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The rise of generative artificial intelligence (AI) language models - challenges and opportunities for geographical and environmental education

Much discussion has been surrounding generative AI language models, such as ChatGPT, and the advantages and threats they present to education. As an AI language model, ChatGPT has the potential to transform geography and environmental education. The extensive knowledge base and natural language processing abilities that ChatGPT possesses make it a perfect tool for this purpose; it can actively include students in conversation (as the chat in its name implies) while also providing them with quick feedback. Because of this, students are free to progress through the material at their own pace, using strategies that best suit them individually. Yet, this change has been criticised by others who worry about intellectual property violations and undermining academic integrity. As discussions continue about whether generative AI models are a boon or bane for education, we would like to focus on the problems and potential facing geography and environmental education in particular.

We did a simple experiment and asked ChatGPT to: "Write a short paragraph to explain how geographical education can support a child's development cognitively and affectively, in responding to the environmental challenges of our times."

This was the result.

Geographical education plays a critical role in a child's cognitive and affective development, particularly in addressing the environmental challenges of our times. By learning about the physical and social geography of their local and global communities, children can develop a greater awareness and understanding of the interconnectedness of natural and human systems. This knowledge can help them to develop critical thinking skills, problem-solving abilities, and a sense of responsibility towards the environment. Moreover, geographical education can foster empathy and respect for cultural diversity, as well as an appreciation for the beauty and complexity of the world we inhabit. Overall, geographical education is an essential tool for equipping children with the skills, knowledge, and attitudes necessary to respond effectively to environmental challenges and to become responsible global citizens.

This response was generated at 0050h GMT on 9 March 2023. We are keenly aware that as ChatGPT continues to learn from user input and revisions, the answer will likely change when you try it at a different time.

The generated paragraph covers the key points of geographical knowledge, skills and attitudes and summarises the points in the last sentence of how these developments will help a child appreciate their environment better. It is a safe answer, and there is nothing wrong with that. However, it is also lacklustre and does not say anything beyond what most educators in geographical and environmental education already know.

Nonetheless, it provided an instant response, was grammatically correct and gave a starting point from which the paragraph could be improved and possibly even allow us to reflect on our own versions or writing styles.

Perhaps the question to ask is whether students will use this tool and add value to their geographical and environmental education, or instead how do we link the knowledge, skills and attitudes to behavioural change. One quick answer that comes to mind is that it can help students better grasp environmental challenges and how they connect to geography by referring to real-world settings. For instance, this can lead to better-informed decisions and an improved understanding of environmental issues. We asked ChatGPT what Tsunamis are, and it gave a relatively standard textbook answer. We then asked if I needed to worry about Tsunamis if I lived in Singapore. Here is the extracted answer at 0100h GMT on 9 March 2023

While Singapore is not as prone to tsunamis as some other coastal regions, it is still possible for a tsunami to affect the country ... Moreover, Singapore is a low-lying island city-state, and many of its densely populated areas are located near the coast. In the event of a tsunami, these areas could be at risk of flooding and damage... However, it is important to note that the risk of a tsunami affecting Singapore is relatively low... Overall, while the risk of a tsunami affecting Singapore is not zero, it is important to remain vigilant and informed about the potential risks, and to follow the guidance and instructions of local authorities in the event of an emergency.

Generative AI can provide a contextualised response to the real-world context. It even goes as far as to offer advice on what to do when there is a tsunami warning. While Singapore is generally safe from tectonics related tsunami, there is still some chance that a tsunami of wave height that could be potentially dangerous can occur for this island state. That said, the use of generative AI is useful for rapid learning but also poses some risks to geographical and environmental education. One of the most significant challenges is the risk of pupils relying too heavily on AI-generated material and failing to acquire critical thinking skills. With ChatGPT offering answers to all sorts of queries, it is crucial to get students to challenge the information they are provided and to think critically about the sources of information. It is also equally important for students to know how to ask the questions to the generative AI model so that they can get relevant and meaningful answers. In geographical and environmental education, we need to identify the sorts of criticality that we want our children to have.

In previous editorials, we have asserted that geographical education should consider the following:

- What geography do students need to know? What are student misconceptions and preconceptions? How can we enhance students' geographical knowledge, understanding and skills?
- How do we understand students' learning progressions in geography? How are these best calibrated and assessed?
- What are the characteristics of effective teaching and learning materials and resources in improving the quality of geographical education?
- What teaching methods are efficient and effective in improving the quality of geographical education?
- How can the education of geography teachers be improved to raise the quality of teaching and the levels of achievement in geography in schools?
- (Commission on Geographical Education, 2016 p. 6)

In answering the first question, generative AI, for example, teachers can make personalised simulations and virtual settings that make it easier and more enjoyable for students to learn about geographical phenomena enhanced knowledge and skills. This method can help students better understand difficult topics that are hard to picture independently. But the use of generative AI for the subsequent questions in the list above becomes less obvious. We argue that while generative AI can be used as supporting tools to answer these questions, there must be some way to guide how students use the tools. In the two examples of how we have used ChatGPT in the sections above, you will notice that the phrased questions are done so deliberately to solicit a certain scope of answers. Hence, the quality of the answer is only as good as the quality of the question posed to the generative AI.

Another thing that could go wrong with generative AI models like ChatGPT is that the amount and quality of human interaction in the classroom could go down. AI can make learning more personalised, but it can't replace the importance of face-to-face interactions between students and teachers and between students. Because of this, it is essential to use ChatGPT to add to and not replace other ways of teaching. There are still some things that ChatGPT cannot do for geographical and environmental education. These include innovative pedagogies, especially for fieldwork, and learning beyond textual, visual and auditory modes, such as using Geographic Information systems (GIS). Indeed, knowing what teaching methods are efficient and effective in improving the quality of geographical education is one of the key questions among geography educators, as expounded in the International Charter on Geographical Education (Commission on Geographical Education, 2016). The operative word is *yet*. With the advancement in technology and AI models continuing to "learn," these may be possible soon too.

The articles featured in this issue concern student learning to curriculum and pedagogy in geographical and environmental education. We have a paper on the influence of Environmental Education on Omani students' self-reported environmental attitudes and behaviours, with a focus on what students learn. Another paper focuses on the difficulties of distance geographical education in Poland. We have a paper on how flood risk is explained in Spanish school geography for pedagogy. There are also two papers in this issue on the use of GIS. The variety of topics is typical of the issues discussed in this journal (refer to Kidman & Papadimitriou, 2012 where the key themes of the journal were identified), but the current discussion on AI raises the question of whether the pace of geographical and environmental education research is keeping up with these rapid changes. The editors encourage researchers to submit papers in this area so that we can start discussing the key issues and discover better ways to engage these emerging technologies.

However, we need a framework to consider how best we can use AI tools like ChatGPT to support good and meaningful geographical and environmental education. We need an angle for this piece. Otherwise, this editorial will probably fall into the same level of mediocrity as one generated by ChatGPT. Chang (2023) has argued that for learning a topic like climate change within the geography curriculum, a framework like the UNESCO four pillars of Education for the 21st century (Delors, 1998) can be used. Delors (1998, p. 97) advocates for an integrated approach to education based on:

1. learning to know
2. learning to do
3. learning to be
4. learning to live together

Generative AI like ChatGPT can help people learn by giving them ready and easy access to information and resources. AI-powered educational platforms, for example, can be designed to tailor learning paths to a student's interests, abilities, and learning style and readiness. Generative AI can also be used to help students learn practical skills through simulations and virtual environments for practice and experimentation. While some may believe that learning to be is more challenging to support with Generative AI, when properly designed, a learning activity that encourages reflection, empathy, and self-awareness can help students learn to be, nudge people into self-reflection and motivate personal growth. In addition, Generative AI can help people collaborate, such as by facilitating global interaction between students and teachers from different places, allowing them to learn from each other's cultural and social context. However, the premise for using AI is in the design of the learning activity, not merely in using the AI platform itself. The key to these four principles is through meaningful design and development of good and effective learning activities, with AI and not just generated by AI.

Education Technology guru Chris Dede (cited in Anderson, 2023) is not too worried about the growing concerns about generative AI in education, like ChatGPT. As someone who has studied emerging technologies for a long time, he has seen many instances where new technologies seemed like they would change the field. Instead, Dede says that teachers need to get smarter about how they teach to make the most of what AI offers. We are sure that when the Gutenberg Press was invented, some people were concerned that woodblock printing technology would be displaced. Teachers were also probably concerned that with the rise of the scientific calculator, students will no longer be able to do mental math. But we have simply become skilful at using these tools without being less intelligent or critical. In fact, our knowledge base has expanded immensely and we now have much more sophisticated ways of knowing than before. However, as with previous disruptive innovations, generative AI language models such as ChatGPT will bring both opportunities and challenges to geographical and environmental education. While its ability to provide individualised and interactive learning experiences is a significant advantage, students must still be encouraged to develop critical thinking skills and engage in human interactions. We can use ChatGPT's potential to provide students with a more engaging and effective learning experience by striking a balance between AI and our pedagogy. Teachers should have agency in this situation. Indeed, researchers like Siemens et al. (2022) argue for human and artificial cognition (HAC) collaboration in the way we should approach this issue. We should not try to do what AI can do, but instead, add value to learning by doing what it cannot do and work with the tool to create meaningful learning experiences for our learners. In geographical and environmental education, we can look to how we use signature pedagogies like fieldwork (Seow, Chang, & Irvine, 2019) to bridge the HAC collaboration. Perhaps AI can help manage the more textual aspects of the fieldwork preparation, assist in the organisation of data collected in the field, and even suggest ways to present the findings. However, the human agency in the HAC is critical in ensuring that the field learning experience is authentic and meaningful. One key drawback of ChatGPT now is that it is based on historical data and it will tell you quite unequivocally that it cannot provide information for anything after 2021. The point to be made is that the quality of learning with AI depends very much on the human part of the HAC collaboration. We will need to understand more examples, critical frameworks, evaluation studies and so forth in geographical and environmental education. IRGEE invites you to submit articles on this topic.

Chang, Kidman, Lidstone, and Stoltman (2022) state that IRGEE has come a long way from the early 1990s when there was a meteoric rise in concerns over the changing environment and the use of technologies like GIS. Today, the academic discourses in geographical and environmental education reflect contemporary concerns with longer-term sustainability as well as the use of emerging technologies (p. 264). There are challenges to using generative AI in geography education as with any new and emerging technology. It is important that children have equal access to the AI regardless of their socio-economic background. Additionally, there could be potential biases in the data used to train these AI systems. Overall, the rise of generative AI creates exciting new opportunities for geography and environmental education. Educators can use this technology to create more engaging and personalised learning experiences for students, preparing them for future environmental concerns. However, it is critical to thoroughly evaluate the potential issues and ethical implications of implementing this technology. Considering the opportunities and challenges posed by generative AI, we must ensure that our efforts in geographical and environmental education do not degenerate.

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