Teaching 'wicked' problems in Geography

Introduction

Wicked problems form the most significant challenges to society and science, and the current and next generation of researchers, educators, planners and policy-makers require the inter- and trans-disciplinary understanding and skills to address these issues. Higher Education has a role and responsibility to lead research into wicked problems (Dentoni & Bitzer, 2015) but also to effectively teach wicked problems (Wilson, 2009), particularly because young people are increasingly aware of and proactively taking action about issues such as climate change and plastics pollution. This demonstrates the need for module and programme designers to consider how to integrate and embed teaching of wicked problems and its affiliated aspects such as environmental and social justice, and global citizenship, into Geography curricula. There is also the need to develop the knowledge, understanding and the high-level transferable and problem-solving skills of undergraduates to equip them to deal with the challenges of researching and communicating wicked problems, whether through actively changing workplace practices, influencing policy-makers or the training of the next generation of teachers. Geography can be viewed as a key facilitating subject which has an important role in equipping students and researchers with the skills to confront work problems and to work towards solutions (Kate, James, & Tidmarsh, 2019).

Wicked problems are encountered in all disciplines; they permeate all facets of our societies and sciences. The term, originally coined by Rittel & Webber in 1973, describes "*a class of problems that are complex, contentious, defy complete definition and resolution, and for which there is no single solution, since any resolution generates further issues*" (Rittel & Webber, 1973, p.4). In Geography they are typically human-environment issues characterised by high degrees of scientific uncertainty and lack of consensus, for which there are currently no correct or optimal solutions, but which require planners and politicians to make decisions and agree plans of action (Brown, Harris, & Russell, 2010). They include global environmental and social changes such as such as human-induced climate change (Levin, Cashore, Bernstein, & Auld, 2012), global poverty (Jabeen & Guy, 2015), food insecurity (Hamann, Giamporcaro, Johnston, & Yachkaschi, 2011), biofuels (Palmer, 2012), environmental management (Chapin *et al*., 2008) including water and forest management (Freeman,

2000; Lach, Rayner, & Ingram, 2005; Wang, 2002), urban planning (Balducci, 2004; Innes & Booher, 2016), health issues (Caron & Serrell, 2009), geopolitics and global terrorism (Acey, 2016), disaster relief aid (Tatham & Houghton, 2011), ecological conservation (Boyd, 2010; Hughes, 2012), or sustainable tourism (Scherrer & Doohan, 2014; Perry, 2015). Although wicked problems are often associated with environmental and social issues, the concept has been adopted by disparate subjects, including the performing arts (cf. Langellier, 2013).

The term 'wicked' recognises that "… *such problems are not morally wicked, but diabolical in that they resist all the usual attempts to resolve them*" (Rittel & Webber, 1973, p.4). This differs from 'tame problems' which can be solved with existing modes of enquiry and decision-making. Thus the term 'wicked' does not have religious (although there are moral and ethical aspects to problem-solving) or youth culture connotations, but the term is nuanced in that it can be considered 'malignant' (as opposed to benign), 'vicious' (in terms of feedbacks), 'tricky' (in terms of being 'slippery'), 'messy' and 'clumsy' (Jordan, Kleinsasser, & Roe, 2014). However, alternative terms such as 'messy' problems may be considered as a less emotive but less 'forceful' term. The increasing use of the term 'wickedity' (Jordan *et al*., 2014) highlights the growing recognition of the magnitude of the issues plus humanistic values associated with the recent moves to recognising the Anthropocene. Some issues, such as human-induced climate change, are so all-encompassing that they are often referred to as 'super-wicked' problems (Levin *et al*., 2012).

Wicked problems are difficult to define concisely, and they are open to lots of different interpretations and emphases. By their very nature wicked problems are complex, multivariate issues where the variables have high interdependency. Typically the issues are so large and complex that they seem to defy resolution (Rittel & Webber, 1973) but typically have both local and global implications. This is compounded by often limited or incomplete data, and uncertain understanding of processes and interdependencies. Because of complex interdependencies, "*the effort to solve one aspect of a wicked problem may reveal or create other problems*" (Langellier, 2013, p.215), the knock-on effects often being unpredictable or inadvertent. Applied solutions may be irreversible and the fallout not known for a considerable time. Typically time is often viewed as running out where wicked problems are concerned, and there is generally a 'no stopping' rule. There are dynamic, continually changing requirements to solutions, with high levels of uncertainty, ambiguity and contradictions. The issues are typically characterised by lack of agreement about what should be done to find and implement

remedies and interventions. This may be due to high degrees of scientific uncertainty and lack of consensus (Brown *et al*., 2010) coupled with the shifting views of stakeholders "*because of incomplete, contradictory, and changing requirements* [making] *surrounding demands are often difficult to recognize*" (Langellier, 2013, p.215). Stakeholders will often have different perspectives and beliefs, there may be disagreement about the nature of the problem and what could and should be done to solve it (Brown *et al*., 2010), making the numerous stakeholder perspectives difficult to accommodate. In addition to the science and socio-economic imperatives, there may also be moral and ethical dimensions to the issue that mean that there is no right or wrong solution and may be inadvertently detrimental (Jentoft & Chuenpagdee, 2009; Conklin, 2006) or difficult to determine (Rittel & Webber, 1973). Consequently, some wicked problems are seem as possibly having no solution or, at least, beyond current technology or current scientific knowledge and understanding. Instead, for wicked problems, "*governance must rely on the collective judgment of stakeholders involved in a process that is experiential, interactive and deliberative*" (Jentoft & Chuenpagdee, 2009, p.553). Consequently they require difficult political decisions to be made for which there are currently no correct or optimal solutions (Brown *et al*., 2010; Conklin, 2006). Basically every wicked problem is unique and novel (Rittel & Webber, 1973) and the consequences are so great that necessitates intervention with the objective of corrective action.

These challenges have necessitated changes in the ways of doing research with shifts to collaborative interdisciplinary studies that "…*requires thinkers who can transcend disciplinary boundaries, work collaboratively, and handle complexity and obstacles*" (Cantor, 2015, p.408). This often involves working at a problem from different angles and viewpoints, involving people who would not usually work together – scientists working with planners and politicians. As a result it requires thinkers who can transcend disciplinary boundaries, work collaboratively, and handle complexity and obstacles (Rittel & Webber, 1973). Unfortunately, effective decision-making and responses are often 'clumsy' (Thompson, 2003; Verweij, *et al*., 2006) or 'elusive' (Jentoft & Chienpagdee, 2009; Brown *et al*., 2010), often with avoidance or stalling for time by practitioners and policy-makers. The result is viewed that "*since wicked problems are part of the society that generates them, any resolution brings with it changes in that society*" (Brown *et al*., 2010, p.4).

So Geography has a unique position in which to unite subjects and work towards a potential solution or correction. 'Wicked problems' are encountered in all disciplines, from health to planning to

ecology. Wicked problems permeate most, if not all, fields of Geography, but are particularly associated with environmental and social sustainability, and human-induced climate change. The researching and teaching of wicked problems is integral to Geography because the subject draws ideas and influences from others subjects, it inherently transcends many subject boundaries, and seems a natural home for integrating study and projects of many environmental and social wicked problems. Geography by its nature is a natural host for discussing and examining complex multivariate and disparate problems crossing disciplines, facilitating nexus thinking, and integrate ideas from cognate disciplines into a geographical perspective (Kate *et al*., 2019) as well as combining internal disciplinary sub-fields (Ziegler, Gillen, Newall, Grundy-Warr, & Wasson, 2013). Complexity is inherent in much of the environmental and social issues, geography as a subject draws on many other subjects, and employs geographical perspectives, often in a more holistic transdisciplinary approach. The diversity of skills and knowledge possessed by Geographers means they are well placed to contribute to wicked problems.

However, the term 'wicked problem' tends not to be widely recognised in Higher Education standards and competences policies and documentation, which has implications for how and when such advanced ideas are introduced. For instance, the Benchmarking Statement for undergraduate Geography courses in the UK (Quality Assurance Agency, 2019) refers to multiple attributes that are relevant to dealing with wicked problems (e.g. section 3.15), but there is no specific reference to 'wicked' or 'messy' problems and the higher-level transferable skills required to deal with are given a cursory acknowledgement (e.g. section 4.9). In the UK, the generic academic level descriptors (Quality Assurance Agency, 2018) recognise the need for the development of problem-solving skills and critical analysis through academic levels (sections 4.10 and 4.12) and communicating technical information to a wider audience (section 4.15). However, there is no mention of dealing with complexity and uncertainty that are inherent to wicked problems until Master's Level 7 (section 4.17) but there is no mention of collaboration, stating students are required to "demonstrate self-direction and originality in tackling and solving problems" (section 4.17). Even at doctoral Level 8 there is no explicit mention of messy problems (Quality Assurance Agency, 2018). The situation is similar internationally and, consequently, explicit reference to wicked problems tends not to permeate the course descriptions of Geography programmes. However, the knowledge, understanding and skills relevant to dealing with wicked problems is implicit in many Geography programmes.

The globalised, inter-connected world that exists necessitates the need for Geographers to teach wicked problems. It is vital to develop knowledge, understanding and, in particular, the skills to the next generation to deal with the opportunities and challenges of new ways of researching through interdisciplinary collaboration. However, it quickly becomes clear that the teaching of wicked or messy problems offers challenges as well as opportunities. The properties of wicked problems (Duckett, Feliciano, Martin-Ortago, & Munoz-Rojas (2016); 2016; Jordan, Kleinsasser, & Roe, 2014; Rittel & Webber, 1973) will require students to recognise and deal with challenging and demanding concepts. This includes the indefinable and non-generalizable nature of an ill-defined problem, and the ambiguously-bounded nature of complex, multivariable issues with high interdependencies of variables. The repercussive nature of wicked problems, where every solution is symptom of another problem, offers particular challenges in that attempts at problem-solution may result in problem-generation, thereby resisting attempts to simplify case studies. Similarly, the ability to visualise and critique potential solutions and future scenarios are also challenging but important to consider. Other properties of wicked problems will tend to be less critical, for instance an appreciation of the temporally-exacting nature (where time is running out and there is 'no-stopping' of the consequences) would be important only as a confining variable in hypothetical case studies. In addition, when teaching about wicked problems, tutors need to be aware of the responses of students – they may experience feelings of being overwhelmed or inadequacies due to limited knowledge or understanding, or anxiety concerning the issues.

The skills that we would require our students to develop include: openness of dialogue with others from outside your subject area; to share and respect different worldviews and subject perspectives; to utilise different knowledge and technical skills; to be able to handle complexity and uncertainty; to be resilient when faced with setbacks and obstacles that inevitably arise; and, to stimulate imagination and creative thinking to come up with potential solutions to evaluate (Brown *et al*., 2010). Students will have to demonstrate reflexivity and resilience to deal with scaling and unpredictability issues (Termeer, Dewulf, Karlsson-Vinkhuyzen, Vink, & van Vliet, 2016) and "handle complexity and setbacks" (Cantor *et al*., 2015, p.408) associated with wicked problems.

The inclusion, either implicitly or explicitly, of wicked problems into the curriculum offers opportunities as well as challenges. What range of skills and competencies are required for students (and indeed researchers) to deal with wicked problems? Firstly an understanding of the complexity of

environmental and social systems to develop a critical understanding of complexity and interlinkages associated with 'messy' problems. Expecting students to recognise and deal with ambiguity and uncertainty may be particularly challenging for students at lower academic levels. Research-informed teaching can enable case studies to be integrated into teaching that can be useful for setting the contexts and complexity (Davidson & Lyth, 2012). Secondly, students require a good grounding in problem-solving and critical thinking of non-wicked problems before contemplating more advanced analysis. Introducing problem-based learning using a more inquiry-based approach with authentic learning proves an inclusive research practice of collaborative thinking and work (Brown, 2010; Davidson & Lyth, 2012). Problem-exploring through team practice can be done using smaller activities to simulate larger issues, such as using video to explore how to solve problems, can promote work together as a team (van Kooten & Berkley (2016).

At what academic level is it most appropriate to introduce wicked problems? It is important not to shy away from complex issues but it should be taught in appropriate ways at the various educational levels, whether at primary (elementary) school or university. Undoubtedly ethical dilemmas need be discussed in greater depth at higher academic levels. How should teaching of wicked problems be taught - embedded implicitly, or explicitly discussed, either embedded within the curriculum or as standalone modules (Davidson & Lyth, 2012)? There is a clear need for students to be increasingly exposed to (team) working across subject disciplines, to share ideas and collaborations. Group work is a key skill. Mixing students with diverse backgrounds or subject knowledge should be welcomed at any level but can be extremely challenging and stressful for students but often results in interesting (and unpredictable) results (Norris, O'Rourke, Mayer, & Halversen, 2016). The earlier students' encounter this approach as an undergraduate the more familiar and confident they will be to undertake more demanding collaborations at higher academic levels.

Finally, our undergraduate curricula should strive towards developing the higher-level transferable skills such as environmental justice, positionality, identifying debunking fake or misleading information, and so on. There are also opportunities and challenges for tutors. Academic tutors also need to have the skills and confidence to facilitate such new ways of teaching and learning, including inter-disciplinary modules with cognate subjects, but also to occasionally take risks to develop fully transdisciplinary modules or to work with traditionally non-cognate subjects such as creative writing or Drama, and to devise and share effective pedagogies. Similarly there are also opportunities and

challenges for course designers and the institution. Most recently, some institutions have moving towards the liberal arts, whereby the traditional discipline 'silos' are dissolved and collaborative research and teaching is encouraged, integrating the sciences, humanities and arts. For instance, the rise of Environmental Humanities in some UK institutions has led to increased liberalisation of the curriculum and the introduction of transdisciplinary courses, modules and projects. Moves towards offering Open Modules which are available to all students are particular suited to interdisciplinary topics such as sustainability and climate change. Should students be encouraged or even compelled to take inter- and trans-disciplinary modules?

Consequently the ability to deal with wicked problems will necessitate the development of new and innovative learning and teaching strategies. Thus teaching wicked problems can become a wicked problem in its own right, with tutors wrangling with the challenges of facilitating workshops, students dealing with (multi- or inter-disciplinary) group work, and targeting the right blend of knowledge, understanding and skills with appropriate activities at various academic levels. Curricula will need adapting to accommodate an enhanced or even new series of learning thresholds, which may include a knowledge of systems and their complex interactions and feedbacks, developing problem-solving skills within team working, developing communication skills to share across academic disciplines and non-academic audiences. The development of higher-transferable skills required to deal with working on wicked problems is one of the fundamental challenges of policy-makers, so it conforms to the raising of professional expectations of our students. And so, as educators and course designers, we need to think carefully how we (and when) introduce 'wicked' problems and the development of new and possibly higher-level geocapabilities to our courses in response to societal needs. Whether modules are multi-disciplinary, or interdisciplinary or truly transdisciplinary will offer challenges to faculty depending on faculty expertise, whether experienced and/or brave to develop more advanced interdisciplinary collaborative ventures, the responses of students to new and typically challenging ways of teaching, learning and assessments, and the teaching strategies employed to develop higher-level transferable skills. Breaking out from disciplinary 'silos' involves risk and quickly-developed experience of faculty. As an intermediate state, interdisciplinary approaches shows maturing of the collaboration as different disciplines work together towards a common objective, but still retaining their own practices. The ultimate goal for the teaching of wicked problems is possibly to achieve transdisciplinarity, whereby others' constructions of knowledge, world views and methods of inquiry

are acknowledged. This approach strives for collective understanding of an issue, such as adopting your own methods and concepts to others' approaches to create a new approach (Brown *et al*., 2010). All of these approaches will require increased facilitation by tutors, the careful scaffolding of support for students, and the potential introduction of reflective practices through learning journals or verbal sharing of experiences (Davidson & Lyth, 2012). However, there are risks. Haigh (2014) adopted transformative learning theory to encourages students to think completely differently is both challenging and liberating, taking risks to develop ideas outside the students' or group's 'comfort zone'. There are other alternative opportunities such as working with stakeholders on active real-world projects (Dentoni & Bitzer, 2015; Paynter, 2014) and service-based learning (Cantor *et al*., 2015).

The papers in this Symposium show how it is possible to integrate the teaching of wicked problems into the curriculum, highlighting the opportunities and challenges based on the experiences of students and faculty. The teaching and study of wicked problems in our curriculum not only demands a new mindset amongst academics, but also a new emphasis for students to engage with the challenges and opportunities of this approach. The editorial team for this Symposium hope that the readers will be challenged and inspired by the studies in this section.

The Symposium papers

This Symposium grew out of a paper session at the Royal Geographical Society's annual conference in August 2016, held at the Royal Geographical Society, London. Sponsored by the *Higher Education Research Group* (now the *Geography and Education Research Group*) of the RGS-IBG, the session on "*Wicked problems in Geography: researching and teaching complexity and uncertainty*" reflected the nexus-thinking theme of the conference by exploring the opportunities, challenges and experiences of teaching wicked problems. The papers in this Symposium consider the latest developments in the teaching of wicked problems. The structure of this Symposium reflects four themes: the first paper provides a review of the 'lay of the land' using climate change as an example (Cross & Congreve, this issue); the next two papers offer examples of innovative cross-disciplinary curricular (Şeremet, Haigh, & Cihangir, this issue; Rivera & Groleau, this issue); the third theme of creativity and culture for future world building is explored in three papers (Law, Corbin, Wilkins, Harris, Martin, & Lowe, this issue; Mellor, this issue; Hoffman, Pelzer, Albert, Béneker, Hajer, & Mangnus,

this issue). The emphasis of the final papers is on preparing the next generation (Favier, Cyvin, van Gorp, Cyvin, & Palings, this issue; Sharp, Fagan, Kah, McEntee, & Salmond, this issue).

Cross & Congreve (this issue) undertake an insightful review of undergraduate Geography courses in the UK and Ireland. The authors issue a challenge for the super-wicked nature of climate change to be better embedded through authentic learning of 'real-world' challenges, particularly through fieldwork and authentic assessments. Their findings reveal that "*most interviewees did not report a clear framing, or positioning of climate change*" in undergraduate curricula, delivered through individual modules rather than permeating the entire programme. They found that teaching of climate change was "*framed in the context of broader societal issues in individual modules …* [with] *occasional references to environmental or global citizenship*" (Cross & Congreve, this issue). They highlight the need for better integration of the topic, in particular aspects such as social justice, within programme-level design, and offer seven principles of good practice for programme planning. The important influence of professional bodies driving curriculum change through accreditation schemes and subject benchmarking should be seen as key agencies in steering the knowledge and skills-set that students and researchers need to acquire for the wicked problems facing our world.

In the first of two papers on innovative cross-curricular curricula, **Şeremet, Haigh, & Cihangir (this issue)** argue the need to develop key geocapabilities of students. The use of authentic learning is again recognising as a key element. The authors outline how Game Theory (using the example of the Prisoner's Dilemma) can be effectively used with Tourism Management students to challenge and develop high-level transferable skills, in particular strategic thinking, negotiation, ethical self-positioning and developing Emotional Intelligence, and problem-solving skills that are essential to deal with the complexity, uncertainty and risk-taking inherent with dealing with wicked problems. They conclude that "*students who are exposed to 'wickedity' through engagement in team-work-based, project-oriented, problem-solving contexts gain useful experience that transfers easily into their future careers*" (Şeremet *et al*., this issue). In the second paper on cross-curricula aspects, **Rivera & Groleau (this issue)** examine how subject silos can be dissolved and replaced with collaborative teaching and projects that grapple with 'real-world' wicked problems. Introducing geographical perspectives and techniques (namely GIS and quantitative analysis) to Business students enabled them to develop 'locational intelligence' and more robust, interrogative ways of problem-solving to deal with the 'messiness' of real-world data and issues. Authentic learning is a recurring theme.

Significantly, the authors recognise the need for faculty to take risks in designing novel and innovative collaborative projects concluding that "*we were willing to step out of the comfort zone of our own disciplines to take on new perspectives and problems with our students and with each other*" (Rivera & Groleau, this issue).

The next three papers explore how creativity and culture can be harnessed by Geography to explore and communicate wicked problems not only for teaching purposes but also to start to communicate ideas and practices more widely in society. The crossover from science to social to policy and governance is extended by consideration of communicating wicked problems to wider audience through art or drama. Authored as a co-partnership between tutors and students, **Law, Corbin, Wilkins, Harris, Martin, & Lowe (this issue)** outline an innovative and creative interdisciplinary student-centred collaboration between Geography and Drama. The writing and production of the play "*provided an opportunity for more open exploration of the* … [participants'] … *knowledge base and transforming views through peer–peer learning*" (Law *et al*., this issue). The subject understanding of Geography students on the issue of climate change was combined with the creative expression of the Drama students through facilitation of co-curricular workshops, and the use of storytelling as a vehicle for communicating complex and technical issues to a wider (public) audience. The authors discuss the psychological barriers to engagement with climate change, acknowledging the 'eco-anxieties' and misconceptions of other students. The authors found that "*other students at the University felt that there had been a lack of dialogue in their lives about climate change, and that misconceptions were widely shared among the Actors' peers*" (Law *et al*., this issue). The authors believe that although "*wicked problems are inherently daunting for learners, but environmental psychology identifies approaches to make climate change less abstract*" (Law *et al.*, this issue). Thus, this paper argues, there is potential and value of Geography student to act as 'sustainability ambassadors' to discuss and educate their peers. Collaboration with the arts is continued in the paper by **Mellor (this issue)** where participatory workshops involving stakeholders, including students, from two communities consider global-local linkages and social constructions of place in the context of climate change and enable fears and concerns, and opportunities and challenges to be openly-shared and explored. Participants "*invent new, and often times fantastical, elements as a starting point for interrogating how we might to respond to the evolving challenges climate change*" (Mellor, this issue). The author concludes that situating the issues are vital, creating a dialogic space (a 'Magic Circle') that fosters

"*speculative and imaginative world-making*" for creative expression and solution-finding, and finally enabling stakeholders to find their own novel solutions to the wicked problems faced. Mellor's (this issue) "*imagining new possibilities for new worlds*" is developed further by **Hoffman, Pelzer, Albert, Béneker, Hajer, & Mangnus (this issue)** through the concept of 'futuring', the "*active imagination of the future*", as an integral part of dealing with wicked problems (Hoffman *et al*., this issue). The authors challenge their students (and the reader) with the premise that "*the imagination of the future requires an understanding of the way in which the future is already in the 'here and now' as an emergent potentiality and object to sense- and meaning-making processes by different groups in society*" and that "*futuring can be conceived as a way of worldbuilding*" with multiple possible futures (Hoffman *et al.,* this issue). The students discuss issues and design artefacts to include in a public exhibition in the 'Museum of the Future'. The students develop critical engagement and experiential learning facilitated through a series of educational activities appropriate that includes a 'detective wall', creating the exhibition and creative expression (such as presenting their world from the perspective of 2050). The authors acknowledge that students find this challenging and require 'scaffolding' support by tutors as facilitators, concluding that "*a futuring approach to education indeed contributes to an enhanced sense of agency among students in dealing with wicked problems*" (Hoffman *et al*. this issue). The papers in this third section highlight the value of interdisciplinary collaboration, how the co-partnership of faculty and students to create new ways of communication, although challenging, can be inspirational and influential, not only for the students and facility, but also for wider engagement with other students or the public.

The papers of the final theme focus on preparing the next generation and introduces 'hopeful geographies' in the discussions of the effective teaching of wicked problems. **Favier, Cyvin, van Gorp, Cyvin, & Palings (this issue)** discuss the course design and geocapabilities that students undertaking teacher-training need to prepare for climate change teaching in schools. Using the Pedagogical Content Knowledge (PCK) framework, the paper identifies key areas to be considered in course design, including the internationalisation of perspectives, encouraging interdisciplinarity, undertaking fieldwork and place-based studies, and addressing preconceptions. The authors suggest that an implicit approach to teaching wicked problems will translate best from students training to teach to teaching in schools. The interest in exploring wicked problems as part of teacher training shows that it is important to introduce such concepts, and indeed reinforce the idea that wicked

problems are inherent in Geography. The final paper by **Sharp, Fagan, Kah, McEntee, & Salmond (this issue)** provides an inspiring and practical conclusion to the Symposium collection. Sharp *et al.* (this issue) remark that "*the way these concepts are taught is more important for student learning than the nature of wicked problems themselves*" and so students need to develop situated knowledges about wicked problems. The paper identifies situated knowledge and hopeful approaches as being the key to effective teaching about wicked problems. Insights include creating safe spaces for teaching and learning, for students to express themselves without risk or judgement, the facilitator openly showing their limits of knowledge or experience, and encouraging the co-production of knowledge and understanding. The authors provide a toolbox of approaches to teaching and learning that can be applied to any wicked problem.

Concluding remarks

The papers in this Symposium on wicked problems highlight the varied fronts in which faculty are addressing the challenge of teaching complex geographical and environmental issues in a society that requires its practitioners to be able to work beyond their subject silos in multi-, inter-, and, increasingly, trans-disciplinary ways. The key recurring themes are the need for situated learning, authentic case studies and assessments, delivered through collaborative projects. It is apparent that the development of higher-level transferable skills, such as team work and interdisciplinary contexts is important. However, problem-solving skills are the foundation of more advanced research approaches, and adequate and sufficient training needs to be built into curricula. But there are other advanced skills, such as negotiation and envisioning of the future, which are increasingly being required of graduates, and so it is a challenge to professional bodies to consider whether these needs to be acknowledge and integrated into accreditation or subject benchmarking statements. So too is the need for our Geography graduates to have imagination and creativity. Finally, the teaching of wicked problems requires creativity and imagination to imaging futures and worlds – perhaps this is a new Geography involving interdisciplinary collaborations dissolving existing subject silos?

This Symposium confirms that the nature of Geography is at the heart of teaching about wicked problems. It has always been an implicit facet of what we do, but now more than ever it seems timely and relevant to make not only students, but also faculty and managers, aware of the need to recognise that the teaching of wicked problems through a geographical perspective may bring about a

closer resolution. Whether this continues to be done implicitly or explicitly in our curriculum is an area of debate. In fact, the cliché that teaching wicked problems is a wicked problem in itself is very evident. Climate change is a recurring topic in this Symposium, which suggests that this would be an attractive and effective focus for the integration of wicked problems into the curriculum, not only in Geography but also across Higher Education institutions as part of any sustainability education agenda. However, an emerging aspect in our teaching is the consideration of emotional intelligence in order to address any eco-anxieties, misconceptions, pessimistic connotations associated with wicked problems. Finally, the papers in this Symposium contribute to hopeful geographies that the current and future generations of students will contend with the growing wicked problems faced by the world, and more now than perhaps ever it is the moral responsibilities of educators at all educational levels to prepare students for future challenges and opportunities.

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