

## **Inclusive Earth and Space Science Education: (Re-)challenging our assumptions**

By **Vincent Tong**

AGU Education Section Secretary

University College London

Email: [vincent.tong@ucl.ac.uk](mailto:vincent.tong@ucl.ac.uk)

(From end of July 2020: Northumbria University, [vincent.tong@northumbria.ac.uk](mailto:vincent.tong@northumbria.ac.uk))

The recent marches and protests in the US and around the world have led to urgent calls for taking meaningful actions against racism across a broad spectrum of our society. As educators, we have a special responsibility to show leadership in shaping our institutions and wider communities for the better in these challenging times. Many of us have been contributing tirelessly to advancing inclusive practices in Earth and space sciences. Just as we are taking a hard look at how structural racism and unconscious biases can be addressed in concrete and effective ways, maybe it is also time to revisit our own approaches to education. No matter how committed we already are to the cause, there are always things we can try and do differently. I would like to introduce a review paper entitled “Examining intersectionality and inclusivity in geosciences education research: A synthesis of the literature 2008-2018”. In particular, I discuss how findings from Mattheis and co-authors can help us reflect on our own practices, and how our education community can be a powerful force to shape our disciplines.

The authors have identified three themes in their systematic review. First, they observed increased challenges to assumptions to science as a neutral and objective activity in the articles included in their study. Despite this trend in recognizing the social dimensions of natural sciences and the significance of human factors in the decision-making process, the review identified a continued belief in meritocracy of higher education. According to the

authors, there is ample evidence of teachers believing that “academic success is primarily attributable to the amount of effort expended by students or natural aptitude”. Failure to account for factors that influence the development of science students’ identities could lead to “systemic issues of marginalization and barriers to access”. The authors also reported a tendency to assimilate learners into the dominant culture of science, rather than changing shared social practices by valuing diversity and developing more meaningful inclusive practices in education.

These three research findings provide evidence-based considerations for challenging the assumptions underpinning our work as educators. We could perhaps ask ourselves this question (again): How do we see the relationship between learners with individual identities and the established norms in earth and space sciences? Our continual commitment to reflecting on our assumptions could determine how meaningful and effective our inclusive practices can be. How can we understand learners’ social identities? Mattheis and co-authors’ research is rooted in intersectionality, in which co-existing social identities play a key part in shaping individual experiences of marginalization. The interaction between racial and gender identities is one combination but social identities are multi-faceted and overlapping. The paper advocates the use of more qualitative research approaches to studying social identities in geoscience education, which can help inform our practices. However, there is the perennial question of linking theory and practice in education. To successfully link theory and practice, our Earth and space science education community needs to build its own cultural interface between educators and education researchers – for addressing the priorities and concerns that are relevant to Earth and space sciences. Educators adopting a reflective evidence-informed approach to teaching, and education researchers reaching out to educators with their research findings would help develop the interface and culture.

Our community with diverse, mixed and overlapping roles in education puts us in a good position to shape inclusive practices in Earth and space science. Some of us are outreach educators working closely with research professors who supervise graduate students in space science. Some of us are research students teaching undergraduate laboratory classes,

mentoring other students in a research group and engaging in peer learning. Some of us are high school teachers working in partnership with education researchers on evaluating novel approaches to conducting geology field trips. These are just a few examples showing how interconnected our education community is. As we continue to develop and share our inclusive practices in our community, we are taking on board not only the diverse social identities of the learners but also those of the educators as well.

However, education and scientific research tend to take place in communities operating at different scales. Many education initiatives have a stronger focus on addressing institutional and national priorities than research, which is often more international in scope. International bodies linking science education and disciplinary science therefore play a special role to bridge these differences. The AGU and its international partners such as the European Geosciences Union and Japan Geoscience Union are committed to both disciplinary science and education with their national/regional and international members in mind. The thriving education sessions in their annual conferences show that engaging with students and the public in inclusive ways is firmly on the agenda. If we were to show leadership in shaping Earth and space sciences for the better in these challenging times, (re-)challenging and sharing our inclusive practices with our fellow international educators would be one good way forward.

## Reference

Mattheis, A., Murphy, M., and Marin-Spiotta, E. (2019). Examining intersectionality and inclusivity in geosciences education research: A synthesis of the literature 2008-2018. *Journal of Geoscience Education*, 67, 505–517.