SUSTAINABLE ENVIRONMENTAL EDUCATION: ISSUES IN THE IMPLEMENTATION FOR A SUSTAINABLE FUTURE

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Abstract

Climate change is a global issue. As such, action is required for sustainable solutions to alleviate social and economic issues related. Environmental education (EE) equips learners with the knowledge, skills, and attitude to take action to resolve environmental issues and problems. Although EE has been integrated into the school curricula, the effects do not seem to be sustainable as students do not seem to take positive action. This could be attributed to several issues in the implementation of EE, such as a lack of environmental knowledge among students, reluctance for positive behavior changes, perception of EE as an individualistic action, lack of teachers' interdisciplinary knowledge for SEE, unclear outcomes for SEE in the curriculum, the lack teacher training in SEE, lack of knowledge of pedagogies for EE among teachers, logistic barriers in implementation and teachers' attitudes towards EE. These issues should be addressed to develop the next generation of global citizens who can shape a more sustainable future for the planet.

Keywords: Environmental education, sustainable education, climate change education.

INTRODUCTION

Climate change is a global issue as the climate crisis threatens the sustainability of the worldwide environment (United Nations (UN), 2023). All countries have a responsibility to take action to help alleviate the environmental, social and economic issues on our planet (UN, 2023). Hence, education is necessary to prepare the world's citizens with the knowledge, skills and attitude to take action for change (UNESCO, 2021). However, the current environmental education (EE) practices do not seem sustainable for the future as there has not been much change in student behavior (Yaacob & Abdullah, 2023). This was evident among teachers with high environmental knowledge and awareness but this did not influence positive practice (Yaacob & Abdullah, 2023).

In contrast, students have low environmental knowledge (Mohd Meerah et al., 2010; Robelia & Murphy, 2012; Sapanove et al., 2024). This indicates that there could be issues in the implementation of EE. This article discusses the importance of addressing climate change as a global issue in EE, followed by a discussion of the issues related to EE, such as the lack of

environmental knowledge among students, reluctance for positive behavior changes, perception of EE as individualistic action as well as lack of teachers' interdisciplinary knowledge and pedagogies for SEE. Some directions for the future of sustainable environmental education are suggested.

CLIMATE CHANGE: A GLOBAL ISSUE

The 2030 Agenda for Sustainable Development has 17 Sustainable Development Goals (SDGs), which aim to eradicate poverty and protect the planet (UN, 2015). However, the climate crisis continues to worsen as greenhouse gas emissions continue to rise. The Intergovernmental Panel on Climate Change predicts the Earth's surface temperature will surpass the critical level of 1.5 °C above pre-industrial levels by 2035 (UN, 2023). Malaysia is experiencing the effects of global warming as the frequency and severity of heat waves have increased and resulted in excessive rainfalls and heavy flooding (Mayowa et al., 2015; World Bank Group and the Asian Development Bank, 2021). Air and water pollution, frequent floods and droughts have also been attributed to extensive deforestation (Miyamoto et al., 2014). A climate calamity is expected in 2100 when the world's average temperature increases by 2.5°C (UN, 2023).

Climate change impacts vulnerable communities' health, social relations, economy and ecology. The UN (2023) claimed that the highly vulnerable regions would experience 15 times higher mortality rates from climate catastrophes. In Malaysia, the regular occurrence of haze due to forest and peat fires and other air pollution has threatened children's health as respiratory diseases, with hospital admissions mortality among children increasing (UNICEF Malaysia, 2021). Food shortages are expected as an estimated 29.6 per cent (2.4 billion) of the global population did not have adequate food access (UN, 2023). Climate justice remains inaccessible for communities and countries experiencing the effects of polluting fuels, technologies, and deforestation (UN, 2023). For life to be sustainable in the future, there needs to be increased awareness and understanding to encourage behavior change and empower the world's citizens. This is possible through education, where people who understand can make the right decisions and take positive actions to save the planet (UNESCO, 2021). EE should be more sustainable to develop responsible citizens who can make a better future.

ENVIRONMENTAL EDUCATION

Sustainable environmental education (SEE) aims to develop responsible global citizens who can take action to ensure the sustainability of the environment (Estrada-Vidal & Tójar-Hurtado, 2017). However, EE, which originated as nature conservation education (Sobel, 2008) and outdoor education (James & Williams, 2017), was deemed an unimportant extra-curricular activity. However, a review of the definitions of EE has shown that EE is a comprehensive and sustainable concept which aims to develop environmental citizens as well as knowledge and understanding of the biophysical world (Stapp, 1969; Tilbury, 1995). In addition, definitions of EE included values to ensure the quality of life and the environment are maintained (Harvey, 1976) and should include the initiative to take action and solve environmental problems as individuals and as a group.

Climate change and environmental protection issues are related to numerous social needs, such as health, social protection, and job opportunities. Hence, EE needs to include strategies which also focus on eradicating poverty, promoting stability, safeguarding all people's rights and dignity, and protecting the earth to ensure sustainability for the future (UN, 2015). The SDGs provide a guide for taking action and aligning their development efforts to promote prosperity while protecting the planet to achieve sustainable development (UNESCO, 2017). Thus, the environmental limits and critical thresholds for using natural resources can be set.

Hence, SEE develops responsible global citizens who can take action to ensure the sustainability of the environment (Estrada-Vidal & Tójar-Hurtado, 2017). SEE includes the cognitive and affective domains of learning, as well as the willingness to take responsible action for conservation and be an eco-conscious citizen who understands their responsibility and the urgency of responsive action needed for the sustainability of the environment. Hence, for SEE, environmental citizenship for individuals to be responsible global citizens who actively participate in both public and personal spaces and take action and responsibility for the environment is needed (Parra et al., 2020).

ENVIRONMENTAL EDUCATION IN MALAYSIA

In Malaysia, various government and non-governmental agencies are involved in promoting EE. In Peninsular Malaysia, the Department of Environment (DOE), the Department of Wildlife and National Parks (DWNP), the Forestry Department, the Forest Research Institute of Malaysia (FRIM) and the municipal councils are involved. Non-governmental organizations (NGOs) such as the Malaysian Nature Society (MNS), the Worldwide Fund for Nature (WWF-Malaysia), Treat Every Environment Special (TrEES) and Wetlands International are playing an active role in preservation and conservation. In East Malaysia, different organizations are involved. In Sarawak, government agencies such as the Forestry Department, the Sarawak Forestry Corporation, the Ministry of Tourism, and local municipal councils help to educate the public by conducting various EE programs in the national parks. The World Conservation Strategy is used as a guideline by NGOs in providing environmental education, and the WWF has been active in this region since the early 1990s. In Sabah, the Forestry Department, the Wildlife Department, Sabah Parks and the Department of Environment have been instrumental in EE programs. The Sabah Nature Society has, since 1988, been the first organization to conduct EE activities through school clubs all over Sabah. Currently, both the Nature Clubs at schools in Sabah and the Kelab Pencinta Alam (KPA) member base are overtaken by the Malaysian Nature Society (MNS).

EE is included in the primary school science curricula under the themes of Earth and Space Science and Technology and Sustainable Living. In 2017, the science curriculum was revised to focus more on Education for Sustainable Development (ESD) and included the climate crisis and environmental issues (Abdullah, Malik & Yaacob, 2022). The revised Standard Based Curriculum for Secondary Schools (KSSM) has ten value-added elements to be included across the curriculum. Two of these elements are related to EE: environmental sustainability awareness and global sustainability.

Hence, in Malaysia, EE is integrated within formal and informal school curricula, with nature clubs conducting co-curricular activities related to EE. In addition, EE is supported by policies and strategies for sustainability.

ISSUES IN IMPLEMENTATION OF ENVIRONMENTAL EDUCATION IN MALAYSIAN SCHOOLS

Although EE has been integrated into the school curricula, the results show that it is not sustainable as there are many issues in the implementation. The issues are discussed in the next section.

Issue 1: Lack of Environmental Knowledge among Students

EE is integrated into science subjects in schools (Sukma et al., 2020) and is narrowly focused on environmental protection and the conservation of resources (Parra et al., 2020). EE needs to focus on competencies associated with environmental citizenship, which include the knowledge,

conceptions, and skills, as well as attitudes and values, and the engagement in actions related to EE for the present and in the future (Hadjichambis & Paraskeva-Hadjichambi, 2020).

In the National Youth Climate Change Survey, youths in Malaysia perceived they have environmental knowledge (UNDP et al., 2020). However, further investigation showcased that they had many misunderstandings of scientific concepts related to climate change. Low levels of environmental knowledge and awareness were recorded among students in Malaysia (Mohd Meerah et al., 2010; Robelia & Murphy, 2012). However, this was not related to attitude, as high school students with a strong positive environmental attitude had low environmental knowledge and awareness (Sapanove et al., 2024). Further, this low environmental knowledge is not just a cognitive issue, as the research showed that environmental knowledge was not related to students' grades in the subjects (biology, chemistry, physics, math, and geography) (Sapanove et al., 2024).

Hence, there seems to be low levels of environmental knowledge among students. The reasons for this were unclear, as even though there was a positive attitude towards the environment, it did not ensure that students had acquired environmental knowledge.

Issue 2: Reluctance for a Positive Change in Behaviour

The lack of environmental knowledge leads to a reluctance to change their behavior. This was noted in the National Youth Climate Change Survey, as youths could not take action because they were unaware of the actions to be taken due to their lack of knowledge in resolving environmental issues and problems (UNDP et al., 2020). The inability of students to take action and make informed decisions was reported by Mohd Meerah et al. (2010) and Robelia and Murphy (2012). Despite promoting the cognitive domain of learning, this seems insufficient in promoting behavioural change for sustainable lifestyles (Karim et al., 2022; Md Zain & Aiyub, 2021). In addition to the lack of knowledge, the reluctance could be due to youths perceiving that a climate-friendly lifestyle is expensive and that their action would not make a difference (UNDP et al., 2020).

On the other hand, Malaysian teachers seem to have high levels of knowledge and positive attitudes towards sustainable development (Yaacob & Abdullah, 2023). Teachers' environmental knowledge influenced their environmental attitudes, but environmental knowledge and attitude did not influence positive practice/behavior among teachers (Yaacob & Abdullah, 2023). Hence, environmental knowledge alone could not influence positive behaviors, as was evidenced by the lack of behavioral change among Malaysian teachers (Yaacob & Abdullah, 2023).

Hence, the reluctance to change in behavior requires more than environmental knowledge and attitude. In SEE, there should be a commitment towards change, and the psychological effects should be considered. Confidence and participation in SEE programs could build the former and ensure that students practice positive behaviors for environmental change.

Issue 3: EE Perceived as an Individualistic Action

EE is perceived to require actions which are more individualistic and personal. The approach in teaching EE was to promote change in the person for the conservation of resources, with the understanding and awareness of the impact of environmental problems (Hadjichambis & Reis, 2020; Parra et al., 2020). This individualistic nature encourages personal action, such as conserving water and electricity or committing to using public transport to reduce pollution and global warming (Hadjichambis & Reis, 2020). Hence, it is possible that in EE teaching, the change in personal lifestyles and choices is emphasized by teachers (Stern, 2000).

On the contrary, to develop responsible environmental citizens, action for the community should be emphasized as well (Stern, 2000). As climate change impacts the most vulnerable

communities, it is only fair that we address the issues among vulnerable communities when solving environmental problems and challenges.

Community involvement and engagement is important for sustainability. In implementing educational initiatives and engagement with the community on coral reef conservation, it was shown that increased community participation was associated with an increase in four sustainability domains of ecotourism development, economic, environmental and social sustainability (Marzo et al., 2023). Hence, educational initiatives and engagement with the community can promote a SEE.

School-based initiatives with the community are also important to develop students who can take collective action to solve problems in the community (Weil, 2021). Communal project implementations build students' experience, skills and confidence in solving environmental issues and problems. These skills and experience are needed by youths to know how to solve problems. Hence, a collaborative approach to promote environmental stewardship and sustainability is engaging for students and is more likely to promote action for change.

Teachers are models of environmental citizenship behaviors, and when teachers adopt sustainable practices in their personal and professional lives, for example, by reusing, reducing and recycling materials, it is more likely that students will also model these behaviors. Teachers who are involved in advocacy efforts and community projects could also involve students so that they can contribute to the community.

In ensuring sustainability practices, the inclusivity principle should be practiced to be more flexible, foster openness and social inclusion to ensure multi-stakeholders' participation, particularly among those most vulnerable (Mohd Yusof et al., 2022; Sianes & Vela-Jiménez, 2020).

EE needs to focus on competencies associated with environmental citizenship, which includes the cognitive and affective domain of learning, for learners to be able to take action in private and public settings, both now and in the future (Hadjichambis & Paraskeva-Hadjichambi, 2020). This would include knowledge, conceptions, skills, attitudes and values, and the engagement in actions related to EE now and in the future (Hadjichambis & Paraskeva-Hadjichambi, 2020).

Issue 4: Lack of Teachers' Interdisciplinary Knowledge For SEE

In sustainability, there are three pillars: environmental, social and economic sustainability, and 20 key themes for sustainable development (UN, 2015). Hence, to ensure sustainability, an interdisciplinary collaborative approach, which combines multiple subjects such as geography, psychology and environmental science to achieve environmental protection, balanced economic development and social inclusion, is required (Smederevac-Lalic et al., 2020). Different forms of knowledge, interests and value commitments would be integrated into a participatory approach to knowledge production (Smederevac-Lalic et al., 2020). Hence, a sustainable approach for EE is to develop global citizens who have acquired different forms of knowledge to make value commitments and informed decisions.

Although this approach of being an environmental citizen of the world should be encouraged in schools, teachers seem to have difficulty teaching it. Firstly, teachers require interdisciplinary expertise in biology, geography, economy and politics. Teachers trained in science education may not have expertise in the subjects. Further, most EE teachers admit they are not specialists and lack training for teaching EE (Behrendt & Franklin, 2014). This is evident in Malaysia, as teachers have insufficient training in EE (Esa, 2010; Lateh & Muniandy, 2010). Hence, since EE is integrated into science, teachers often focus on the cognitive domain of science learning to impart knowledge and understanding. This approach to teaching is insufficient to bring about transformation in behaviour, skills, and attitudes among secondary school students (Sukma et al., 2020).

In the Malaysian curriculum, EE has been integrated across subjects, most commonly in Science, Geography, and Moral Education (Md Zain & Aiyub, 2021). However, many teachers found this topic insignificant for teaching as this SEE was not a subject which would be assessed (Pudin et al., 2005; Rahman, 2017). In addition, SEE was an additional subject for teachers, and hence it was a burden to teach (Lateh & Munianday, 2010). Teachers also lacked the expertise in EE, and in many cases, had poor knowledge of the interdisciplinary nature of EE (Lateh & Munianday, 2010). In addition, EE content seemed similar to Biology (Abdullah et al., 2011). In Anderson and Jacobson's (2018) study, half the teachers believed that EE should be taught in the curriculum under natural sciences, social studies and mathematics and neglected the importance of community participation and skills such as problem-solving.

Hence, to have SEE, teachers need to have interdisciplinary expertise. EE should no longer be taught by the science or geography teacher only. Instead, EE requires teachers to facilitate interdisciplinary discussion and include knowledge of social relations, health, economics and ecology, as well as skills such as problem-solving, communication, collaboration, critical thinking and creativity.

Issue 5: Unclear Learning Outcomes for SEE in the School Curriculum

EE has been integrated for almost a decade across subjects in the curriculum. However, the curriculum content seems inadequate and does not conform to current sustainable development issues, such as climate change (Karim et al., 2022). A document analysis of the curriculum showed that the learning outcomes for desired behaviors in sustainable consumption were lacking (Abdullah et al., 2020). Hence, the perception that EE lacked relevance (Anderson & Jacobson, 2018; Kim & Fortner, 2006) and that the curricula were discipline-focused and not interdisciplinary (González-Gaudiano, 2007) were among the barriers to EE implementation.

The Ministry of Education Malaysia implemented a program on Education for Sustainable Consumption (ESC), which aimed to ensure a sustainable development approach for EE where the efficient use of resources while preserving the environment, fulfilling the basic needs of the global community, and improving the quality of life (Karim et al., 2022). However, the ESC program implementation did not get the teachers' attention (Abdullah et al., 2020).

Furthermore, to equip teachers with the skills for EE, the MOE provided a guidebook for teachers. However, there were challenges in implementing EE with this guidebook as there was a lack of awareness and usage of the guidebook (Karim et al., 2022). There were also complaints such as the lack of detailed instruction in the guidebook and the absence of uniform implementation of EE activities across subjects (Pudin et al., 2005).

Hence, there is a need to include SEE in the national curriculum. Consideration has to be made whether to include it as a separate subject or to integrate SEE in a specific subject. Although ESC was included for sustainable consumption education and elements of sustainability have been included across the curriculum in the Malaysian curriculum, there is still room for improvement in the way the outcomes of the curriculum are written (Abdullah et al., 2020). This is because skills such as problem-solving, communication, collaboration, critical thinking and creativity did not seem to be emphasized in EE.

Issue 6: Lack of Teacher Training in SEE

SEE requires interdisciplinary knowledge and various teaching approaches (Smederevac-Lalic et al., 2020). While Malaysian teachers have high environmental knowledge and awareness, they lack positive behaviors (Yaacob & Abdullah, 2023). Although there have been programs on SEE such as the ESC, and guidebooks were provided, teachers were still not showing the behaviors which encouraged the sustainable development approach for preserving the environment, fulfilling

the basic needs of the global community, and improving the quality of life (Abdullah et al., 2020; Karim et al., 2022).

In the Ministry of Education Malaysia, teacher training uses the three-tier cascade model, which is time-consuming and selective for certain teachers only (Karim et al., 2022). Hence, the training for SEE would only have reached a smaller number of teachers. These teachers would need to train their colleagues at the district level, and they would, in turn, train other teachers at the school level. However, this training model would affect teachers' interest, understanding, and interpretation, especially for SEE, as the information and approaches may have been diluted (Karim et al., 2022).

Hence, for a more sustainable approach to training for EE, a more holistic approach focusing on the cognitive and affective domains of learning to ensure that teachers develop students who can take action and solve environmental issues is required (Hadjichambis & Reis, 2020). As SEE requires an interdisciplinary approach, it should integrate the ecological, social and economic dimensions (UNESCO, 2009). Hence, teachers and educators need to be exposed to new approaches to teaching SEE and be able to facilitate interdisciplinary collaboration.

Issue 7: Lack of Knowledge of Pedagogies for SEE among Teachers

Most teachers are unaware of EE pedagogies and do not have sufficient resources for teaching (Paraskeva-Hadjichambi et al., 2020). To develop students as citizens with skills for responsible pro-environmental behavior, who can take action and be agents of change, teachers should be provided with training and resources (Hadjichambis & Reis, 2020).

There are specialized pedagogies and tools for teaching EE, such as place-based education, civic ecology education, eco-justice pedagogy and action competence (Paraskeva-Hadjichambi et al., 2020). For example, field trips have a huge potential for EE and should be embedded in the classroom (DeWitt & Storksdieck, 2008). Field trips offer learning experiences that are more extensive and cannot be replicated in the classroom, allowing students to explore and allowing them to have autonomy in their learning (DeWitt & Storksdieck, 2008). Learning is no longer a transmission of facts but an experience of a new reality that the learners can construct through interacting with the environment and having authentic experiences (DeWitt & Storksdieck, 2008).

However, secondary school teachers are not aware of these pedagogies and require support and training for these approaches. Effective EE should be implemented not only in the formal classroom but in various settings. This includes non-formal settings for voluntary work in or outside school and informal settings such as in the community, at public events and spaces for campaigns and non-activist demonstrations (Paraskeva-Hadjichambi et al., 2020). However, this requires the teachers to change their pedagogies and instructional approaches to integrate interdisciplinary knowledge in EE (Kim & Fortner, 2006).

Issue 8: Logistic Barriers to Implementing EE

Although place-based and outdoor education are important pedagogies for EE, implementing these pedagogies takes up time. Hence, logistic barriers related to resources (e.g., time, funding, instructional material, transportation, field trip resources), support (e.g., safety, liability and classroom management, administrative support, and community interest) and curriculum (e.g., curriculum issues, emphasis on testing and standards), prevent the successful implementation of EE.

Many teachers lack the motivation to implement these pedagogies due to these logistic issues, such as lack of time for planning and preparation (Paraskeva-Hadjichambi et al., 2020; Sukma et al., 2020). Further, teachers who do not have resources and instructional materials for

teaching EE may need more assistance in implementing EE in education (Paraskeva-Hadjichambi et al., 2020).

Teachers faced difficulties finding time for lesson preparation and teaching time in EE (Behrendt & Franklin, 2014). Teachers are required to align their teaching to specific learning objectives, standards, and assessment scores in the curriculum. A lot of time and preparation is needed for the desired outcomes. The teachers' busy schedules and limited preparation time made it difficult to design new curricula or methods to integrate EE into the existing lessons (Bruyere et al., 2012). Hence, allotting time to identify suitable instructional materials and develop new lessons for EE integration can be challenging.

Although teachers believed that there were resources such as videos and animation available online, they lacked the time to evaluate these resources. However, the content of ready-made materials might not be suitable for the context of some countries. Velempini (2017) agreed that it was challenging for teachers to incorporate new subjects not discussed in the syllabi and textbooks. In addition, teachers are scarcely provided with comprehensive tools to incorporate environmental content (Ketlhoilwe, 2003). Hence, teaching EE with limited instructional material is challenging.

One of the pedagogies for EE is outdoor learning. It potentially encourages positive attitudes, arouses students' interest and improves behavior. Students involved in field trips are more engaged in environmental content and understand essential environmental knowledge better (Ajiboye & Silo, 2008). Research makes clear recommendations to teachers about best practices for optimizing the effectiveness of field trips as learning experiences (Braund & Reiss, 2012). However, logistics issues from lack of funding for transportation and resources for field trips limit the use of this pedagogy. Rural schools near nature reserves may provide students with opportunities for direct experiences in nature, but urban schools might have challenges accessing nature. Unfortunately, for successful EE implementation, field trips or outdoor EE is required (Boeve-de Pauw et al., 2019). Hence, students from urban schools may need additional expenditure for transportation and field trip resources (e.g., entrance fees for zoos and aquariums) to access nature.

Safety, liability and classroom management are other significant barriers. Education officers and school principals always put students' safety as the top priority, which led to other barriers, such as administrative support (Behrendt & Franklin, 2014). Support from administrators is critical, but most administrators do not see the natural world around them as an extension of the classroom to provide learning possibilities. There is also a disbelief that teachers can infuse EE into learning (Ketlhoilwe, 2003). Hence, the lack of clarification on the benefits of integrating EE knowledge into the curriculum is a barrier. Administrators must be convinced that learning in outdoor settings can lead to beneficial cognitive, affective, behavioral and social impacts (Rickinson et al., 2004). The role of the administrators in supporting teachers in implementing EE is important. The education authorities and heads of schools should provide the necessary professional development for teachers and support EE activities beneficial for students (Ketlhoilwe, 2003). However, some do not even recognize the instructional difficulties encountered by teachers.

Standards and testing are also a logistics barrier for EE (Behrendt & Franklin, 2014). Students were expected to achieve specific learning outcomes within a time frame. The curriculum is pre-determined by the policymakers and educational officials. Students are guided along the curriculum using the standards and tests to evidence their learning in core subjects like mathematics and English. However, as EE is not a core subject, there is no examination, which may indicate it as unimportant (Ketlhoilwe, 2003). As EE is not a curriculum priority among school principals and teachers, there is less importance attached to EE (Reese, 2018). Many teachers pointed out that the lack of time (Behrendt & Franklin, 2014) was a barrier as they needed

to keep up with the existing curricula. Educators even perceived EE engagement negatively as it might affect studies in other subjects (Reese, 2018).

Issue 9: Attitudes towards EE

Most studies have cited the negative attitude among teachers which affected the implementation of EE, such as lack of teacher interest or commitment and teacher confidence. The teachers did not value EE when it was a non-academic subject added to the syllabus as they were already struggling with an overloaded curriculum (Prabawa-Sear, 2018). In the school curriculum, teachers focus on the curriculum standards, which makes integrating sustainability in education extremely difficult (Green & Somerville, 2015). Hence, the negative attitude towards EE.

Teachers' confidence in being outdoors is also a crucial factor in ensuring EE's success. Teachers felt more comfortable as experts teaching in familiar classrooms. The lack of knowledge and experience in being outdoors affects the teachers' confidence as it may conflict with what teachers know and value (Beijaard et al., 2004).

CONCLUSION

Climate change is an important global agenda. To ensure sustainability, EE needs to develop students with the knowledge, skills and attitude to participate actively and take action not only individually but collaborating with the community to design sustainable solutions concerning the environment. Cultivating environmental knowledge should also include the steps to resolve environmental issues and skills such as problem-solving and critical thinking so that students take positive action confidently. EE should not be tied to a single discipline but incorporate interdisciplinary knowledge. Hence, teachers need to be equipped with knowledge of economics, geography, psychology and environmental science. In addition, teacher training programs for EE will need to be more holistic. Professional development for teachers should encourage the acquisition of interdisciplinary knowledge and pedagogical knowledge for EE such as place-based education, voluntary community work and projects. Effective pedagogies could develop positive attitudes and encourage positive action towards the environment among students.

The curriculum needs to be improved and includes the specific behaviors for SEE in the learning outcomes, such as critical thinking, creativity and problem-solving. Consideration would need to be made to address the logistics barriers, such as lack of resources and time for outdoor learning. Instead, technologies such as virtual reality may be an option, as place-based education could be provided without many logistical problems. High-quality resources such as 360-degree videos for outdoor education could also replace the need to travel. Hence, some of the issues related to EE could be addressed with appropriate resources and technologies, as well as professional development for the teachers. The curriculum would also need to be evaluated to ensure that the required outcomes for students to behave as environmental citizens in the future are developed. Addressing these issues is important as there is an urgent need to develop responsible global citizens who can positively address the problems related to climate change and the environment.

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REFERENCES

Abdullah, S.H.; Malik, N.K.A.; Yaacob, H. (2020). Education for sustainable consumption: An analysis of the Malaysian secondary school curriculum. *Ecodevelopment, 3*(2), https://doi.org/10.24198/ecodev.v3i2.39121

Ajiboye, J., & Silo, N. (2008). Enhancing Botswana children's environmental knowledge, attitudes and practices through the school civic clubs. *International Journal of Environmental & Science Education, 3*.

Anderson, C., & Jacobson, S. (2018). Barriers to environmental education: How do teachers' perceptions in rural Ecuador fit into a global analysis? *Environmental Education Research, 24*(12), 1684-1696. https://doi.org/10.1080/13504622.2018.14771

Behrendt, M., & Franklin, T. (2014). A review of research on school field trips and their value in education. *International Journal of Environmental and Science Education, 9*(3), 235-245.

Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education, 20*(2), 107-128. https://doi.org/10.1016/j.tate.2003.07.001

Boeve-de Pauw, J., Van Hoof, J., & Van Petegem, P. (2019). Effective field trips in nature: The interplay between novelty and learning. *Journal of Biological Education, 53*(1), 21-33. https://doi.org/10.1080/00219266.2017.1418760

Braund, M., & Reiss, M. (2012). *Learning science outside the classroom*. Taylor & Francis.

Bruyere, B. L., Wesson, M., & Teel, T. (2012). Incorporating environmental education into an urban after-school program in New York city. *International Journal of Environmental & Science Education, 7*(2), 327-341

DeWitt, J., & Storksdieck, M. (2008). A short review of school field trips: Key findings from the past and implications for the future. *Visitor Studies, 11*(2), 181-197.

Esa, N. (2010). Environmental knowledge, attitude and practices of student teachers. *International Research in Geographical and Environmental Education, 19*(1), 39-50. https://doi.org/10.1080/10382040903545534

Estrada-Vidal, L. I., & Tójar-Hurtado, J.-C. (2017). College student knowledge and attitudes related to sustainability education and environmental health. *Procedia - Social and Behavioral Sciences, 237*, 386-392. https://doi.org/10.1016/j.sbspro.2017.02.030

González-Gaudiano, E. (2007). Schooling and environment in Latin America in the third millennium. *Environmental Education Research, 13*(2), 155-169. https://doi.org/10.1080/13504620701295684

Green, M., & Somerville, M. (2015). Sustainability education: Researching practice in primary schools. *Environmental Education Research, 21*(6), 832-845. https://doi.org/10.1080/13504622.2014.923382

Hadjichambis, A. C., & Paraskeva-Hadjichambi, D. (2020). Education for environmental citizenship: The pedagogical approach. In A. C. Hadjichambis, P. Reis, & D. Paraskeva-Hadjichambi (Eds.), *Conceptualizing environmental citizenship for 21st century education* (pp. 262–292). Springer.

Hadjichambis, A. C., & Reis, P. (2020). Introduction to the conceptualisation of environmental citizenship for twenty-first-century education. In A. C. Hadjichambis, Reis, P., Paraskeva-Hadjichambi, D., Cincera, J., Boeve-de Pauw, J., Gericke, N., & Knippels, M.-C. (Ed.), *Conceptualizing environmental citizenship for 21st century education* (pp. 1-14). Springer.

Harvey, G. D. (1976). *Environmental education: A delineation of substantive structure*. Southern Illinois University-Carbondale.

James, J. K., & Williams, T. (2017). School-based experiential outdoor education: A neglected necessity. *Journal of Experiential Education, 40*(1), 58-71.

Karim, N.; Othman, H.; Zaini, Z.-I.I.; Rosli, Y.;Wahab, M.I.A.; Al Kanta, A.M.; Omar, S.; Sahani, M. (2022). Climate change and environmental education: Stance from science teachers. *Sustainability, 14*, 16618. https://doi.org/10.3390/su142416618

Ketlhoilwe, M. J. (2003). Environmental education policy implementation in Botswana: The role of secondary education officers and school heads. *Southern African Journal of Environmental Education, 20*, 75-84.

Kim, C., & Fortner, R. W. (2006). Issue-specific barriers to addressing environmental issues in the classroom: An exploratory study. *The Journal of Environmental Education, 37*(3), 15-22. https://doi.org/10.3200/JOEE.37.3.15-22

Lateh, H., & Muniandy, P. (2010). Environmental education (EE): Current situational and the challenges among trainee teachers at teachers training institute in Malaysia. *Procedia - Social and Behavioral Sciences, 2*(2), 1896-1900. https://doi.org/10.1016/j.sbspro.2010.03.1005

Marzo, R, Chen, H., Anuar, H., Wahab, M., Ibrahim, M., Ariffin, I. A., Ahmad, A., Kawuki, J. & Aljuaid, M. (2023). Effect of community participation on sustainable development: An assessment of sustainability domains in Malaysia. *Frontiers in Environmental Science. 11*. https://doi.org/10.3389/fenvs.2023.1268036

Mat Said, Aini & Fakhru'l-Razi, A. & Paim, Laily & Masud, Jariah. (2003). Environmental concerns, knowledge and practices gap among Malaysian teachers. *International Journal of Sustainability in Higher Education, 4*, 305-313. https://doi.org/10.1108/14676370310497534

Mayowa, O. O., Pour, S. H., Shahid, S., Mohsenipour, M., Harun, S. B. I. N., Heryansyah, A., & Ismail, T. (2015). Trends in rainfall and rainfall-related extremes in the east coast of Peninsular Malaysia. *Journal of Earth System Science, 124*(8), 1609–1622. URL: https://www.ias.ac.in/public/Volumes/jess/124/08/1609-1622.pdf

Md Zain, N. and Aiyub, K. (2021). Matlamat pendidikan untuk pembangunan lestari (ESD) daripada perspektif guru geografi KSSM. [The goal for education for sustainable development from the perspective of KSSM geography teachers]. *Malaysian Journal of Social Sciences and Humanities, 6*(10), 54 - 64. https://doi.org/10.47405/mjssh.v6i10.1110

Miyamoto, M. & Mohd Parid, M. & Noor Aini, Z. & Michinaka, T. (2014). Proximate and underlying causes of forest cover change in Peninsular Malaysia. *Forest Policy and Economics, 44*. https://doi.org/10.1016/j.forpol.2014.05.007

Mohd Meerah, T. S., Halim, L., & Nadeson, T. (2010). Environmental citizenship: What level of knowledge, attitude, skill and participation the students own? *Procedia - Social and Behavioral Sciences, 2*(2), 5715-5719. https://doi.org/10.1016/j.sbspro.2010.03.933

Mohd Yusof, M.I., Yusof, R., Ab. Rahman, F. A. & Harsono, D. (2022). Community participation for sustainable development goals: The localisation process. *International Journal of Service Management and Sustainability, 7*(2), 173 – 191. https://doi.org/10.24191/ijsms.v7i2.19952

Pudin, S.; Tagi, K.; Periasamy, A. (2005). *Environmental education in Malaysia and Japan: A comparative assessment*. Proceedings of the 2005 International Conference on Education for Sustainable Future, Nagoya, Japan.

Parra, G., Hansmann, R., Hadjichambis, A. C., Goldman, D., Paraskeva-Hadjichambi, D., Sund, P., . . . Conti, D. (2020). Education for environmental citizenship and education for sustainability. In A. C. Hadjichambis, Reis, P., Paraskeva-Hadjichambi, D., Cincera, J., Boeve-de Pauw, J., Gericke, N., & Knippels, M.-C. (Ed.), *Conceptualizing environmental citizenship for 21st century education*: Springer.

Prabawa-Sear, K., & Dow, V. (2018). Education for sustainability in Western Australian secondary schools: Are we doing it? *Australian Journal of Environmental Education, 34*(3), 244-261. https://doi.org/10.1017/aee.2018.47

Rahman, H.A. (2017). Usaha dan cabaran dalam mengaplikasikan pendidikan alam sekitar dalam sistem persekolahan di Malaysia [Efforts and challenges in the application of environmental education in Malaysian school system]. *Asian Journal Environment, 1*, 61–70.

Reese, R. (2018). A qualitative exploration of the barriers and bridges to accessing community-based K-12 outdoor environmental education programming. *Journal of Outdoor and Environmental Education, 22*. https://doi.org/10.1007/s42322-018-0019-4

Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M. Y., Sanders, D., & Benefield, P. (2004). *A review of research on outdoor learning*. National Foundation for Educational Research in England and King's College London.

Robelia, B., & Murphy, T. (2012). What do people know about key environmental issues? A review of environmental knowledge surveys. *Environmental Education Research, 18*(3), 299-321. https://doi.org/10.1080/13504622.2011.618288

Sapanova, N., Cessna, S., DeChano-Cook, L. M., Childibaev, D., & Balta, N. (2024). Kazakhstani high school students' environmental knowledge, attitudes, awareness and concern. *International Research in Geographical and Environmental Education, 33*(2), 139–156. https://doi.org/10.1080/10382046.2023.2281697

Sianes, A., & Vela-Jiménez, R. (2020). Can differing opinions hinder partnerships for the localisation of the sustainable development goals? Evidence from marginalised urban areas in Andalusia. *Sustainability, 12*(14), 1–20. https://doi.org/10.3390/su12145797

Smederevac-Lalic, M., Finger, D., Kovách, I., Lenhardt, M., Petrovic, J., Djikanovic, V., Conti, D., Boeve-de Pauw, J. (2020). Knowledge and environmental citizenship. In A. C. Hadjichambis, Reis, P., Paraskeva-Hadjichambi, D., Cincera, J., Boeve-de Pauw, J., Gericke, N., & Knippels, M.-C. (Ed.), *Conceptualizing environmental citizenship for 21st century education* (pp. 69-82). Springer.

Sobel, D. (2008). *Children and nature: Design principles for educators*. Stenhouse.

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues, 56*, 407-424.

Sukma, E., Ramadhan, S., & Indriyani, V. (2020). Integration of environmental education in elementary schools. *Journal of Physics: Conference Series, 1481*(1), 012136. doi: 10.1088/1742-6596/1481/1/012136

Tilbury, D. (1995). Environmental education for sustainability: Defining the new focus of environmental education in the 1990s. *Environmental Education Research, 1*(2), 195-212. https://doi.org/10.1080/1350462950010206

UNDP, UNICEF & EcoKnights (2020). *Change for climate: Findings from the National Youth Climate Change Survey Malaysia*. Putrajaya.

UNESCO (2021). *Learn for our planet a global review of how environmental issues are integrated into education*. UNESCO. Available online: https://unesdoc.unesco.org/ark:/48223/pf0000377362 (accessed on 12May 2022).

UNESCO. (1992). *Convention concerning the protection of the world cultural and natural heritage*. UNESCO.

UNICEF Malaysia (2021). *Analysis of impacts of climate change and environmental degradation on children in Malaysia and assessment of child-sensitivity of current adaptation and mitigation policies: technical report*. United Nations.

United Nations (2015). *Transforming our world: The 2030 agenda for sustainable development.* United Nations.

United Nations (2023). *The Sustainable Development Goals Report 2023: Special Edition*. United Nations.

United Nations Educational Scientific and Cultural Organization (UNESCO). (1977). *Final report: Intergovernmental conference on environmental education*. UNESCO.

United Nations Educational Scientific and Cultural Organization (UNESCO). (2017). *Education for sustainable development goals: Learning objectives*. UNESCO.

Velempini, K. (2017). Infusion or confusion: A meta-analysis of environmental education in the 21st century curriculum of Botswana. *Africa Education Review, 14*(1), 42-57. https://doi.org/10.1080/18146627.2016.1224560

Weil, Z. (2021). *The world becomes what we teach: Educating a generation of solutionaries*. Lantern Publishing & Media.

World Bank Group and the Asian Development Bank (2021). *Climate risk country profile: Malaysia.* The World Bank Group and the Asian Development Bank.

Yaacob, A., & Abdullah, N. (2023). Environment education for Sustainable Development (SD) among primary school teachers. *EDUCATUM Journal of Social Sciences, 9*(2), 35–42. https://doi.org/10.37134/ejoss.vol9.2.4.2023