

GLOBAL CITIZENSHIP IN THE ERA OF CLIMATE CRISIS :SHAPING STUDENTS AS PIONEERS OF ENVIRONMENTAL SUSTAINABILITY

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Abstract

The escalation of the global climate crisis and environmental degradation demand an educational transformation that does not just transfer knowledge, but equips the young generation as sustainability pioneers. Global Citizenship Education (GCE) is a vital instrument, but its implementation is often constrained by the gap between theoretical understanding and real changes in students' behavior. This research aims to explore GCE's strategy in shaping students as agents of change who have ecological awareness and environmental justice. This study applies the Systematic Literature Review (SLR) approach by complying with the PRISMA protocol. The data search was conducted exclusively on the Scopus database with a publication range of 2020–2026, which resulted in 11 empirical articles selected after going through a rigorous selection process and deduplication. Data analysis was carried out thematically to map the pedagogical approach and contribution of the study to the Sustainable Development Goal (SDG) 13. The findings show a shift in the educational paradigm from conventional teaching to the development of critical competencies and real action through a multidisciplinary approach. The strategy of integrating art, technology, and Socio-Scientific Inquiry-Based Learning (SSIBL) has proven to be significant in reducing eco-anxiety and turning it into constructive hope. In addition, the use of local wisdom and linguistic landscapes was found to be effective in internalizing global values without uprooting students' cultural roots. The effectiveness of change agent character formation is achieved through the CARE-KNOW-DO framework, which aligns empathy, scientific validity, and active participation in the Open Schooling model. However, fundamental challenges are found in a curriculum that is still anthropocentric biased and standardized global assessments that often ignore the local socio-economic context. Education is required to navigate these tensions by strengthening the dimensions of epistemic justice and crucial literacy such as Ocean Literacy. The climate crisis has destabilized students' psychological states, so GCE must evolve through action-based pedagogy and interdisciplinary curriculum reform.

Keywords: *Global Citizenship Education; The Climate Crisis; Environmental Sustainability; Systematic Literature Review; Agents of Change*

Abstrak

Abstrak Peningkatan krisis iklim global dan degradasi lingkungan menuntut transformasi pendidikan yang tidak hanya mentransfer pengetahuan, tetapi juga membekali generasi muda sebagai pelopor keberlanjutan. Pendidikan Kewarganegaraan Global (GCE) adalah instrumen yang penting, tetapi implementasinya sering terkendala oleh kesenjangan antara pemahaman teoretis dan perubahan nyata dalam perilaku siswa. Penelitian ini bertujuan untuk mengeksplorasi strategi GCE dalam membentuk siswa sebagai agen perubahan yang memiliki kesadaran ekologis dan keadilan lingkungan. Studi ini menerapkan pendekatan Tinjauan Literatur Sistematis (SLR) dengan mematuhi protokol PRISMA. Pencarian data dilakukan secara eksklusif di basis data Scopus dengan rentang publikasi 2020–2026, yang menghasilkan 11 artikel empiris yang dipilih setelah melalui proses seleksi yang ketat dan deduplikasi. Analisis data dilakukan secara tematik untuk memetakan pendekatan pedagogis dan kontribusi studi terhadap Tujuan Pembangunan Berkelanjutan (SDG) 13. Temuan menunjukkan pergeseran paradigma pendidikan dari pengajaran konvensional ke pengembangan kompetensi kritis dan aksi nyata melalui pendekatan multidisipliner. Strategi mengintegrasikan seni, teknologi, dan Pembelajaran Berbasis Penyelidikan Sosio-Ilmiah (SSIBL) terbukti signifikan dalam mengurangi kecemasan ekologis dan mengubahnya menjadi harapan konstruktif. Selain itu, penggunaan kearifan lokal dan lanskap linguistik terbukti efektif dalam menginternalisasi nilai-nilai global tanpa mencabut akar budaya siswa. Keefektifan pembentukan karakter agen perubahan dicapai melalui kerangka CARE-KNOW-DO, yang menyelaraskan empati, validitas ilmiah, dan partisipasi aktif dalam model Open Schooling. Namun, tantangan mendasar ditemukan dalam kurikulum yang masih bias antropocentrik dan penilaian global standar yang sering mengabaikan konteks sosial-ekonomi lokal. Pendidikan diperlukan untuk menavigasi ketegangan ini dengan memperkuat dimensi keadilan epistemik dan literasi penting seperti Literasi Laut. Krisis iklim telah menstabilkan kondisi psikologis siswa, sehingga GCE harus berkembang melalui pedagogi berbasis aksi dan reformasi kurikulum lintas disiplin.

Kata Kunci: Pendidikan Kewarganegaraan Global; Krisis Iklim; Keberlanjutan Lingkungan; Tinjauan Literatur Sistematis; Agen Perubahan

INTRODUCTION

The worsening global climate crisis has reached an alarming point and is impacting almost all aspects of human life. Data from the Global Carbon Project (2022) shows that global carbon dioxide emissions in 2021 recorded the highest figure in history, reaching 36.3 billion tons of CO₂ (Deng et al., 2022; Friedlingstein et al., 2022; Ji, 2024). In fact, nearly 90% of the world's population now lives in regions affected by climate change, with nearly 1 million species threatened with extinction due to habitat destruction and climate change (Niederman et al., 2025; Ortiz et al., 2020; Sandra Díaz et al., 2020). In addition, a report from UNICEF (2023) notes that more than 1 billion children around the world are now threatened by the impacts of the climate crisis, ranging from droughts, floods, to unpredictable extreme weather (UNICEF, 2023). In the midst of the urgent threat of the climate crisis, education is the absolute key to equipping the young generation to be able to act as agents of solutions and saviors of the ecological future (Kumar et al., 2023; Rousell & Cutter-Mackenzie-Knowles, 2020).

A study showed that citizenship education in four countries (Singapore, Vietnam, South Korea, and Australia) increases the level of adaptation of people wherever they are (Van, 2024). Based on ICCS 2022 data, an average of 67% of students in more than 40 countries showed increased citizenship knowledge and involvement in social, political, and environmental issues, after attending civics education that teaches the interconnectedness between social, economic,

and sustainability issues (Schulz et al., 2022). This data shows that education can be an effective tool in shaping students into individuals who not only care about climate change, but also actively participate in the solution of that change (Alshehri, 2024; Estrada-araoz et al., 2023; Srivastava, 2024). This is in line with a study published in *Environmental Education and Pro-Environmental Behavior Among UM Peñaplata College Students* (2024), which shows that the level of environmental education among UM Peñaplata College students is at a very high level, with an average overall score of 4.79 (SD = 0.25). The study also found that there was a significant relationship between environmental education and pro-environmental behavior, with a correlation of $r = 0.686$ ($p < 0.05$). In addition, regression analysis showed that behavioral indicators had the greatest influence on pro-environmental behavior, with a coefficient value of 0.381 (t-value = 6.339, $p < 0.001$), which showed a significant influence in shaping students' pro-environmental actions. These figures show that education can be the key to shaping a generation that not only cares, but is also ready to act in the face of an increasingly profound environmental crisis (Almencion et al., 2024; Bibi et al., 2025).

Global citizenship education (GCE) is now an indispensable tool in equipping students with an understanding of complex global challenges, especially climate change and social justice (Bosio, 2023; Cripps, 2024; Nur et al., 2022; Pountney, 2025). As an educational approach that emphasizes the values of empathy, social responsibility, and intercultural understanding, GCE opens up space for students to see themselves not just as citizens, but as part of a global community that has an obligation to the sustainability of the planet (Cárdaba et al., 2024; Mulyana et al., 2025; Sutrisno, 2023). More than just theory, global citizenship education encourages students to understand the relationships between social, economic, and environmental issues, and to become individuals who are ready to drive real change at the local and global levels (Agoi, 2025; Ferguson & Brett, 2025).

However, the biggest challenge that arises is how to integrate this knowledge and awareness into real action. Although many countries have begun to implement global citizenship education in their curricula, few have succeeded in linking the theory to measurable behavioral changes in students' daily lives (Inguaggiato et al., 2025; Jerome et al., 2024). The worsening climate crisis, with its increasingly felt impacts, forces us to explore more deeply how education can equip students with a deep understanding of sustainability, as well as encourage them to act as inevitable agents of change in creating a more just and sustainable world (Chang et al., 2024; Id et al., 2025; Perwitasari et al., 2023).

This research aims to explore how global citizenship education can shape students as pioneers of sustainable change and drivers of environmental justice, taking into account the urgency of the climate crisis that increasingly threatens our future. In addition, this research will analyze the role of global citizenship education in increasing students' awareness of environmental and sustainability issues, as well as how education can equip them with the skills and values necessary to become agents of social and environmental change. The research also aims to explore the impact of the climate crisis on students' mindsets and behaviors, as well as to evaluate the challenges and opportunities in integrating global citizenship and environmental justice education into the secondary school curriculum, by providing relevant recommendations for education in the era of climate change.

Therefore, this study wants to answer questions that discuss global citizenship education in shaping students' awareness of the importance of environmental justice and sustainability in

the midst of the global climate crisis, how the climate crisis affects students' mindsets and behaviors related to social and environmental issues, and how global citizenship education can respond to them, as well as what are the challenges and opportunities in integrating Global Citizenship and Environmental Justice Education in the educational curriculum at the secondary school level to create students who are ready to face global environmental challenges. Therefore, this research focuses on the role of education in equipping students with the knowledge, skills, and attitudes necessary to address profound environmental challenges and fight for a more just and sustainable world.

THEORETICAL AND CONCEPTUAL FRAMEWORK

Sustainable Global Citizenship

Sustainable Global Citizenship refers to the concept of citizenship that emphasizes the importance of understanding and acting on global issues, with a focus on environmental and social sustainability. This concept combines individual and collective responsibility in the face of planetary challenges such as climate change, social inequality, and natural resource crises. Sustainable global citizenship puts forward an integrative approach, where students or citizens are invited to understand the relationship between local actions and their impact on the world globally, as well as develop skills and values to contribute to creating a more just and sustainable world. This approach requires awareness of the importance of maintaining a social-ecological balance and creating positive change through sustainable actions in daily life (Akçay et al., 2024; Fang et al., 2023; Granados-Sánchez, 2023; Jenkins, 2021; Leite, 2021; Nam, 2024; Sharma, 2025; Yanniris, 2021).

From the perspective of critical realism, sustainable global citizenship requires not only an awareness of environmental issues but also the ability to act within the confines of existing socio-political systems. This approach emphasizes the importance of integrating personal abilities, motivations, and social context in fostering sustainability. Students must be equipped with the emotional intelligence and practical skills needed to navigate and influence the system of government towards sustainable environmental practices (Granados-Sánchez, 2023).

Sustainable Global Citizenship is therefore an integrative concept that connects awareness of global crises with the responsibility of local action to achieve socio-ecological balance. Viewed through the perspective of critical realism, this approach demands more than just an understanding of the issue; It requires a synergy between emotional intelligence, personal motivation, and practical skills so that individuals are able to navigate and influence existing socio-political structures in order to realize just and sustainable systemic change.

Global Citizenship Education (GCE) in the Era of Globalization

As the climate crisis escalates in the era of globalization, global citizenship education (GCE) is needed to address pressing environmental issues. GCE aims to form active and responsible global citizens, who understand the interconnectedness of global issues such as climate change (Pountney, 2025; Römhild & Gaudelli, 2021; Waldron et al., 2019). In response to global issues, the concept of cosmopolitanism has an important role in education to create an understanding that every individual, despite being separated by geographical distance, is responsible for environmental sustainability, and social justice around the world (Hanley, 2020; Hooft, 2009). This is in line with Oxfam's framework on GCE, which emphasizes four key elements: understanding global connectivity, social justice, active participation and environmental responsibility (Qublan & Bataineh, 2025). Educational frameworks should

therefore be aimed at empowering students to understand the global impact of issues such as climate change and foster a sense of shared responsibility by developing a critical understanding of global citizenship to actively engage with issues such as the climate crisis and environmental sustainability (Aziz & Abdullah, 2025).

The methods used in CGE involve participatory approaches, such as group discussions, international collaborative projects, and the development of critical thinking on relevant global issues, as applied in climate change education projects involving students from different countries. This method is more familiarly known as "planetary citizenship education," which encourages students to engage critically with environmental issues and develop sustainable solutions (Karsgaard & Davidson, 2023). In addition, CGE also focuses on developing civic competencies through activities that introduce the values of solidarity, equality, and sustainability. This approach not only teaches students about global issues, but also encourages them to take real action in society, whether through social action, public policy, or individual behavior change that supports sustainability (Schwiertz & Schwenken, 2020).

Therefore, Global Citizenship Education (GCE) plays a vital role in responding to the climate crisis by forming global citizens who have cosmopolitan awareness and collective responsibility for environmental sustainability. By integrating social justice value frameworks through participatory methods and "planetary citizenship education", GCE goes beyond just a theoretical understanding of global connectedness. This approach actively empowers students to build critical competencies and take concrete action to bring concrete solutions to future ecological challenges.

Climate Literacy and Environmental Management

Building a resilient community foundation for the global climate crisis must begin with strengthening Climate Literacy. Priyanka Raj and Shivdasini Amin (2024) affirm that literacy is not just theoretical knowledge, but a vital tool for forming environmentally responsible global citizens. An education that emphasizes understanding anthropogenic impacts, climate change science, and ethical responsibility are absolute prerequisites in preparing students to lead change. However, this cognitive understanding of climate science will not be complete without the realization that the impact of the crisis is not evenly distributed across all levels of society (S Raj & S Amin, 2024).

Therefore, this literacy framework should be expanded to include Environmental Justice Theory that highlights structural inequalities in which the burden of environmental damage is often disproportionately borne by marginalized communities, such as low-income and minority groups (Suman, 2025). This concept demands policy reform so that the distribution of environmental benefits becomes equitable, in line with the idea of Just Sustainability from Kajola and Agyeman (2021) which affirms that sustainability is impossible to achieve without social justice. The integration of this justice perspective in education aims to equip students with the sensitivity to recognize ecological injustices, which then require the right pedagogical framework in order to be taught effectively (Kojola & Agyeman, 2021).

Environmental and climate literacy education is now understood as a holistic effort that goes beyond just theoretical knowledge transfer. Collectively, the experts affirm that this education should be able to form practical and ethical competencies, where students not only understand the dangers of climate change, but are also empowered to make wise decisions as

well as design technical solutions that consider the long-term environmental costs and benefits. To achieve this level of deep understanding of adaptation and mitigation, interdisciplinary and action-based pedagogical methods through cycles are needed *Plan-Do-Check-Act* (PDCA) as Problem-Based Learning (PBL) to train students to become agents of change (Gallay et al., 2025; Keum & Baek, 2025; Kranz et al., 2022; Martín-Ramos et al., 2025). This climate literacy program can be tailored to different age groups and professions to provide relevant knowledge about climate risk management (Wellman et al., 2025).

Strengthening climate literacy is a vital foundation in building resilience in a global society, but its effectiveness depends on holistic integration between scientific understanding and environmental justice principles. Climate education should not stop at the transfer of theoretical knowledge, but should expand its scope on *the issue of Just Sustainability* to highlight structural inequalities and the unequal distribution of ecological burdens. Through an action-based interdisciplinary pedagogical approach (PBL), this education empowers students to not only have ethical sensitivity, but also practical competence in designing real adaptation and mitigation solutions for a sustainable and equitable future.

RESEARCH METHOD

This study uses the Systematic Literature Review (SLR) approach to identify, classify, and analyze from various articles collected as sources (Paul et al., 2021; Sauer & Seuring, 2023; Williams et al., 2020). This resource elaborates Global Citizenship Education on the role of students as agents of environmental change in responding to the climate crisis. This study aims to compile a comprehensive mapping of empirical research relevant to global citizenship education in the era of the climate crisis, while highlighting pedagogical models, strategies, and approaches that support the formation of students' character that is aware of their global and environmental responsibilities. This approach also assesses how global citizenship education can contribute to strengthening students' role as active agents of change in the face of the challenges of the climate crisis at the local and global levels. In addition, the study also looks at how global citizenship education can contribute to strengthening students' role as active agents of change in the face of the challenges of the climate crisis at the local and global levels.

The literature selection process in this study follows the PRISMA guidelines (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) to ensure transparency, traceability, and reliability of research procedures (Page et al., 2021). The literature search is carried out exclusively through the Scopus database, using the following Boolean syntax:

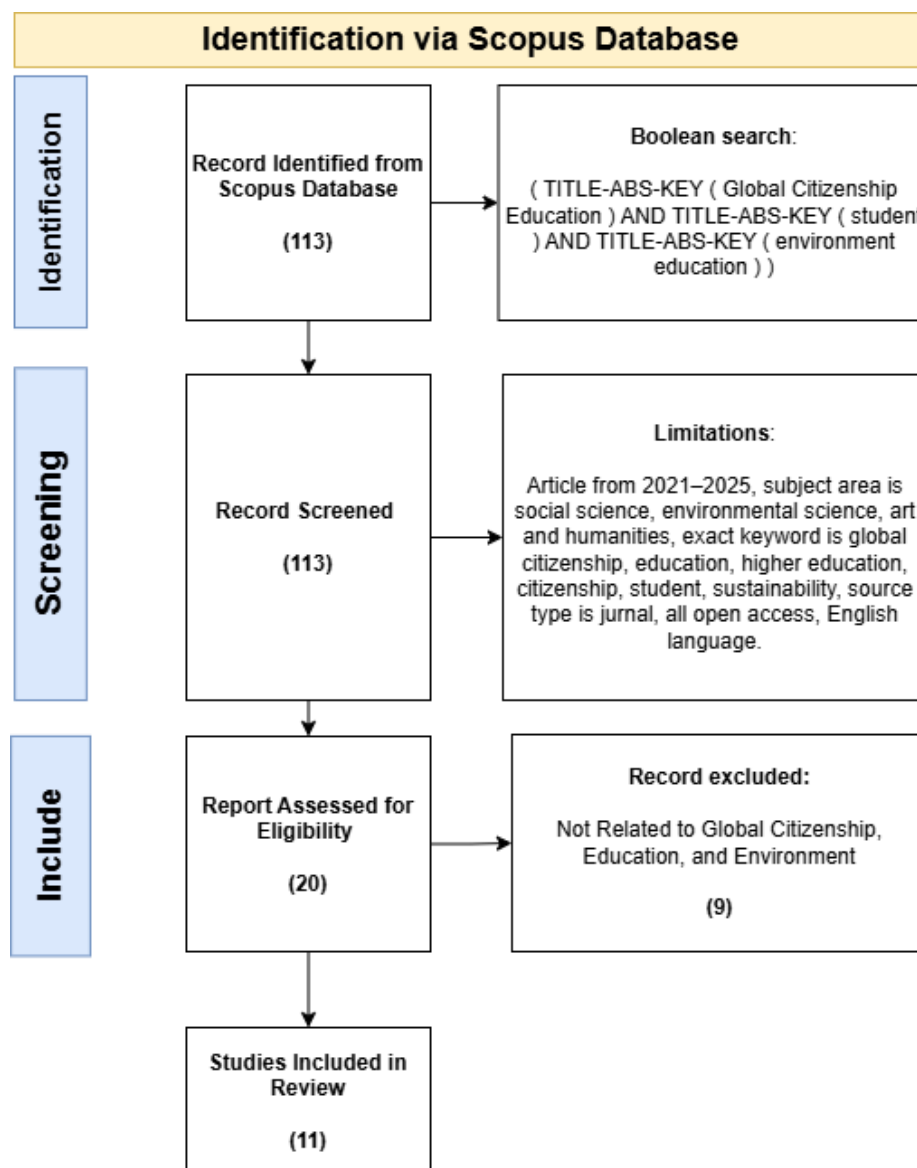
(TITLE-ABS-KEY (Global Citizenship Education) AND TITLE-ABS-KEY (student) AND TITLE-ABS-KEY (environment education)) AND PUBYEAR > 2020 AND PUBYEAR < 2026 AND (LIMIT-TO (OA , "all")) AND (LIMIT-TO (EXACTKEYWORD , "Global Citizenship") OR LIMIT-TO (EXACTKEYWORD , "Education") OR LIMIT-TO (EXACTKEYWORD , "Higher Education") OR LIMIT-TO (EXACTKEYWORD , "Citizenship") OR LIMIT-TO (EXACTKEYWORD , "Global Citizenship Education") OR LIMIT-TO (EXACTKEYWORD , "Student") OR LIMIT-TO (EXACTKEYWORD , "Students") OR LIMIT-TO (EXACTKEYWORD , "Sustainable Development") OR LIMIT-TO (EXACTKEYWORD , "Students") OR LIMIT-TO (EXACTKEYWORD , "Environmental Education") OR LIMIT-TO (EXACTKEYWORD , "Sustainable

Development Goal") OR LIMIT-TO (EXACTKEYWORD , "Teaching") OR LIMIT-TO (EXACTKEYWORD , "Sustainability")) AND (LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "SOC") OR LIMIT-TO (SUBJAREA , "ARTS") AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")))

This syntax is used to limit search results to relevant scientific articles, with a focus on global citizenship education that is directly related to the climate crisis, sustainable environmental change, and the formation of students' character as agents of change, which is available open-access, indexed in the fields of social sciences and humanities (SOC and ARTS), and published between 2020 and 2026.

Inclusion criteria include empirical research articles (qualitative, quantitative, or mixed methods), available in full access, published in Scopus-indexed journals, in English, and have direct relevance to global citizenship education that supports the achievement of SDG 13 in the context of sustainable environmental change through education. Non-empirical articles, which do not focus on global citizenship education or are irrelevant to continuing education and climate change, were excluded from this study.

An initial search yielded 20 articles. After the deduplication and filtering process of titles and abstracts, 11 articles met the inclusion criteria. Furthermore, a full text review was carried out to ensure fit with the focus of the study. A total of 11 articles were retained for analysis.



The selection and screening process is reported through a PRISMA flowchart, ensuring that all stages are documented systematically and transparently (Page et al., 2021; Sohrabi et al., 2021). The selected articles were analyzed using a thematic analysis approach to identify the core values integrated in global citizenship education, the pedagogical strategies and approaches applied, and their contribution to the achievement of SDG 13, particularly in improving learning outcomes, the quality of the learning process, and expanding access to education that supports environmental awareness. The analysis was strengthened through contribution mapping to assess the contribution of each study to the SDG 13 indicators, as well as vote counting to see the frequency of occurrence of themes, accompanied by sensitivity analysis to evaluate the influence of low-quality studies on synthesis results.

RESULT

Table 1. Main Data

Authors	Title	Year	Journal	Country	Author Affiliation	Subject or Educational Level
Erlinda Rosita, Riani, Dian Susilastri, Hestiyana, Edi Setiyanto, Wiwin E. S. Nurlina, Restu Sukesti, Sutarsih, Sutejo, Nia Kurnia, & Syarifah Lubna	Integrating Kutai Malay Identity Into Global Citizenship Education Through Linguistic Landscape	2025	Journal of Language Teaching and Research	Indonesia	Language, Literature, and Community Research Center, National Research and Innovation Agency (BRIN), Jakarta	Junior High School. Subject: Kutai Malay Language and Global Citizenship Education (GCE).
Mustafa Şeker	A study on how environmental issues are discussed in social studies textbooks	2024	Environment , Development and Sustainability	Turkey (Turkey)	Department of Turkish and Social Sciences, Faculty of Education, Yildiz Technical University, Istanbul	Elementary School (Grade 4) and Secondary School (Grade 5). Subject: Social Studies with a focus on environmental issues.
Claire Lee, Aminath Shiyama, & Fathimath Shafeeqa	Our World, Our Futures: A dialogic approach to environmental literacy and global citizenship education in primary schools in the Maldives and England	2025	British Educational Research Journal	United Kingdom (UK) & Maldives (Maldives)	Read: Oxford Brookes University, UK. Shiyama: The Maldives National University. Shafeeqa: Institute of Research and Development, Maldives.	Primary Schools, ages 7-12 years. Subject: Environmental literacy and Global Citizenship Education (GCE) through art and cross-cultural dialogue.

Emily Wilson & Pauline Black	Caring for Our Planet: A World Apart or Same Difference? A Global Music Collaboration	2025	Journal of Applied Research in Higher Education	Scotland (UK) & Australia	Wilson: University of Melbourne, Australia. Black: University of Aberdeen, Scotland (UK).	Higher Education (Music education students/prospective teachers). Subject: Music Education, digital collaboration, and sustainability (SDGs) as a form of climate activism.
Pedro C. Mellado-Moreno & Carmen Burgos	Didactics in social studies for global citizenship education: dimensions and technological contexts	2025	Frontiers in Education	Spain (Spain) & Chile (Chile)	Mellado-Moreno: Rey Juan Carlos University, Spain. Burgos: Universidad de Atacama, Chile.	Conceptual Analysis for School Education (School Work/General Education). Subjects: Social Studies and Global Citizenship Education (GCE) with a focus on didactic dimensions and technological contexts.
Yiannis Georgiou & Eleni A. Kyza	Fostering Chemistry Students' Scientific Literacy for Responsible Citizenship through Socio-Scientific Inquiry-Based Learning (SSIBL)	2023	Sustainability	Cyprus (Cyprus)	Department of Communication and Internet Studies, Cyprus University of Technology.	Secondary Education - Grade 8 Students/Age ~13 years old). Subjects: Chemistry Education, Science Literacy, and Responsible Citizenship.

Alexandra Okada, Giorgos Panselinas, Mihai Bizoi, Rosina Malagrida, & Patricia Lupion Torres	Fostering Transversal Skills through Open Schooling with the CARE-KNOW-DO Framework for Sustainable Education	2024	Sustainability	English (UK), Greek (Greece), Romanian (Romania), Spanish (Spain), & Brazil (Brazil)	Okada: The Open University, UK. Panselinas: Hellenic Open University, Greece. Bizoi: Valahia University of Târgoviște, Romania. Malagrida: IrsiCaixa, IGTP, Spain. Torres: Pontificia Católica Universidade do Paraná, Brazil.	Primary to Secondary/Higher Education (Age 7-19 years) . Subjects: Science Education, Open Schooling, and Transversal Skills (CARE-KNOW-DO) for Sustainability.
Jop Dispa, Ward Vloeberghs, & Katja Skenderija	Getting critical about critical world citizenship: Bottom-up skills development and in-classroom operationalization within a Dutch liberal arts college	2025	Teaching in Higher Education	The Netherlands (The Netherlands)	Erasmus University College, Erasmus University Rotterdam, The Netherlands.	Higher Education (Bachelor/Liberal Arts & Sciences). Subjects: Critical World Citizenship and Higher Education Pedagogy.
Carmen Edith Pazoto, Edson Pereira Silva, Luiz Antonio Botelho Andrade, Jana Menegassi del Favero, Camilla Ferreira Souza, & Michelle Rezende Duarte	Ocean Literacy, formal education, and governance: A diagnosis of Brazilian school curricula as a strategy to guide actions during the Ocean Decade and beyond	2021	Ocean and Coastal Research	Brazil (Brazil)	Pazoto, Silva, Duarte: Fundação Municipal de Educação de Niterói / Universidade Federal Fluminense, Brazil. Andrade: Prefeitura Municipal de Niterói. del Favero: Universidade Federal do Rio de Janeiro.	Elementary/Secondary Education (Elementary School/Years 6-14) - Curriculum Analysis. Subjects: Ocean Literacy, Formal Education, and Curriculum Policy (PCN & BNCC).

José-Luis Parejo, María-O Corton-Heras, Alba Nieto-Blanco, & Cristina Segovia-Barberan	Plastics as an Educational Resource for Sustainable Development: A Case Study in Ghana	2021	Sustainability	Spain (Spain) & Ghana	Parejo & Corton-Heras: University of Valladolid, Spain. Nieto-Blanco: CEIP "Andrés Segovia", Madrid. Segovia-Barberan: "Montessori" School-British Education, Madrid.	Early Childhood Education. Subjects: Environmental Education (Focus: Plastics & Recycling), Arts, and Sustainable Development.
Harsha Chandir & Radhika Gorur	"Unsustainable measures?" Assessing Global Competence in PISA 2018	2021	Education Policy Analysis Archives	Australia	Deakin University, Australia.	Secondary Education (15-year-old students/PISA target). Subject: Evaluation of Education Policy, Global Competence, and Science & Technology Studies (STS) in PISA assessment.

Based on these data, it can be seen that the discourse on education for *sustainable development* and global citizenship is growing rapidly. The majority of recorded publications were released in the range of 2024 to 2025, indicating the urgency and novelty of this topic in the global academic realm. These studies cover a broad but intersecting spectrum of topics, ranging from *ocean literacy* in Brazil, the integration of Kutai Malay local identity into global citizenship in Indonesia, to transversal skills development through *open schooling frameworks* in Europe. One of the main themes that emerged was the effort to align macro environmental issues—such as climate change and plastic pollution—into the formal curriculum, both through science education (Chemistry and General Sciences) and social sciences, in order to foster students' awareness and responsibility as global citizens.

Countries from various continents such as Indonesia, the United Kingdom, Spain, Australia, and the Maldives recorded significant contributions in this study, reflecting the cross-border nature of sustainability issues. Indonesia, specifically, highlights the *glocal approach* by integrating the local wisdom of the Kutai Malay language into global citizenship education. On the other hand, cross-border collaborations are evident, such as the study between the UK and the Maldives on environmental literacy, as well as the Scottish and Australian collaborations exploring the role of music education in responding to climate change. This geographical diversity confirms that environmental and civic education is no longer seen as a purely local issue, but rather a global challenge that requires contextual yet insightful pedagogical approaches, from early childhood education in Ghana to higher education in the Netherlands.

The global trend in this study shows a paradigm shift from mere knowledge transfer to the development of critical competencies and real action. This can be seen from the various levels of education studied, ranging from the use of plastic as a learning resource in Early Childhood Education (PAUD), the global competency assessment of 15-year-old students through PISA, to the formation of critical world citizenship at the higher education level. The approach used is increasingly multidisciplinary; Not only limited to geography or biology lessons, but also venturing into chemical literacy for responsible citizenship as well as textbook analysis of social sciences. This transformation signifies that the education of the future is geared towards producing individuals who are not only academically intelligent, but also have strong ecological literacy and critical thinking skills in the face of global dynamics.

The implementation of a curriculum that integrates environmental literacy and global competencies has great potential to redefine national education goals in various countries. The synergy between scientific understanding, social awareness, and local cultural preservation as seen in case studies in Turkey, Cyprus, and Indonesia shows that modern education serves as a bridge between self-identity and planetary responsibility. By continuing to innovate learning methods that connect sustainability issues with students' daily lives, the education sector shows its central role in preparing an adaptive generation that cares about the sustainability of the earth and the harmony of the global community.

Country	Number of Publication
UK	3
Spain	3
Brazil	2
Australia	2
Greece	1
Romania	1
The Netherlands	1
Chile	1
Turkey	1
Cyprus	1
Maldives	1
Indonesia	1

Recent global research shows that education for sustainable development and global citizenship is growing and is seen as urgent. Various countries integrate environmental issues, local identity, and global competencies into the curriculum through a multidisciplinary and collaborative approach. This trend marks a shift from teaching knowledge alone towards the formation of critical competencies, ecological literacy, and real student engagement. Overall, modern education is geared towards producing global citizens who are able to respond to sustainability challenges contextually, rooted in local cultures, but still globally oriented.

RQ 1. Shaping student awareness in the midst of the global climate crisis through Global Citizenship Education

Building a Foundation of Awareness and Creativity of students starts from the affective realm before the cognitive realm. Okada et al. (2024) found that the application of the

framework *CARE-KNOW-DO* in *Open Schooling* effectively forms awareness because it puts the "caring" phase (*care*) that involves empathy and ethics as the main gateway before students learn science knowledge (*Know*) or take action (*Stuart*). This affective approach is strengthened through the integration of art and creativity (Okada et al., 2024). Wilson and Black (2023) show that the use of music and technology in global collaboration is capable of changing climate anxiety (*eco-anxiety*) becomes a constructive hope (*constructive end*), which motivates students to be actively involved (Wilson & Black, 2025). In line with that, Parejo et al. (2021) found that fun and hands-on experience-based learning (*experiential learning*), such as turning plastic waste into works of art or counting tools, successfully instills a deep understanding of the impact of pollution on local communities (Parejo et al., 2021).

Environmental awareness is optimally formed when global concepts are integrated into relevant local contexts and formal curricula. Rosita et al. (2025) prove that the utilization of *Linguistic Landscape* In schools, which display sustainability messages using regional languages and local wisdom (such as rhymes), are particularly effective in helping students internalize global civic values (Rosita et al., 2025). In the context of a formal curriculum, Pazoto et al. (2022) emphasize the importance of including specific material such as marine literacy (*Ocean Literacy*) into national curriculum guidelines to provide a strong knowledge base for conservation (Pazoto et al., 2022). In addition, Georgiou and Kyza (2023) found that SSIBL-based learning models (*Socio-Scientific Inquiry-Based Learning*) able to improve science literacy for responsible citizenship; by researching real issues such as *Biofuel*, students not only understand science but also develop a moral responsibility to act (Georgiou & Kyza, 2023). Seker (2024) added that the presentation of this environmental material must be adjusted to the stage of students' cognitive development in a concrete manner so that understanding is formed correctly (Şeker, 2024).

On the other hand, the development of critical, prosocial, and global connectivity dimensions is needed to identify the social structures that affect the environment and connect knowledge to tangible actions (Mellado-Moreno & Burgos, 2025). This is supported by Dispa et al. (2025) who found that mastery of "positionality" skills (*positionality*), the ability to reflect on one's position in society to help students understand their role in global issues without feeling overwhelmed (Dispa et al., 2025). Further, Lee et al. (2025) show that a cross-cultural dialogical approach allows students to understand "global connectedness" (*Global Interconnectedness*), where they are aware of the impact of their local actions on colleagues in other countries, thus fostering solidarity (Lee et al., 2025). Chandir and Gorur (2021) affirm that the formation of authentic global competencies occurs when education recognizes and responds to the diverse socio-economic realities of students, making sustainability actions a relevant part of daily life, not just external demands (Chandir & Gorur, 2021).

In summary, students' awareness and creativity are most effectively built through affective approaches that foster empathy, constructive expectations, and meaningful learning experiences before entering the cognitive and action realms (psychomotor). This affective approach is useful for strengthening understanding of global issues and seeing the role of self in social structures.

RQ 2. The Role of Education in Shaping Students as Agents of Sustainable Change

The role of education in equipping students with the values of Global Citizenship is a systemic process that goes beyond knowledge transfer. First, education plays a role in building

sustainability awareness from an early age through material and contextual interactions. A case study in Ghana shows that early childhood education can transform perceptions of plastic waste from just a pollution problem to an educational resource (Parejo et al., 2021). Through this creative approach, education instills the value of *reuse* and environmental responsibility in concrete terms before students understand abstract concepts. These findings complement the framework *CARE-KNOW-DO*, where formal education at the primary and secondary school levels facilitates based learning *Open Schooling*. This model allows students to develop transversal skills by solving real problems in their communities, making the school a hub for social innovation (Okada et al., 2024).

Second, education serves as a vehicle for the development of scientific literacy and critical inquiry that is essential for responsible decision-making. Georgiou & Kyza (2023) emphasize that through *Socio-Scientific Inquiry-Based Learning* (SSIBL), students are trained to not only accept scientific facts, but formulate evidence-based solutions to socio-scientific problems (Georgiou & Kyza, 2023). However, the effectiveness of this role is highly dependent on the quality of the teaching material. Şeker (2024) underlines the need for social science textbook reform so that it is no longer anthropocentric (Şeker, 2024). Meanwhile, Pazoto et al. (2021) demand an explicit curriculum policy that covers crucial but often overlooked issues, such as Marine Literacy (*Ocean Literacy*), to ensure education is relevant to planetary challenges (Pazoto et al., 2022).

Third, education plays a vital role in building affective connections and epistemic justice through cross-cultural dialogue. This is evident through a dialogue approach between students in the UK and the Maldives that is able to foster empathy for climate impact inequality (Lee et al., 2025). Cross-cultural dialogue can be established in a fun and easily accepted way by the audience by holding musical collaborations between parties to manage ecological anxiety (*eco-anxiety*) to become a collective hope (Wilson & Black, 2025). On the other hand, universities often play a role in sharpening "critical world citizenship" so that students are encouraged to reflect on their position in the global power structure through digital competencies for global advocacy (Dispa et al., 2025; Mellado-Moreno & Burgos, 2025).

Fourth, education has a corrective role to challenge biased standardization in global competency measurement. Chandir & Gorur (2021) provide an important critique of large-scale assessments such as PISA, reminding that education should not get stuck in a single definition of "global competence" that is often Western-biased and ignores local nuances. Therefore, the role of education is to navigate the tension between global standards and local wisdom, ensuring that efforts to form "global citizens" do not alienate students from their own cultural contexts, but rather empower them to contribute uniquely (Chandir & Gorur, 2021).

Overall, education plays an important role in shaping the values of Global Citizenship by fostering sustainability awareness from an early age. Education is carried out through creative approaches, socio-scientific inquiry, intercultural dialogue, and relevant curriculum policies. So education not only transfers knowledge, but also empowers students to understand their role in planetary issues and act responsibly in their context.

RQ 3. The Influence of the Climate Crisis on Students' Mindsets and Behaviors and the Role of Global Citizenship Education in Responding to It

A comprehensive analysis of the current literature shows that the climate crisis is having a profound psychological and cognitive impact on students, which in turn drives a fundamental transformation in the approach to Global Citizenship Education (*Global Citizenship Education/GCE*). Psychologically, exposure to the narrative of environmental destruction triggers the phenomenon *eco-anxiety* significant, where students feel a fear that could potentially cripple their agency if not managed appropriately (Wilson & Black, 2025). This impact is complicated by geographic perception gaps; There is a sharp disparity between students in the *Global South* who face direct existential threats, such as in the Maldives, compared to students in *Global North* who tend to look at climate issues in a more abstract way (Lee et al., 2025). In addition to psychological factors, students' mindsets are also shaped by the limitations of the existing formal curriculum. Studies show that learning materials often fail to build a holistic environmental ethics due to the dominance of anthropocentric narratives in social science textbooks and the absence of crucial topics such as marine literacy (*Ocean Literacy*) in the curriculum documents, which causes students to not understand the vital role of marine ecosystems (Pazoto et al., 2022; Şeker, 2024).

Responding to these multidimensional challenges, Global Citizenship Education (GCE) is evolving into a more holistic approach, integrating cognitive, affective, and sociocultural dimensions. In the cognitive realm, education responds to the need for the validity of information through scientific inquiry. Application *Socio-Scientific Inquiry-Based Learning* (SSIBL) has proven to be effective in training science students to formulate evidence-based decisions and become responsible citizens (Georgiou & Kyza, 2023). This effort is strengthened at the higher education level through the development of "critical world citizenship" that encourages students to be self-reflective of their privileged position in the global structure (Dispa et al., 2025). However, this cognitive response is accompanied by a critical note of global standardization of assessments such as PISA, which is considered to risk simplifying student competence and ignoring the nuances of the local context (Chandrawati et al., 2024). Therefore, modern didactics are required to critically integrate technological competencies to facilitate students' democratic participation in the digital era (Mellado-Moreno & Burgos, 2025).

Furthermore, the pedagogical response of GCE extends to affective dimensions and tangible actions rooted in local wisdom. To address students' anxiety, arts education offers a "pedagogy of care" that transforms negative emotions into collective expectations through creative collaboration (Wilson & Black, 2025). While a cross-cultural dialogical approach is used to build radical empathy and solidarity between students from different geographical backgrounds by emphasizing the importance of cultural contextualization through musical integration, and local identity that proves to be strategic in instilling global values without uprooting students' cultural roots (Lee et al., 2025; Rosita et al., 2025). In the end, education makes it a concrete action through a model *Open Schooling* which hone students' transversal skills in solving community problems to familiarize themselves with sustainable environmental care practices from an early age (Okada et al., 2024; Parejo et al., 2021).

Thus, the climate crisis impacts students psychologically and cognitively, causing environmental anxiety and differences in perceptions of geographic context. So Global Citizenship Education (GCE) addresses this problem by integrating three aspects: cognitive, affective, and sociocultural. Scientific inquiry and critical reflexivity help the cognitive realm, while empathy and collective expectations in the affective realm are addressed through art

pedagogy and cross-cultural conversations. The Open Schooling model builds environmentally caring practices and transversal skills. Thus, modern GCE not only transfers knowledge, but also empowers students to act responsibly locally as well as globally, while maintaining cultural relevance and community context.

RQ 4. Challenges and Opportunities in Integrating Global Citizenship Education and Environmental Justice in the Education Curriculum

The fundamental challenge is found at the level of curriculum content that is often not aligned with the sustainability or developmental needs of students. Şeker (2024) reveals serious inconsistencies in textbooks (such as Social Sciences), where environmental issues are presented in an abstract manner and inappropriate to students' cognitive development leading to failures in instilling effective environmental sensitivity (Şeker, 2024).

Another challenge of content gaps is also highlighted by Pazoto et al. (2022), who found that although the topic of marine environment (*Ocean Literacy*) crucial for global sustainability, this topic is very underrepresented in school curricula in Brazil, with a very low frequency of occurrence of sea-related terms (0.0001%). This hinders students' understanding of the role of the ocean in the global climate system (Pazoto et al., 2022).

The final challenge has to do with how global competencies are measured and defined. Chandir and Gorur (2021) provide a sharp criticism of the assessment *Global Competence* in PISA 2018, found that standardized survey instruments are often biased *Global North* and failing to grasp the complexity of the lives of students from diverse backgrounds. They point out that survey questions often assume the lifestyles of global elites (e.g. about the use of heating energy), making them irrelevant or difficult to answer by students from low socio-economic contexts, which ultimately makes the data less valid to guide equitable education policies (Chandir & Gorur, 2021).

The most significant opportunity for instilling environmental literacy and global citizenship lies in the shift from passive instructional methods to action-based pedagogy, art, and social-scientific inquiry. Approach *Open Schooling* with a CARE-KNOW-DO framework and approach *Socio-Scientific Inquiry-Based Learning* (SSIBL) effectively develops students' transversal skills, including scientific citizenship (*Scientific citizenship*) and problem-solving, where students feel more confident in connecting science with real life. This suggests that this method can improve students' understanding of science as a human endeavor and their drive to participate in environmental action. In contrast to students who study in conventional classes, who actually lose their grades and attitudes (Georgiou & Kyza, 2023; Okada et al., 2024).

Innovative opportunities are also found in the use of art and technology. Scottish and Australian cross-country digital music collaborations enable students to develop climate awareness (*Climate Consciousness*) and position itself as an active global citizen through the creation of works of art (Wilson & Black, 2025). A cross-cultural dialogical approach through art empowers students to understand global interconnectedness and epistemic justice, transforming them from observers to co-creators of knowledge (Lee et al., 2025). In context *Global South*, Parejo et al. (2021) show that the use of plastic waste as an educational resource through art and games is able to transform Ghanaian students' understanding from simply seeing plastic as an economic object to a critical awareness of its environmental hazards, practicing critical global citizenship (Parejo et al., 2021).

Integration opportunities also lie in the development of critical thinking skills rooted in local and personal identities. Dispa et al. (2025) highlight the importance of translating the abstract concept of "critical world citizen" into tangible skills (*Tangible*), such as patience and positionality, and emphasizing that criticism must be personal and focused on the immediate environment so that students do not feel paralyzed (*Paralyzed*) by the magnitude of global problems (Dispa et al., 2025). Mellado-Moreno and Burgos (2025) complement this perspective by proposing a five-dimensional matrix (conceptual, participatory, prosocial, critical, and identity), in which the dimensions of identity and sense of belonging (*sense of belonging*) to local communities identified as a fundamental prerequisite for active democratic participation at the global level (Mellado-Moreno & Burgos, 2025). In addition, Rosita et al. (2025) found opportunities in the use of the school linguistic landscape to teach GCE values through local wisdom, although challenges arise because the representation of regional languages (such as Kutai Malay) is still very minimal (6.8%) compared to national languages (Rosita et al., 2025).

Overall, the main challenges in global citizenship education related to the environment include curriculum content that is not appropriate for student development, lack of marine literacy, and biases in global assessments that ignore local contexts. However, significant opportunities arise through action-based pedagogy, art, and socio-scientific inquiry. These opportunities can be done through Open Schooling and SSIBL-based learning approaches that are effective in building transversal skills and critical awareness. The integration of art, technology, cross-cultural dialogue, as well as approaches that emphasize local identity and positionality enable students to understand global connectedness, internalize the value of GCE, and act responsibly, making learning more relevant and transformative.

DISCUSSION

Sustainable Global Citizenship is effectively implemented through a proven CARE-KNOW-DO framework. Learning can start from the "care" phase to build empathy. Furthermore, learning can enter the "know" phase to acquire knowledge. In the final stage, learning enters the "act" (do) phase to take steps while navigating the socio-political system towards sustainable practice. (Akçay et al., 2024; Fang et al., 2023; Granados-Sánchez, 2023; Okada et al., 2024). This concept emphasizes that the ability to reflect on one's position helps students understand their role without feeling overwhelmed (Bentley, 2023; Nagle & Foli, 2020). Students can implement directly from the theoretical need for emotional intelligence to foster solidarity and an understanding of "global connectedness", where students are aware of the impact of their local actions on peers in other countries (Dispa et al., 2025; Lee et al., 2025).

In its implementation, learning can be carried out through various activities that are effectively adjusted (Thuy, 2025; Ulfiani et al., 2023). First, art activities can be carried out through global music collaborations that raise environmental themes (Wilson & Black, 2025). To enjoy a work of music or art that is accessible to the open community creates an understanding that each individual is responsible for the sustainability of the environment around the world despite being separated by geographical distance (Anasta et al., 2025; Foster & Sutela, 2024; Zhang, 2025).

Second, creative activities can be carried out through fun experiential learning, such as processing plastic waste into a work of art (Parejo et al., 2021). Local contextualization activities can be carried out through the use of rhymes in regional languages that internalize global values and local culture. The use of Linguistic Landscape based on local wisdom (such as regional language rhymes) is very effective in internalizing global values can be built through local cultural roots because local contextualization adapted in a formal curriculum is able to connect local actions with global impact (Rosita et al., 2025). This shows that the integration of local contexts is the key to learning effectiveness (Alumia et al., 2025; Jusriadi & Abdullah, 2025; Lestari et al., 2025).

Third, the Socio-Scientific Inquiry-Based Learning (SSIBL) approach is carried out by involving the investigation of real issues and becomes a practical solution (Nugroho et al., 2025). Students will be trained to investigate real crucial issues to develop moral responsibility that aligns with the theoretical goal of forming responsible citizens (Georgiou & Kyza, 2023; Hartati et al., 2023; Qublan & Bataineh, 2025; Ulfiani et al., 2023). Specific literacy that contains the latest environmental issues must be prioritized in the formal curriculum so that more crucial learning materials can be learned and realized by students (Diana et al., 2024; Pazoto et al., 2022). It also supports the theoretical view that the material must be tailored to the cognitive development of students in order to be effective for developing critical, prosocial, and globally connected dimensions to identify social structures that affect the environment and connect knowledge to real actions (Mellado-Moreno & Burgos, 2025; Şeker, 2024).

The role of education forms agents of sustainable change through four strategic roles. First, build early awareness and community problem-solving skills through material and contextual interactions that complement the framework *CARE-KNOW-DO*, where formal education at higher levels (primary and secondary schools) facilitates based learning *Open Schooling* (Ananda et al., 2024; Okada et al., 2024; Parejo et al., 2021). Second, to develop scientific literacy through *Socio-Scientific Inquiry-Based Learning* (SSIBL) is based on critical inquiry and a non-anthropocentric curriculum that covers crucial and relevant issues to planetary challenges (Georgiou & Kyza, 2023; Pazoto et al., 2022; Şeker, 2024). Third, fostering affective connections and epistemic justice through cross-cultural dialogue and digital advocacy competencies (Dispa et al., 2025; Lee et al., 2025; Mellado-Moreno & Burgos, 2025; Wilson & Black, 2025). Fourth, carry out a corrective function against the bias of global assessment standardization in order to accommodate local wisdom (Chandir & Gorur, 2021).

The role of education as a catalyst for sustainable change begins from the internalization of sustainability values from an early age through material interactions that transform the perception of waste into educational resources, then escalated through the *CARE-KNOW-DO* framework in the model *Open Schooling* which positions schools as a hub for social innovation for the community (Almencion et al., 2024; Jerome et al., 2024; Okada et al., 2024; Parejo et al., 2021). Students' intellectual capacity is sharpened through an approach *Socio-Scientific Inquiry-Based Learning* (SSIBL) to formulate a solution-based, but its effectiveness requires curriculum reform that removes anthropocentric bias and curriculum policies that explicitly accommodate crucial issues such as (Georgiou & Kyza, 2023; Pazoto et al., 2022; Şeker, 2024).

In practice, the education process is carried out by facilitating cross-disciplinary dialogue on climate inequality and collaborating with art and music to transform *eco-anxiety* Become a Collective Hope (Lee et al., 2025; Wilson & Black, 2025). Meanwhile, higher education levels

are carried out through digital advocacy competencies (Dispa et al., 2025; Mellado-Moreno & Burgos, 2025). Finally, education plays a vital corrective role in challenging the hegemony of global assessment standardization such as PISA, ensuring that the formation of global competencies does not erode local wisdom but instead empowers students to contribute uniquely (Chandir & Gorur, 2021).

The influence of the climate crisis on students' mindsets and behaviors in the form of destabilizing students' psychological and cognitive conditions (Moyanov et al., 2024; Vercammen et al., 2025). This triggers *eco-anxiety* that threatens individual agency as well as creates a sharp disparity in geographical perception between existential threats in the Global South and the abstraction of issues in the Global North (Lee et al., 2025; Wilson & Black, 2025). This vulnerability is exacerbated by the deficit of formal curriculum that is still dominated by anthropocentric narratives and neglects crucial literacy such as *Ocean Literacy* (Pazoto et al., 2022; Şeker, 2024). So it can be concluded that the climate crisis destabilizes students psychologically and cognitively through *eco-anxiety* as well as geographic perception disparities that effectively paralyze individual agencies (Schwartz et al., 2022).

The main challenges found are the composition of a curriculum that is not in harmony with student development or the existence of bias in global assessments (Khan et al., 2025; Shukur, 2025; Townend et al., 2025). Climate literacy should not stop at the transfer of theoretical knowledge alone but there must be a real implementation of climate literacy that has been prepared (Kolenatý et al., 2022; Kumar et al., 2023; Leve et al., 2023). This is because this global competence can at any time become a trap if it is trapped in a Western bias definition that is not in line with the principles of Just Sustainability which highlights structural inequality and unequal distribution of burdens (Chandir & Gorur, 2021).

Instead, the opportunity for curriculum integration lies in interdisciplinary and action-based pedagogical methods such as the Plan-Do-Check-Act (PDCA) cycle or the Problem Based Learning (PBL) that theory suggests. A tangible implementation of this concept is seen in the Open Schooling and SSIBL models that empower students to design real solutions for their communities (Georgiou & Kyza, 2023; Okada et al., 2024). In addition, the prosocial and critical dimensions proposed by Mellado-Moreno & Burgos (2025) reinforce the theoretical argument that education should equip students with the sensitivity to recognize ecological injustices and act ethically (Mellado-Moreno & Burgos, 2025).

The implementation of Sustainable Global Citizenship has proven effective through the CARE-KNOW-DO framework that guides students gradually from building empathy and knowledge to taking tangible actions that are responsive to socio-political issues. The success of this approach is supported by diverse pedagogical methods such as the use of music, artistic creativity, contextualization of local wisdom, and *Socio-Scientific Inquiry-Based Learning* (SSIBL) which positions education as a strategic catalyst to transform *eco-anxiety* into a solution agency of change. Despite the challenges of global assessment bias and an anthropocentric curriculum, the integration of interdisciplinary learning models based on *Open Schooling* and *Problem Based Learning* offers a crucial opportunity to form critical citizens, have global solidarity, and be able to provide equitable solutions to environmental challenges.

CONCLUSION

This study confirms that the climate crisis has destabilized students' psychological and cognitive conditions through the phenomenon of *eco-anxiety* and distortion of understanding due to an anthropocentric biased curriculum. To mitigate these impacts, Sustainable Global Citizenship Education has proven to be effective when operationalized through the CARE-KNOW-DO framework. This model systematically transforms empathy (Care) into knowledge validity (Know), and leads to active participation (Do), so that students are able to understand global connectivity without feeling paralyzed by the magnitude of the challenges faced.

Pedagogically, the effectiveness of the framework is achieved through the integration of a socio-scientific inquiry approach (SSIBL) to hone critical reasoning, the use of art collaboration to build emotional solidarity, and the contextualization of local wisdom to instill relevant global values. These findings also provide a strong criticism of the standardization of global assessments that tend to be biased by the West and ignore local nuances. Therefore, the direction of future education must shift to *an Open Schooling* model and interdisciplinary curriculum reform that links local actions with global impact, in order to produce agents of change who have critical competence, prosocial and ethical responsibility intact.

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