the contribution of sociobiological literacy in shaping critical awareness, empathy, and social responsibility of students. The results of the study show that the development of sociobiological literacy has succeeded in increasing students' understanding of the relationship between biological factors and social dynamics, enabling them to analyze issues such as climate change, identity conflict, digital disinformation, and ethical dilemmas of biotechnology more holistically and critically. This approach also strengthens students' character and commitment to universal values such as justice, peace, and sustainability, and encourages proactive action in responding to global challenges. The success of sociobiological literacy integration is greatly influenced by the role of adaptive teachers, contextual learning strategies, and responsive curriculum support. Thus, sociobiological literacy is not only a complement, but a transformative educational strategy that is urgently needed to be implemented in the education system in order to form adaptive, empathetic, and responsible 21st century global citizens.

1. Introduction

The 21st century is marked by the complexity of social challenges such as social inequality, intercultural conflict, and technological disruption (Susilowati & Najicha, 2021; Nurrahman et al., 2025). This condition requires the education system to not only produce individuals who are intellectually intelligent, but also have a critical awareness of global issues and the ability to actively contribute as responsible world citizens (Hanipah, 2023). In this context, education plays a strategic role, not only in equipping students with knowledge and skills, but also in

shaping global character and perspectives that enable them to become competent and ethical citizens amidst the ever-changing global dynamics.

The concept of Global Citizenship is becoming increasingly relevant in facing these challenges (Manalu, 2023). This concept refers to an individual's awareness of their identity and responsibilities as part of the global community, as well as their ability to contribute to the common good, both locally and universally (Supriatna & Atikah, 2024). Within this framework, Global Citizenship Education (GCE) emerges as an approach that aims to shape individuals with global awareness, intercultural competence, and commitment to universal values such as justice, peace, and sustainability (Setiono et al., 2024).

To achieve the goal of global citizenship effectively, understanding of human and societal dynamics needs to go beyond the boundaries of traditional disciplines. This is where the concept of Sociobiological Literacy offers a significant perspective. Sociobiological literacy can be defined as the ability to understand and analyze social phenomena from a biological-evolutionary perspective, by acknowledging the complex interactions between genetic, environmental, and cultural factors in shaping human behavior and social structures. As a branch of science that studies social behavior in the context of biological evolution, sociobiology provides important insights into understanding the biological roots of social behavior such as empathy, cooperation, aggression, and conflict.

The integration of sociobiological principles into education is expected to enrich students' insights into human social dynamics, as well as strengthen the foundation of character as global citizens. In the last five years, awareness of the importance of comprehensive literacy to face social challenges has grown in Indonesia. For example, research by Priyanti et al (2023) shows the urgency of developing environmental literacy and science literacy in responding to ecological issues. Although it does not explicitly mention sociobiology, this approach has a strong intersection with the understanding of human and environmental interactions, which are often rooted in biological dynamics. Meanwhile, Ulya (2025) emphasizes the importance of understanding the basics of human behavior in forming students' character, which suggests the need for a cross-disciplinary approach, including sociobiology.

In the context of 21st-century social challenges, sociobiological literacy offers a highly relevant contribution (Putra & Ardianto, 2024). First, in the issue of pandemics and global health, sociobiology helps explain variations in human responses to health threats, including compliance with health protocols and the emergence of pro-social behavior such as altruism in a crisis (Rizal, 2024). Second, in the issue of climate change and sustainability, understanding the human tendency to prioritize short-term interests, cognitive biases, and the tragedy of the commons phenomenon can be explained through a sociobiological approach (Dakhlan et al., 2024). This opens up space for more effective educational strategies in encouraging sustainable behavior.

Third, in dealing with disinformation and social conflict, sociobiological literacy provides an understanding of why humans are susceptible to information manipulation, why confirmation bias is so strong, and how group identity can trigger conflict between groups. This knowledge can be used to develop mitigation strategies and strengthen the values of empathy and cross-cultural cooperation. Research Irayanti & Komalasari (2023) on media and information literacy highlights the importance of the ability to filter information, but not many have linked it to the biological roots of vulnerability to disinformation. Fourth, advances in biotechnology and artificial intelligence raise new ethical dilemmas. In dealing with issues such as genetic engineering, cloning, and the use of AI in social decision-making, an understanding of sociobiology can help citizens assess the biological and ethical impacts in more depth (Usmi, 2023).

Unfortunately, discussions on sociobiological literacy are still relatively limited in the literature and educational curriculum in Indonesia. However, the potential to integrate this approach is enormous, especially in the context of strengthening science literacy, character education, and global citizenship. Through the development of sociobiological literacy, students will not only understand the scientific aspects of human social behavior, but will also be able to apply this understanding to respond to social challenges critically and constructively. This is an important foundation in forming a cooperative, just, and sustainable society.

Thus, the discussion of sociobiological literacy is not merely a complement to the education system, but rather an urgent need to equip the younger generation to face the social challenges of the 21st century and become adaptive, empathetic and responsible global citizens. This research aims to examine in depth the urgency and potential of integrating sociobiological literacy in education as a strategy to strengthen Global Citizenship Education (GCE) in the era of 21st century social challenges. Specifically, this research aims to: (1) identify the contribution of sociobiological literacy in shaping students' global character and awareness; (2) analyze the relevance of the sociobiological approach in addressing contemporary issues such as pandemics, climate change, disinformation, and technological ethical dilemmas; and (3) explore opportunities for curriculum development and learning practices that integrate sociobiological principles in a contextual and transdisciplinary manner in the Indonesian education system. Thus, the results of this research are expected to provide a conceptual and practical basis for strengthening global character education based on scientific understanding of human behavior and social dynamics

2. Methodology

This research methodology uses a library research approach by systematically reviewing various sources of scientific literature, both from national and international journals that are relevant in the last five years (2021–2025) (Sari & Asmendri, 2020). This study aims to explore, review, and analyze the development of the concept of sociobiological literacy and its relationship to global citizenship education in facing the social challenges of the 21st century. Data sources were

obtained from reputable academic databases such as Google Scholar, Scopus, and DOAJ, which contain scientific articles with main topics covering sociobiology, science literacy, character education, global citizenship, and contemporary social issues such as climate change, digital disinformation, identity conflict, and biotechnology ethics.

The literature selection process was carried out using a purposive sampling technique, considering the relevance of the topic, the recency of the data, and the quality of the publication, including research that highlights the interdisciplinary approach between biology and social sciences. The data obtained were analyzed using a qualitative-descriptive approach, focusing on identifying key themes, argumentative patterns, and literature contributions to the understanding of sociobiological literacy in forming critical, empathetic, and responsible global citizens. This approach was chosen because it is able to provide an in-depth conceptual mapping of the role of sociobiology in 21st century education, as well as presenting a synthesis of the latest findings to strengthen the theoretical basis and arguments in the development of sociobiological literacy as a transformative educational strategy.

3. Results and Discussion

The development of sociobiological literacy in the context of global citizenship shows significant results in shaping students' understanding of 21st-century social dynamics. Students show an increased understanding of the relationship between human behavior, social structures, and biological factors that influence social life. They are able to integrate basic sociobiological concepts such as cooperation, competition, and the evolution of social behavior in analyzing contemporary issues such as climate change, social conflict, and global injustice (Hermawanto, 2021; Sholikhah; Mutoharoh et al., 2025). The increase in students' understanding of the relationship between biological factors and social dynamics reflects the success of this approach in bridging the gap between the natural sciences and the social sciences. Concepts such as "evolutionary mismatch" are used to explain social inequality that arises from the mismatch between modern social structures and human biological instincts (Apriyoza et al., 2025). Education that adopts an interdisciplinary approach has been shown to equip students with a more comprehensive understanding (Nasihudin et al., 2023; Ervia et al., 2024; Erdreich, 2025).

Students exposed to sociobiological literacy show increased critical awareness of global issues. They not only recognize challenges such as intolerance, environmental crises, and social polarization, but are also able to analyze the biological roots and social dimensions of these challenges (Wulandari et al; Njoku, 2024). This understanding strengthens the argument that empathy and cooperation are not just social values, but adaptive evolutionary strategies in forming a cooperative society (Faizah et al., 2021). Sociobiological literacy plays a strategic role in peace education and the formation of global ethics for students. The evolutionary perspective allows them to understand the dynamics of intergroup

conflict through group selection theory, while emphasizing the importance of social regulation and empathy as a counterweight (Sukaesih, 2023). Learning that combines scientific dimensions and moral values has been proven to strengthen students' character (Eren, 2021).

In addition to increasing understanding and awareness, sociobiological literacy makes a real contribution to the development of students' global citizenship dimensions, such as solidarity, environmental responsibility, and commitment to social justice. They begin to understand that all humans share the same biological heritage, which is the basis for the emergence of cross-cultural empathy. Sociobiological literacy also broadens students' way of thinking in analyzing environmental crises. They understand that the human tendency to take short-term advantage is a biological heritage that, in the modern context, creates the phenomenon of the tragedy of the commons (Usmi, 2023). This awareness encourages students to act more wisely and responsibly in maintaining environmental sustainability.

Students' ethical understanding of technological advances such as AI and genetic engineering also increases through a sociobiological approach. They not only see the technical side, but are also able to examine its impact on human values, individual rights, and the sustainability of species (Salma et al., 2025). This literacy strengthens the reflective and ethical dimensions in students as global citizens. In terms of learning, an interdisciplinary approach in developing sociobiological literacy has succeeded in creating contextual and meaningful learning experiences for students. The use of global case studies, ethical discussions, and problem-based learning (PBL) methods opens up space for students to think critically and creatively (Sumual et al., 2025). The success of integrating sociobiology into learning cannot be separated from the role of adaptive teachers. Teachers are able to design learning that combines elements of biology, sociology, and global citizenship, while avoiding biological determinism that can be misleading (Rose et al., 2024). Students are directed to understand that biological factors are only one part of the complexity of human behavior.

One of the positive impacts of sociobiological literacy is students' deeper understanding of the roots of disinformation and digital information manipulation. They realize that cognitive biases such as confirmation and group favoritism have a biological basis that must be recognized and controlled (Karmana, 2024). This awareness strengthens their ability to face the digital era. Students who understand sociobiological literacy also show increased empathy and global solidarity. They are more motivated to take real action on social issues such as environmental conservation and human rights (Rizky et al., 2024). This shows that sociobiological literacy forms caring and responsible students. However, challenges in integrating sociobiological literacy remain, such as resistance to approaches that are considered controversial. Pedagogical strategies based on evidence and values can overcome this. Sociobiological material can be presented in a dialogical and contextual manner so that students remain comfortable and open-minded (Situmorang et al., 2025).

This study also shows that sociobiological literacy can bridge between science and social literacy, forming critical, reflective, and transformative mindsets of students. They not only understand social structures, but also the biological basis of human tendencies and responses (Hardiyanto et al., 2025). This finding is consistent with various recent studies that emphasize the importance of integrating science in character education and global citizenship. Thus, sociobiological literacy is not just a complement in the education system, but a primary strategy in shaping students as adaptive, empathetic, and responsible global citizens. Its integration into the curriculum is an urgent need to address the challenges of the 21st century in a holistic and meaningful manner (Zebua, 2025).

4. Conclusion

Based on the results and discussion, it can be concluded that the development of sociobiological literacy significantly contributes to forming students who have critical, empathetic, and responsible understanding as global citizens amidst the complexity of 21st century social challenges. This literacy allows students to understand the relationship between biological factors and social dynamics, and to be aware of the evolutionary roots of behaviors such as cooperation, empathy, conflict, and tendencies towards disinformation. With an interdisciplinary approach that integrates the concepts of evolutionary biology and social sciences, students are able to analyze contemporary issues such as climate change, identity conflict, digital manipulation, and ethical dilemmas in the advancement of biotechnology more holistically. They are not only trained in critical thinking, but are also encouraged to act proactively in solving global problems based on scientific understanding and universal values. The role of teachers, contextual learning strategies, and adaptive curriculum support are the keys to the success of integrating sociobiological literacy in education.

References

- Apriyoza, W., Ariati, C., & Shaar, S. A. (2025). Kontribusi Ilmu Biologi dalam Membangun Karakter Islami Berdasarkan Ajaran Al-Qur ' an dan Sunnah. *Al-Alam: Islamic Natural Science Education Journal*, 4(1), 1–12.
- Dakhalan, M., Kuswandi, D., Malang, U. N., & Malang, U. N. (2024). Pendidikan Kewarganegaraan Global (GCE). *Madika: Jurnal Politik Dan Governance*, 4(2), 158–171.
- Erdreich, L. (2025). Digital Well-Being and Superdigital Citizenship: A Class Comparison of Parenting Practices for Remote Learning. *Social Justice Research*. <https://doi.org/10.1007/s11211-025-00454-4>
- Eren, E. (2021). Exploring Biological Literacy: A Systematic Literature Review of Biological Literacy. *European Journal of Educational Research*, 10(3), 1199–1213. https://www.researchgate.net/profile/Ebru-Eren/publication/348382981_Education_Policies_in_the_Context_of_Political_Communication_in_Turkey/links/5ffc2aeba6fdccdb846cc03/Education-Policies-in-the-Context-of-
-

- Political-Communication-in-Turkey.pdf
- Ervia, E., Harahap, R. D., & Chastanti, I. (2024). Analisis Perkembangan Kurikulum Biologi dari kurikulum 1984 Sampai dengan Kurikulum Merdeka. *Didaktika: Jurnal Kependidikan*, 13(1), 927–936. <https://doi.org/10.58230/27454312.491>
- Faizah, U., Rustaman, N. Y., Ambarwati, R., & Rahayu, D. A. (2021). Persepsi Calon Guru Biologi Tentang Keterampilan Memecahkan Masalah Biodiversitas: Kajian Terkait Society 5.0. *Jurnal Inovasi Pembelajaran Biologi*, 2(2), 12–23. <https://doi.org/10.26740/jipb.v2n2.p12-23>
- Hanipah, S. (2023). Analisis Kurikulum Merdeka Belajar Dalam Memfasilitasi Pembelajaran Abad Ke-21 Pada Siswa Menengah Atas. *Jurnal Bintang Pendidikan Indonesia*, 1(2), 264–275. <https://doi.org/10.55606/jubpi.v1i2.1860>
- Hardiyanto, L., Irawatie, A., & Suryono. (2025). Relevansi Nilai-nilai Pancasila dalam Mengasah Kritisisme Masyarakat Modern. *Jurnal Citizenship Virtues*, 5(1), 47–61.
- Hermawanto, A. (2021). Darwinisme Sosial Dan Keamanan Internasional: Sebuah Analisis Ringkas. *Paradigma: Jurnal Masalah Sosial, Politik, Dan Kebijakan*, 23(2), 334. <https://doi.org/10.31315/paradigma.v23i2.5012>
- Irayanti, I., & Komalasari, K. (2023). Membangun Etika Kewarganegaraan Global Melalui Karakter Moral Pancasila: Analisis Konseptual. *Jurnal Pendidikan Kewarganegaraan*, 13(1), 21. <https://doi.org/10.20527/kewarganegaraan.v13i1.15945>
- Karmana, I. W. (2024). Literature Review: Efektivitas Metode Pembelajaran Inovatif dalam Pendidikan Biologi. *Educatoria: Jurnal Ilmiah Ilmu Pendidikan*, 4(4), 162–167.
- Manalu, D. K. (2023). Identitas Nasional dan Nasionalisme di Era Digital: Dakam Kajian Kewarganegaraan. *JAGADDHITA: Jurnal Kebhinekaan Dan Wawasan Kebangsaan*, 14(4), 18–29.
- Mutoharoh, T., Sangadah, D., Adxki, H., & Maysaroh, Y. (2025). Analisis Konten Media Digital Instagram terhadap Kemampuan Berkomunikasi Mahasiswa Pendidikan Biologi. *INTEGRASI: Jurnal Kesatuan Ilmu*, 1(1), 37–42.
- Nasihudin, M. D., Prafitasari, A. N., Mudayanti, A. Ri., Sari, R., & Fauzi, R. (2023). Korelasi Mindfulness Social Emotional Learning terhadap Fokus Belajar Siswa pada Mata Pelajaran Biologi SMA. *Jurnal Biologi*, 1(2), 1–10. <https://doi.org/10.47134/biology.v1i2.1958>
- Njoku, M. I. A. (2024). Assessment of Biology Literacy Level among Adolescents in The Port Harcourt Metropolis. *International Journal of Functional Research in Sciend and Engineering (IJFRSE)*, 14(7).
- Nurrahman, Aziz, A., & Afif, N. (2025). Penerapan Project-Based Learning Berbasis Karya Tulis Ilmiah untuk Meningkatkan Kompetensi Abad 21 di Sekolah Dasar. *ANDRAGOGI*, 7(1), 28–41.
- Priyanti, N. A., Habiburrahman, N., & Andriani, R. D. (2023). Perspektif Inovasi dan Strategi Pembelajaran Biologi di Era Revolusi Pendidikan Abad 21. *Jurnal Pembelajaran Dan Riset Pendidikan*, 3(4), 507–512.
- Putra, R. D., & Ardianto, B. (2024). Evolusi Kewarganegaraan di Era Globalisasi dan Digitalisasi (2019- 2023). *Jurnal Multidisiplin Ilmu Akademik*, 1(3), 478–482. <https://doi.org/10.61722/jmia.v1i3.1548>
-

- Rizal, A. (2024). Urgensi Pendidikan Kewarganegaraan Global Dalam Mata Pelajaran Pendidikan Pancasila Dan Kewarganegaraan Di Abad 21. *Innovative: Journal Of Social Science Research*, 4(3), 714–721. <https://doi.org/10.31004/innovative.v4i3.10183>
- Rizky, D., Lubis, N., Batubara, N. A., & Fatimah, S. (2024). Kecenderungan Global Dalam Proses Pembelajaran Pendidikan Pancasila Dan Kewarganegaraan Di Sekolah. *JIPE: Jurnal Pendidikan Guru Madrasah Ibtidaiyah*, 2(1), 49–58. <https://doi.org/10.24269/v2.n2.2017.49-58>
- Rose, A. E., Nency, A., Sudira, E., Haria, Y., & Suryanda, A. (2024). Eksplorasi Strategi Inovatif Pembelajaran Biologi di Abad 21. *DIAJAR: Jurnal Pendidikan Dan Pembelajaran*, 3(1), 102–107. <https://doi.org/10.54259/diajar.v3i1.2270>
- Salma, A. K., Syafa, I. T., Az-zahra, S., & Mareta, R. D. (2025). Pentingnya Kompetensi Literasi Digital Mahasiswa Calon Guru Biologi. *INTEGRASI: Jurnal Kesatuan Ilmu*, 1(1), 1–11.
- Sari, M., & Asmendri. (2020). Penelitian Kepustakaan (Library Research) dalam Penelitian Pendidikan IPA. *NATURAL SCIENCE: Jurnal Penelitian Bidang IPA Dan Pendidikan IPA*, 6(1), 41–53.
- Setiono, P., Amaliyah, Y., & ... (2024). Pendidikan Ekonomi Pada Gen Z: Analisis Kebutuhan Desain Pembelajaran Untuk Meningkatkan Literasi Kewargaan Ekonomi Calon Guru Sekolah Dasar. *ECODUCATION: Economic & Education Journal*, 6(2), 522–536.
- Sholikhah, M. (2025). Tinjauan Literatur Augmented Reality pada Pembelajaran Biologi dalam Melatihkan Literasi Digital pada Artikel. *Bioedu: Berkalah Ilmiah Pendidikan Biologi*, 14(1), 240–248.
- Situmorang, F., Sigalingging, G., & Gultom, J. (2025). Paradigma Baru Pendidikan Kewarganegaraan di Sekolah Dasar : Pendekatan Berbasis Karakter dan Kewarganegaraan Global Jurnal Teknologi Pendidikan Dan Pembelajaran (JTPP). *Jurnal Teknologi Pendidikan Dan Pembelajaran (JTPP)*, 02(03), 883–887.
- Sukaesih, S. (2023). Mewujudkan Generasi Cerdas, Kompetitif dan Berkarakter pada Abad 21 Melalui Pendidikan Biologi dan Inovasi Riset Berkelanjutan. *Prosiding Seminar Nasional Biologi XI*, 11, 16–22.
- Sumual, T. P., Sukmarayu, Gedoan, Jemmy, & Sukmatul. (2025). Peningkatan Hasil Belajar Biologi Melalui Model Discovery Learning Berbasis Media Audio Visual tujuan pendidikan , baik di tingkat sekolah maupun nasional . Pendidikan pada hakikatnya pembelajaran . Materi disampaikan masih menggunakan pendekatan konvensional. *Algoritma: Jurnal Matematika, Ilmu Pengetahuan Alam, Kebumihan Dan Angkasa*, 3(3), 93–107.
- Susilowati, D. A., & Najicha, F. U. (2021). Dampak Teknologi Abad Ke-21 dan Media Sosial Terhadap Pendidikan Kewarganegaraan. *Jurnal Ilmiah Pendidikan Pancasila Dan Kewarganegaraan*, 47(4), 124–134. <https://doi.org/10.31857/s013116462104007x>
- Ulya, N. (2025). Pendidikan Karakter dalam Masyarakat Multikultural : Integrasi Etika , Beragama dan Kewarganegaraan Global. *Journal of Artificial Intelligence and Digital Business (RIGGS)*, 4(2), 1049–1054.
- Usmi, R. (2023). Analisis Kewarganegaraan Global dalam Konteks Pendidikan Kewarganegaraan. *Journal of Civics and Moral Studies*, 8(1), 1–9.
-

<https://doi.org/10.26740/jcms.v8n1.p1-9>

- Wulandari, A., Alfiani, F., & Saputra, T. (2024). Pentingnya Mengintegrasikan Pendidikan Kewarganegaraan dalam Kurikulum Sekolah Melalui Perspektif Global. *Jurnal Pendidikan Guru Sekolah Dasar*, 1(3), 11. <https://doi.org/10.47134/pgsd.v1i3.511>
- Zebua, N. (2025). Integrasi Teknologi Digital dalam Pembelajaran Biologi : Analisis Kualitatif terhadap Pemahaman Konseptual dan Keterampilan. *Edukasi Elita: Jurnal Inovasi Pendidikan*, 2(2), 52–64.

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