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Teaching (Super) Wicked Problems: Climate Change in the Higher Education Curriculum

Iain Cross[1]

[1]*London School of Hygine and Tropical Medicine, London, United Kingdom*

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Abstract: Climate change is a 'super-wicked' problem associated with challenges including food security, mass migration and biodiversity loss. Young people are increasingly expecting their university education to prepare them to address these challenges. This requires universities to go beyond scientific accounts of climate change, and to engage students in the complex interactions between social, economic and environmental systems. The research analyses if climate change is framed as a wicked problem in UK and Ireland undergraduate programmes. The first phase involved semi-structured interviews with 15 academics in subjects where climate change is commonly taught (geography and related disciplines). The second phase, which is on-going, engages academics in subjects where it is not commonly taught and professional T&L roles (25 completed to date). It highlight key principles for climate change in the curriculum. The research draws on and moves forward academic research in education for sustainability and authentic learning.

Paper: Young people are increasingly concerned by the slow pace of governments and society more broadly to tackle climate change, evident through the school strikes in 2019 and the following achieved by the climate activist Greta Thunberg. As these young adults progress into higher education, universities will need to respond to changing expectations from students, that their studies prepare them to make a significant contribution to addressing climate change challenges. They also rightfully expect that their university learning experience equips them effectively for their professional careers, developing their employability skills. One of the most important issues that graduate will face in their professional careers is the impact of climate change on economies, societies and the environment (e.g., Gregory & Lewin, 2020). It is essential to progress their learning beyond scientific accounts of the changing climate into an applied, multi- disciplinary understanding that better reflects the super-wicked nature of climate change and empowers students to be agents of positive change in a complex and uncertain world (e.g., Sproken-Smith, 2013).

Climate change is widely recognized as the archetypal wicked problem. The effects of anthropogenic CO2 emissions and other greenhouse gases on global climate, ecosystems and society are far-reaching and no single, clearly defined solution can 'solve' these challenges. Advocates of taking rapid and substantial action on climate change argue that the costs of inaction now lead to much higher costs later (Helm, 2015; Stern, 2006; Vivid Economics, 2020). Efforts to mitigate climate change are highly political, with the risks and costs falling unequally within and between countries. Many of the disruptive consesquences of climate change on human health and wellbeing, water resource management, and social cohesion in cities are themselves wicked problems. A lack of

leadership to effectively coordinate global approaches to reducing CO2 and mitigating the effects of climate change, and an increasingly short time period before a climate "tipping point" is reached (IPCC, 2018), has led to climate change being referred to as a "super-wicked" problem

So what skills do students today need to be able to more effectively contribute in their professional careers to climate change challenges? Strong IT skills will be a key feature of the move to a low carbon economy. Skills in project management and communication are needed to successfully manage the transition process to low carbon organizational models (GLA, 2020). So-called "soft skills" will become increasingly important in future as the level of complexity of job requirements increases. However, developing skills in problem-solving, team working and critical thinking is often poorly integrated in our education system with the delivery of subject- specific knowledge (IPPR, 2019). There should be more focus on teaching ways of thinking and in-depth engagement with stakeholders rather than zeroing-in on specific technical solutions (Kaufman et al., 2013). To build these skills in students, the curricula itself needs to embody these principles by being participatory, reflexive, inclusive, flexible, creative, experimental and authentic (McCune, 2020).

However, there is an inherent challenge in developing even more tightly structured curricula with rigid outcomes to teach students about wicked and super-wicked problems (Knight, 2001). Instead, a process approach to curriculum design can focus on the way in which knowledge is acquired and the position of these learning experiences within the programme-level structure (Knight, 2001). A process approach enables multiple authenticities to be acknowledged within the curriculum without privileging one over another. Student learning would be designed as a series of experiences through which they independently construct their own individual and authentic understanding, rather than by prescribing authenticity as achieving a set of predefined outcomes. For example, some students could undertake projects with an NGO on zero plastic, while others on the module produce materials that support the city council on green infrastructure. It is the learning process and experiences that are important, not that some will have more technical knowledge about plastics or green infrastructure at the end of the module. This approach is aligned with teaching wicked problems, as it does not prescribe technical solutions, but a set of learning experiences to allow students to develop their own ideas. Programme learning outcomes can then logically emerge from a curriculum design process that focuses first on learning experiences.

In the spring and summer of 2020 the research project looked at climate change teaching in the curriculum. In parallel, the project studied degree programmes in the UK and Ireland where climate change commonly features (geography and related courses) and those where it is not commonly taught (such as law, chemistry, modern languages, fashion, business…). These interviews have been used to developed seven principles to assist programme teams to improve climate change teaching in environmentally-related degree programmes. These have wider applicability across many disciplines, and are shown in Figure 1.

References: Figure 1. Seven principles for good climate change teaching

1.

2. **Climate change should be framed as a super-wicked problem**: Programme teams should develop a clear intellectual position on climate change informed by the conceptual

framing of climate change as a super-wicked problem. This should be articulated at the programme level to enable module content to be orientated around it.

3.

4. **Teaching should be solutions-focused**: It should develop the skills required for students to design and implement innovative mitigations and solutions, not just teach solutions and mitigations that are currently used or offer purely scientific or cultural accounts of climate change.

5.

6. **Students' skills to engage with climate change and wicked problems should be clearly scaffolded**: Material concerning climate change should be carefully integrated throughout levels of study and modules, such that the advanced skills to tackle wicked problems effectively are progressively developed during a programme.

7.

8. **Assessment should be authentic**: Assessment strategies should focus on opportunities for students to apply their climate change knowledge and skills to contexts relevant to professional practices.

9.

10. **Students' identity as a professional practitioner should be developed**: Students should have opportunities to develop an awareness of their responsibility as a geographer, to help take better professional decisions in the context of climate change.

11.

12. **Teaching about climate change should be delivered using climate-aware methods**: Carbon-intensive approaches to teaching (e.g., air travel) should be avoided where possible and replaced with practices that model climate-sensitive behaviours (e.g., rail travel, using local environments).

13.

14. (7) **Technology should meaningfully enrich climate change teaching**: Students should be given opportunities to develop an aptitude for using technology innovatively to critically explore data and communicate messages creatively.

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