Transdisciplinary teaching- How can we educate scientists of the future?

Authors

1. Dr. Oliver Heidrich - Newcastle University

2. Prof. Hayley J. Fowler - Newcastle University

3. Prof. Ulrich Salzmann - Northumbria University

Abstract

The global industrial economy and its associated industrial processes of extracting, transforming and disposing Earth resources are great examples of Anthropocene process. The 'Anthropocene' encapsulates the idea that we are living in a new global epoch in which human and natural systems are inextricably linked; formerly resilient systems have been pushed into altered and degraded states, with humanity as the key agent in planetary-scale change. The science base for adaptation and societal resilience (as well as mitigation efforts) in the Anthropocene needs to align with the UN's Sustainable Development Goals (SDGs), such that well-founded decisions on risk and opportunity can inform smarter governance structures and regulatory requirements.

In our newly-developed PhD training programme "ONE Planet", our vision is to provide a training environment that develops and fosters innovative, transformative ways of working to produce independent research scientists and future leaders who can analyse and design the sustainable transdisciplinary responses needed to address intensifying global change. This presentation will introduce 'ONE Planet', which combines industrial ecology, climate sciences, engineering, geography and social sciences. We will principally manage multi-, inter- and trans-disciplinarity through dialogue across scientists/end-users through ONE Planet cohort activities and mini-groups from the PhD outset.

Our approach is centred on transdisciplinarity – transcending the traditional boundaries of natural and social sciences (Popa et al., 2015). We define multidisciplinarity as associated with more than one academic discipline; interdisciplinarity as the knowledge that exists between academic disciplines; and transdisciplinarity as the union of all inter-disciplinary efforts that will create a unity of intellectual frameworks beyond the disciplinary perspectives (Vemury et al., 2018). The active involvement of 40+ industry and end-user representatives as members of the training programme is key to making our training relevant to society. Our investigations are also built around internationally-recognised research excellence that spans the science remit, with research themes from Climate and Climate Change (e.g. weather and extreme events, Palaeoenvironments), Earth System Processes (e.g. geohazards, hydrology), Anthropocene (e.g. pollution, carbon management) and Environmental Informatics (e.g. observations, big data).

We describe transdisciplinary training environments and training programs, starting with a common first 6 months and a mini-group project comprising four students – one from each of the ONE Planet research themes – together with an exemplary initial PhD topic. Each cohort has four mini-groups,

established at the Residential Activity Centre (RAC). Each mini-group is therefore, by nature, multi-disciplinary, with four students, their supervisors and end-users, and will together define a real-world problem (or 'grand challenge'), including management and stakeholders issues, then relating these broad issues to one of our partners' field environmental observatories or research facilities. Key skills including data management, instrumentation, modelling, analysis methods and testing concepts to explore solutions to the real-world problem are considered. Bringing students together as a cohort gives rise to complementary skills and provides deep learning through real-world problem solving activities (Tilbury, 2011, Bramald et al., 2015). This will enhance inter-disciplinary development through peer-to-peer learning, shared skills and analysis and form the basis for transdisciplinary outcomes. Through further engagement with project partners from industry we provide specialised skills and knowledge transfers. Future scientists will provide the evidence and scientific rigour needed to make well-founded decisions and informs smarter governance structures and regulatory requirements.

References

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