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Resilience and Pedagogy: Learning From International Field Studies in Urban Resilience in Canada and Germany

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What impact does an immersive, international field school experience have on learning about urban resilience; and conversely, what impact does a framing concept of urban resilience have on international field schools in environmental and planning studies? This article reports on qualitative analysis of learning outcomes related to a novel pair of international field schools on the theme of urban resilience. Our field schools took place with German and Canadian students seeking to understand urban resilience in two different contexts, one a context of urban decline and post-industrial transformation, the other a context of urban growth encountering new climate change-related constraints. We found that the elements attributed the most importance for learning by students were the immersive experience of instrumental efforts being taken to advance urban resilience and the opportunity to see concepts of urban resilience put into action in the field. Mixed success was achieved in the students' ability to incorporate more intrinsic understandings of urban resilience into their experiences; in particular, instructors' expectations of students' readiness to engage in social and peer learning were tested, as were the complications in navigating across instrumentalist and intrinsic understandings of urban resilience. This review of field school and resilience pedagogy offers insight into the challenges of teaching and learning in the terrain of urban resilience.

Keywords

education research, urban resilience, international field schools, Canada, Germany

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INTRODUCTION

Whereas traditional classroom settings are the tried and true means to deliver knowledge to students, learning in the "field" is considered an advantageous bonus for participants' learning. The experiential and immersive value of field school learning has proven so popular as to have become a ubiquitous curriculum component in environment-related disciplines (Fuller et al. 2006, Curran et al. 2019).

Ubiquity, however, does not necessarily prove that the purported benefits to student learning or understanding play out in all field school contexts. Other studies promote the general benefits of student learning from field schools, notably: better retention of lessons learned (Manner 1995) and improved cognitive abilities (Heinrich et al. 2015). At the same time, pedagogical researchers warn that field experiences do not offer a clear and direct path to the "truth" that students are seeking when it comes to environmental studies (Nairn 2005). Typically, educators tout the benefits of field courses in allowing students to explore new, less sanitized and less filtered epistemologies, compared to textbook and classroom learning. Scott (1992, 25) has suggested that this "evidence of experience" method often still "reproduces rather than contests given ideological systems." Neither classroom nor experiential education, in and of themselves, ensure access to the kind of perspective and understanding necessary to critically question the many assumptions, beliefs, and accepted practices in which we are all immersed (Fuller et al. 2006). Additional work is demanded of educators to equip their students with the tools to dig into reality, its pretenses, how external realities connect to our independent behaviours and its leverage points for transformative understanding and action.

This work is compounded when the subject of study has the practical complexity and conceptual over-determination of the idea of "resilience," now a prominent term in environmental and planning-related studies that is beginning to develop as a key concept in environmental education as well. As a conceptual framing device in both planning and environmental education, resilience is treated both in an instrumentalist way – a means to build content knowledge for appropriate action – and in an intrinsic way – as a set of personal and collectivist values to develop and apply. Often, these two different approaches and outcomes are expected to emerge concurrently. Significantly, learning about social-ecological systems using resilience as a conceptual framing device is seen to offer better retention and improved cognitive skills, as well as affective learning outcomes such as changed values and beliefs (Fazey 2010, Honwad et al. 2014). What is less well recognized is that achieving these distinct outcomes demands different learning qualities and pedagogical strategies.

Building on the promise that "[Experiential learning] reveals the complexity of geographical problems but…in the field this complexity then becomes amenable to comprehension" (Fuller et al. 2006, 90), this article explores the teaching and learning ramifications of experiential learning about geographical problems that are thematically-centered on the challenges of urban resilience. Our study examines a reciprocal student learning exchange between the Technical University of Dortmund in Germany and Simon Fraser University in Vancouver, Canada. Students embarked on two-week excursions to the Ruhr and Metro Vancouver regions, respectively, to explore potential urban resilience opportunities and challenges. Through an account of our experimental course design and qualitative analysis of student reflection data, we examine the outcomes of this pair of courses in terms of the qualities

of learning in the field this international group of students experienced as they engaged with the complexity and uncertainty of practices of urban resilience.

This specific research question relates to broader questions about how to approach environmental education in our times. At the end of the focal decade for Education for Sustainable Development, UNESCO (2014) released a summary report positing four main dimensions of the task. In addition to the learning content itself, the first dimension, the other principles included: emphasis on pedagogy and learning environments that inspire action for sustainability; on learning outcomes defined to include the needs of future as well as present generations; and on the empowerment of learners to transform themselves into transition managers and global citizens of a green economy and society. A major challenge in effective environmental education is characterizing and contextualizing the complexity of acting in the service of sustainable development without leaving students feeling lost in a sea of uncertainty – offering learning that inspires action. As Fuller et al. (2006) suggest, experiential learning, compared to classroom learning, can help reveal and demystify complexity as students are challenged to constructively engage in real world contexts. Learning via the "co-creation" of skills and techniques in partnership situations in real world settings in order to grapple effectively with complexity and uncertainty is offered as a new essential for students (Rooij and Frank 2016). Resilience, itself, can be considered a framing concept within environmental and planning studies, a tool for understanding and situating practice within this sea of uncertainty (Meerow et al. 2016). In putting the concept of resilience into practice in our field school, we tested the effectiveness of this concept in terms of how it served to orient students both to urban planning situations in which an instrumental approach based on urban resilience is being applied, and to the epistemology and set of values demanded intrinsically of resilient practitioners and change agents.

This is an important line of inquiry for environmental educators at this time as "resilience" rises in prominence in environmental education and planning studies, while the impact of using this term remains unclear. Indeed, a heated debate exists on the meaning and utility of resilience in planning and environmental studies. Emblematic of the lack of clarity around the use of the term resilience in planning are Davoudi et al. (2012, 299): "[I]t is not quite clear what resilience means, beyond the simple assumption that it is good to be resilient" (see also Stumpp 2013, Meerow et al. 2016). Illustrating Davoudi's assertion regarding the lack of a common ontology in resilience discourse, the term can be characterized as being either engineering or ecologically-focused (Holling 1996, Swanstrom 2008), evolutionary in nature (Cowell 2013, Davoudi et al. 2013), or as a framework with several distinct characteristics (Rodin 2014), along with a multitude of other overlapping and contradictory understandings.

In environmental and sustainability education, Krasny and colleagues (2011) are some of the early investigators of the interoperation of concepts of resilience and learning. They found that the notion of resilience in social-ecological systems had received little attention to date, yet that it had the potential to advance environmental and sustainability education scholarship in three ways. First, resilience scholarship added dimensions and dynamics of change to more stasis-oriented mainstream concepts of sustainability in education. Second, resilience thinking prompted new and productive lines of research about learning at the intersection of social and governance systems and natural resource systems. Third, core concepts of social-ecological resilience promised to offer positive learning outcomes for individual learners because they were

consistent with environmental education goals. Learning should be considered the lynch pin connecting sustainability and resilience thought and action (Lundholm and Plummer, 2011, 21). As a component of societal response to the lack of resilience in cities, learning is considered key – although a variety of perspectives exist on the form and nature of the learning we need. Our approach here begins in support of the need for learning to be experiential and active.

Within this context of conceptual array, we report on what we can say students learned through an immersive, international and local experience field school in urban resilience.

Review of Literature on Resilience and Pedagogy

As the use of resilience in teaching in environmental and planning fields is relatively new, the literature on resilience and pedagogy specifically is thin.

Russ and Krasny (2017, 9-10) conclude from 30 chapter contributions that "urban environmental education offers opportunities for participants to … recreate the meaning of place in cities and thus play an active role in transforming the places where most of the world's population lives." In keeping with this view, the pedagogical research case study presented here represents an attempt at critical, place-based and expeditionary education.

In the most extensive series of edited volumes related to the subject of universities and environmental education, the Palgrave World Sustainability Series edited by Filho and colleagues, less than 5 % (31 of a total 626) of the chapters across the 21 published volumes we examined reported specifically on experiential, immersive, and otherwise non-traditional learning environments. These chapters represent 31 distinct initiatives and accompanying research to understand how learning about environment and sustainability changes when it occurs outside the classroom. A few of these efforts approximated field school environments, such as a studio course in which students aided the disaster recovery efforts of an Australian community hit by wildfire, an effort in community asset mapping and generation of opportunities for sustainable tourism in a tourism-dependent community, a participatory action research projects in India and Kenya, and engagement with a fishing community in the Azores Islands. Concepts that emerged from these and other cases included the concepts of civic ecology, co-production of knowledge, place consciousness, and action research, as well as systems change and experiential activities.

As a specific example of the co-creation of knowledge in new forms emerging from this approach to learning, a project at the Environmental Education and Sustainability Laboratory of the University of Sciences and Arts of Chiapas, Mexico worked with native and mestizo peoples on community sustainability efforts. They revealed the benefit of such initiatives not to participants but to the university itself: "The modern University finds fertile ground, a source of life-giving water in the painful and hopeful interculturality that throbs in the towns of Chiapas" (Reyes-Escutia 2018, 40). Universities increasingly see both a sustainability agenda and an internationalization agenda as an important part of their mission in offering new scientific and cultural perspectives, and changing the minds of the 'next' generation (Delgado-Marquez et al. 2013, Hale et al. 2013, Paige et al. 2009). International educational travel is said to offer "pedagogical benefits, intercultural competence, chances and challenges" (Lopez et al. 2016, 22). Another case, while reporting on the benefits of "community living" for the academic

participants in an experiential sustainability project, who became more aware of "real needs," also specified value offered by the program in "to integrate, implement, and communicate urban planning and sustainability concepts in the community" (Gelpi et al., 2018).

Students are reported to be sensitized to real-world conditions and necessary trade-offs when making plans for sustainable development "in the real world." For example, an international service learning course for Canadian students in rural Mexico was described as a key pedagogy "to be able to develop students' knowledge, skills, and attitudes such that they are prepared to address these non-technical challenges (like public welfare and social justice issues)" (Winkelman et al. 2016, 310). Some researchers further specify the type of new knowledge, skills and attitudes that students are coming to expect from studies related to sustainability and resilience. In a case of environmental education for teachers in training, teachers were conceived as needing resilience skills in order to become part of a "social belt of transmission" of those skills: "teachers with resilient characteristics are necessary to strengthen resilience in their students. Then, students could share individual resilience with their friends, family and neighbors, to create a social belt of transmission of resilience permeated by environmental education for sustainability" (Cajigal et al. 2018, 185). Another project-based learning initiative pointed out that it offered students new skills in cooperation and co-creation: "the establishment of a broad network of relevant stakeholders in the learning process, as a platform for student research and practical insights, provided a methodological approach of cooperation which can be applied in the future" (Lovren et al. 2016).

Another key new skill targeted in several of these initiatives was that of "change agency." Providing experiential demonstration to students of effective citizen behavior was a key piece of the training offered, such that participants could go on to participate more effectively in local sustainability governance: "The inclusion of education for sustainability in the communities should be promoted so that the social actors know the importance of their actions and recognize their potential for change" (Tiepo et al. 2018, 219).

This set of case studies demonstrates above all else that the means by which to assess and understand the impacts of field-related initiatives toward sustainability has yet to be clearly and unambiguously determined. Those involved in designing and researching these initiatives point to clear evidence of short term positive impacts on participants from all sides, using logic such as: "Conventional classroom learning from books, wall charts and memorization often results in youth's negative attitudes towards environmental sciences. Environmental education researchers therefore have suggested that classroom interventions or combinations with field experiences that actively involve youth may promote pro-environmental behaviour, knowledge and positive attitudes towards the environment" (Skanavis and Manolas 2015). Researchers and instructors tend to be more tentative on even their capacity to know what impacts they may have in the longer term: "While the potential for 'real world' impact animates student learning and makes engagement meaningful, broader impacts can be hard to conceptualize and assess; arguably the more potentially consequential the impacts, the more they are likely to be mixed and hard to understand." (Jiusto and Vaz 2016, 125).

Honing in from the above, our review of the interdisciplinary literature on case studies of resilience in pedagogy specifically revealed a total of 22 sources. Of these, 12 were related to field schools, 6 to teaching and learning more generally, and 4 related to experiential learning.

These studies provide perspectives on the benefits and risks of field schools, details about how student learning was assessed, and inductive analysis of learning based upon examination of these assessment data. These studies report agreement that despite the richness of the opportunity to learn within an immersive context, active instructors continue to be essential to positive learning results.

Two recent cases in point are Owens et al. (2015) and Heinrich et al. (2015). Owens et al. (2015) conducted a field school that focused on researching understandings and history of sustainability in the Cascadia Region of the US and British Columbia. Heinrich et al. (2015) studied four separate field schools which incorporated different experiential components both on and off-campus. The two research teams drew upon a qualitative analysis of student reflections, observational writing, and essay assignments to suggest how they felt their learning was impacted by the field school context. Recognizing that learning is largely determined by individual conditions (Ewert and Sibthorp 2009), Owens et al. (2015) highlighted students' perceptions of the excursion as "eye opening" and to have "challenged assumptions about formal learning" (Owens et al. 2015, 319). It also facilitated a more integrated and immersive approach to learning; one student stated that, "Unlike a conventional lecture setting where 'you learn about something and when you leave you try not to think about it,' on the field school 'you talk about [course material] because you can't stop thinking about it . . . you are immersed in it'" (Owens et al. 2015, 319). This suggests at the same time that experiential immersion helps legitimize the real-world instrumental relevance of learning content, and that immersion is legitimizing and conducive to social reflection and intrinsic learning.

Both of these pedagogical research projects found that critical and reflective thinking capabilities could be strengthened with the purposeful inclusion of critical thinking as a student learning outcome (Owens et al. 2015, Heinrich et al. 2015). Both facilitated the development of more thorough "analysis and synthesis" of what was being learned, which, in turn, helped foster stronger critical thinking which here seemed to be indicated by an ability to justify one's opinions to others. Heinrich et al. (2015, 375) found that experiential learning "place[d] a value on a learner's relationship with the content and [could be]… relevant to developing complex worldviews necessary for approaching environmental problems that have a mix of causes and effects with uncertain solutions."

Evidence points to growing interest and demand for field school opportunities to advance understanding of the practice of resilience, similar to what has been shown for the concept of sustainability (Holden et al. 2008). Several studies analyze the limitations of learning about resilience in the classroom. Ban et al. (2015) examine five such courses, two of which are most relevant in situating our study: one at Reading University, U.K. and one at the University of Victoria, Canada. Yoon et al. (2016) reflected on the experience of learning about resilience in the context of a field school that introduced students to thinking about "current environmental problems" in Korea, taking into account social-ecological system resilience (Yoon et al. 2016, 3).

Ban et al.'s (2015) study found that classroom learning approaches to resilience in human-environment interactions worked well for graduate students but not as well for undergraduate students. Some were "inspired" and liked the topic but other students found resilience to be "analytically ambiguous" and needed more time to conceptualize and understand

what was being taught. As noted, some students struggled to find substance within the conceptual complexity of resilience when they lacked real-world scenarios to give the concepts value; this affected student learning outcomes. Ban et al. (2015) suggest that for future research, experiential or real-world applications of resilience should be employed to engage more students, more deeply with the complexity of the topic.

Our study takes off from where Ban et al. (2015) leave off, using a field school model to help students take the complexity of resilience beyond the classroom walls and to walk right into the contexts the course seeks for them to interpret in terms of resilient systems. Onto our field school model we added the approach of a binational reciprocal exchange, for which our review of the literature did not find precedent.

Research Objective: Understanding the impact of experiential learning approaches in urban resilience studies

Our study addresses the value of experiential learning in teaching resilience, and, conversely, the impact of resilience framing in orienting an experiential field school environment. We build on the results of Ban et al.'s (2015) study and suggest ways in which experiential learning can affect learning outcomes. Complementing Yoon et al.'s (2016) study, we suggest avenues to assess student learning outcomes regarding resilience. We also assess student learning in regard to formal instruction (professor-student) and informal (peer-to-peer) relationships.

The purpose of studying the extent to which learning occurred and was valued across these three levels in our field school was to understand the order of learning in which our students were engaging in the relatively open field of urban resilience. We designed the course to offer rich content in responses to urban resilience in two international contexts, but also wanted to offer opportunities for students to come to understand the personal and institutional attributes demanded by resilience as a framing concept. Part of this personal engagement with resilience entailed a willingness to learn socially, via informal and non-expert settings and channels (Spellman 2015). The concept of social learning presents an alternative to the disappointment of linear understandings of the absorption and application of new knowledge; the alternative is to understand learning as a circulatory flow amongst social actors who attempt to try new knowledge on for its fit with existing patterns and problems (Wals 2009). Via social learning thinking, "new information is learned within communities through a process of coding that is not transparent" (Holden 2008, 4). A community can be considered a group of people that holds a "knowledge codebook" in common, and this knowledge codebook is sure to contain both explicit and tacit knowledge – respectively, the kind of knowledge that can and that cannot be articulated directly to others. This understanding of a social path to knowledge, its acquisition and maintenance, increasingly is considered key to societal capacity to adapt to new global economic and ecological conditions (Boyd et al. 2011). Social learning occurs in all human groups, including in the interstices of formal educational settings. In fact, pedagogical theory supports the adaptation of formal learning strategies to facilitate social learning – field schools can be considered one such key adaptation. Tidball and Krasny (2010, 2011) and Spellman (2015) identify social capital, particular aspects of human capital, and sense of place as key social learning outcomes that can occur within formal education settings. Field schools are particularly well suited to generate these kinds of learning outcomes; at the same time, these kinds of outcomes are also oriented specifically toward generating resilience-supporting systems.

Sterling identifies two different views of the purpose of education that draw to a point two different conceptions of resilience in learning that are seldom reconciled: one approach seeks to nurture "an external outcome" (an instrumentalist approach) while the other seeks to attain "a quality within the learner" (an intrinsic approach) (Sterling 2011, 46). Plummer (2011, 2) reflects on how this distinction translates into education about resilience when he asks: "How might we reconcile environmental education focused on the development of resilient learners and on fostering resilient social-ecological systems?" Extrapolating from the instrumentalist-intrinsic dichotomy in pedagogical approaches as Sterling presents them, we could refer to the dual processes in the case of a field school in urban resilience as, on the one hand, providing, "education in the service of the resilient city" vs. "education in the service of being resilient in the city."

Sterling (2011, 46) rejects the positioning of these two approaches as dichotomous choices, and posits that both should be considered to sit within a "transformative educational paradigm" of "sustainable education." Sterling (2011, 47) argues that the instrumentalist approach to achieving outcomes, "an agent by which the development of more sustainable lifestyles can be achieved," constitutes a first order approach, while the intrinsic approach is a second order approach that "involves the development of learners' abilities to make sound choices in the face of uncertainty and complexity of the future" (Scott and Vare 2008, 3). To these two approaches, Sterling (2011, 50) adds a third order approach of "social learning informed by resilience theory," which is the means by which the learning reflected in the first two orders approaches paradigm change toward resilience.

The connections between teaching and learning resilience and sustainability, and social learning processes, have been emphasized by other researchers in this field (Honwad et al. 2014; Orr 1992, Gold et al. 2003, Bruening and Frick 2004, Fuller et al 2006, Shephard 2008; Sterling 2010). Where students interact with one another, stakeholders, and professors outside of the classroom setting, an ideal situation for social learning is created. As Krasny et al. (2009) allude in their overview of the outcomes of sustainability and resilience-oriented field courses in the USA and Sweden, formal course learning objectives were strengthened and extended by social learning that occurred via unmediated interaction between peers and community members. Supporting this, Svinivki and McKeachie (2011) and Barkley et al. (2005) found that when students were given the opportunity to work together, the experience was more "dynamic" and "motivating" for students to shape and articulate their ideas. Building upon these studies, we hope to assess how unmediated social learning processes may have played a role in learning about urban resilience in our own field school context.

FIELD SCHOOL FORMAT

In 2016, Robin Chang from the Technical University of Dortmund and Meg Holden from Simon Fraser University launched a pair of new field schools to investigate and compare urban resilience in Metro Vancouver, Canada and the Ruhr Region, Germany. Together, they designed interacting, project- and field-studies based courses to operate in parallel and a research methodology to evaluate this experimental model. From September 2016 through July 2017, both instructors enlisted undergraduate and graduate students along with a host of professional participants in the initiative. The actors involved are summarized in Table 1.

Table 1. Participants in the German-Canadian Urban Resilience Exchange

F01 Project Resilient Cities (TU-Dortmund) N=11 students	In this year long, mandatory course, spatial planning students generated a group project focused on urban resilience, based in part on a two-week excursion to Metro Vancouver in March 2017.
GEOG 449 (SFU) N=24 students	A fourth year, one semester seminar course in urban geography designed to include the codesign and hosting of a workshop on urban resilience in March 2017 together with the TU Dortmund students.
GEOG 497 (SFU) N=10 students	A fourth year international field school in geography, oriented around a two week excursion in the Ruhr in June 2017.
URB 694 (SFU) N= 3 students	An independent study elective course within the graduate Urban Studies program, which permitted these students to take part in the German field school.
Researchers and practitioners in urban resilience, Metro Vancouver N= 40	Practitioners in resource management, flood management consulting, regional water management, environmental and sustainability consulting, architecture, engineering, urban development, policy analysis, real estate. Researchers in environmental education, environmental impact assessment, landscape planning, climate change visualization, climate change adaptation, risk management, and public engagement.
Researchers and practitioners in urban resilience, Rhine-Ruhr N= 35	Practitioners in regional water management, public engagement, municipal flood protection, urban planning, urban development, local *industriekultur* architecture, regional planning association, environmental consulting firms. Researchers in urban development, cultural heritage, sustainability, urban governance, environmental economics, environmental management, and Canadian/American studies.

In this pair of field schools, the cities were the classrooms, as students engaged in learning across disciplines and domains of urban and resource management, planning and cultural practices, both at home and abroad; and applied a problem-solving approach (Russ and Krasny 2017). They included both local and global place-based elements, due to the reciprocal international exchange element in which students were paired with international peers in order to bridge gaps in experience and understanding as they visited one another's home places. They included a "critical environmental education" element through the co-design of student, expert and public workshops in both international field school destinations, in addition to guided visits in which students were encouraged to ask difficult and comparative questions, to "create new spaces for collaborative and social learning" (Stevenson et al. 2017, 56) within the field school environment. We also valorized the "learningscape" of individual students through the inclusion of group discussions, travel reflections and first person blog essays as field school elements, prodding students in these ways to relate their course learning to their "movement through life in various social roles and how [they connect] experiences and make meaning and learn cumulatively across and among all experiences" (Heimlich et al. 2017, 119). In addition to the value of immersive experience for connecting the personal lifeworld to the material presented for learning, we also expected the field school approach to offer enhanced learning opportunities due to the intrinsic motivation that manifests for field school travelers who must summon a level of autonomy and self-determination required to adjust and operate in an unfamiliar destination (Heimlich et al. 2017).

The urban resilience content offered within these two contexts is rather starkly different. While both regions face urban resilience challenges related to water management, the Vancouver region experiences this threat from sea level rise due to climate change, whereas the threat in the Ruhr is the result of subsidence due to over a hundred years of coal mining. The Ruhr region's industrial past has resulted in a need for continuous pumping of inland waters to keep the region on dry land. This history also resulted in a situation in which the Emscher River system was used as an open-air sewer. The process of modernizing an underground, piped sewer system in the region and cleaning the Emscher to bring it back to life remains underway. Added to their different histories, the two regions also face very different demographic and socio-economic trends at present, with the long post-industrial Vancouver region experiencing growth and prosperity-driven crises of social and environmental justice, and the newly deindustrializing Ruhr region experiencing decline and a struggle to reinvent a future that is neither dependent on coal nor dismissive of deep industrial heritage. The comparative context presented by this pair of cases represents different expectations of what aspects of the urban system need to be made resilient: in Crescent Beach, in the Vancouver region, the coastline management approach and shoreline development and residential servicing arrangements are the focus of resilience planning work, whereas in the Ruhr, a massive legacy of outdated coal mining and coking infrastructure needs to be cleaned, repurposed and revitalized. The two regions represent different systems elements in flux, from the flows of water to attitudes about beach living and beach access, to the economic base, attitudes about the uses of rivers and undeveloped landscapes and core infrastructure. Different processes are considered to be driving these changes, in between climate change and global economic trends.

The students were mostly in their early 20s, although some of the Canadian students were in their 30s. Most were studying in their third to fifth year of university. The majority of Canadian students had previous work experience, ranging from service, to government, to

private sector work. Fewer of the German students had work experience; some had worked previously in the service industry, at urban design-related firms and with municipal governments. Most students from both groups had previous international travel experience, but whereas the German students may have had previous travel experience in North America, most of the Canadian students' previous travel or living experience was in Asia, not Europe.

None of the students had previous exposure to the concept of resilience. Their instructors introduced them to urban planning and related literature on the topic at the beginning of their studies, in preparation for the course. Notably, the structure of the German course allowed these students to work collaboratively within a more extensive year-long research project. The Canadian travelers, instead, were asked to reflect on their learning experiences via a series of blog posts and a shorter site-based research project that placed a site in the Vancouver region in side-by-side comparison with one in the Ruhrgebiet, with respect to urban resilience.

The students were also asked to form a one-on-one learning partnership with one peer in particular for the duration of their course. Because all students were learning about the concept of urban resilience, this one-on-one correspondence was considered an opportunity to expose differences that could be related to culture or context and that could change as the pair engaged in international field study together.

In March 2017, the eleven "F01" bachelor's students from TU Dortmund arrived in Metro Vancouver to commence the first of the two exchanges. Students participated in excursions to sites with lessons for urban resilience, hearing from professionals working at the regional scale down to the site and building scale. Students had the opportunity to meet with learning partners during this exchange as well, as co-participants in some excursions, and co-organizers of a two-day workshop. This workshop, *Urban Resilience Strategies in Metro Vancouver*, was a platform for about 60 local researchers and practitioners to discuss the work of urban resilience in the Metro Vancouver context.

Following this, in June 2017, SFU students travelled to the Ruhr region for a parallel field school experience. The field school experiences were structured similarly, involving local site visits and discussions with practitioners and researchers. The students co-organized and participated in a second two-day workshop, which also involved presentations and discussions with about 50 participants including local researchers and practitioners. In addition, both groups of students presented their own research findings on aspects of urban resilience in one of the field sites.

At the end of the Dortmund workshop, students in both German and Canadian groups were asked to rate three statements about the nature of their learning. The results of this exercise foreground our analysis by providing insight into the strengths and weaknesses of our particular field school format.

First, we learned that the immersion mattered to the students and was perceived to benefit learning about urban resilience. With respect to whether their learning was influenced by being in a new place, there was virtual unanimous agreement. Students across both groups also shared widespread agreement with the proposition that their own past experiences had influenced the way they were learning in the course. (Interestingly, some students claimed that past immersive

experiences helped them to contextualize and learn, and others claimed that their lack of previous immersive experiences in other cultures helped them to absorb lessons in the present experiential learning environment.)

Secondly, regarding whether students valued learning about resilience in a social learning atmosphere which encouraged learning from peers as well as experts and instructors, the student feedback was mixed. A similar proportion of students from both countries, about one-third, agreed that they had been influenced by their peers. However, when considering whether they had learned from their trans-Atlantic peers, a majority of the German students disagreed with this; two-thirds of the Canadian students agreed.

METHODS

German and Canadian students were introduced at the beginning of their course to the research their instructors were conducting, and how data would be collected from them. Using the course learning platform Canvas, each student submitted a series of reflections, guided by semi-structured questions at inflection points during their studies: pre-travel, pre-workshop, post-workshop, course wrap-up. Upon course completion, student reflection data was assembled in qualitative analysis software NVivo and coded using an open coding strategy, consistent with the methodology used by Owens et al. (2015) and Castleden et al. (2013). In examining the data, we sought codes that would enable analysis of the data to respond to the following research question: What learning do students attribute directly and specifically to experience, compared to what they learn from experts and what they learn from peers, in the context of an international field school on urban resilience? We used the results along with our reflections on student learning as instructors to consider both how the field school influenced students' education in the service of the resilient city versus their education in the service of being resilient in the city. We expected students to report specific evidence of learning more from the international immersive experience and from their personal interaction with an international peer learning partner than they would from expert channels such as formal course materials and instruction. We expected to see evidence of students adapting the concept of "resilience" to the relationships that they formed with their partner in the course of the experience –we expected them to incorporate Sterling's (2011) two orders of learning unproblematically into their new understanding of urban resilience.

After some refinement, the coding structure developed revolved around four sets of themes:

1. Factors students noted as affecting their field school learning experience e.g. cultural and interpersonal differences, learning objectives at the outset of the course;
2. Qualities or knowledge students attributed to learning in a field school context, learning with a learning partner, or learning from experts;
3. Evolution of individual students' understandings of urban resilience; and
4. Outlier reflections which either strayed from the majority of student responses or contradicted our research expectations.

Data set assembly, cleaning and coding was initially completed by Rebecca Gunderson. Results were presented to the two primary researchers-instructors, who reviewed and raised questions independently, based upon independent assessments of student learning, which

resulted in revisions to the coding following a team meeting and discussion. After this discussion and revision process, inter-researcher reliability of the coding was 100%.

RESULTS

In order to understand how the design of our field school affected student learning about urban resilience, we begin with a presentation of the experiential learning elements that were the lessons most learned within the course. After this, we provide a more critical analysis of what design aspects may have worked against learning across instrumentalist and intrinsic learning orders in the three registers we targeted: learning in the field, learning from international peers, and learning from expert instruction, in workshop and cultural exchange settings.

Learning in the field

Overwhelmingly, both Dortmund and Vancouver-based students felt that the site visits allowed them to contextualize their learning within the international cultural and social fabric to understand how their theoretical knowledge of the topic of resilience could matter in practice. One student reflected: "The opportunity to learn in the field and directly talk with municipal [staff and] companies' managers about their everyday approach to resilience has been extremely useful to transfer from theoretical concepts to practical interpretations."

Site visits also gave students access to "expert" knowledge and this face-to-face time was considered valuable and added to, or deepened their understanding of urban resilience. As one student stated:

> [My] learning and knowledge [were] influenced by the excursions because the… sites we visited and the people we talked to about resilience enabled us to think differently and to apply resilience to specific situations. The different resilience approaches … completed or at least extended our knowledge of resilience.

A recurrent sentiment in student reflections from the Vancouver workshop was a sense of enjoyment of having seen the neighbourhood, its makeup, proximity to the water, and flood protection measures first hand, with additional commentary from local experts. Similarly, at the Dortmund workshop, we visited a non-profit urban planning organization working to transform a local brownfield site. This visit allowed students to see the initiation point and options considered to guide spatial and social transformation toward a new economic model, not based on the regional mainstay of coal mining and coking. However, when invited to reflect more fully on the experiential lessons about human behavior in the lived contexts in which they were immersed, students expressed considerable dissonance in confronting the gap between intrinsic and instrumentalist understandings of urban resilience. With respect to the dynamic, complex, and front-line contradictions that they had to face, one student wrote:

> I was impressed how little many people care about the environment or the issue of flooding as the experts at Crescent Beach explained to us. For me it is kind of shocking to talk about resilience, sustainability and climate change and what it does to us [while] driving everywhere and using plastic cutlery at the same time. It is hard to understand the connection between words and actions if they

> are so different from each other. I hope the experts can change many peoples' attitudes and behaviour to create resilient cities.

Experiential opportunities to construct a bank of "how-to" knowledge about existing urban resilience practices were considered by most to be the biggest contributors to the value of the field schools. At the same time, the exposure to experiential context concomitantly raised grave doubts for the students about the seriousness of the pursuit of urban resilience from an intrinsic perspective. Choosing appropriate and informative site visits and building relationships with the tour leaders at these institutions so that our engagement on site was interactive and deeply questioning proved to be invaluable for students' content learning and understanding of the structural and social challenges of urban resilience. In Vancouver, we were accompanied by SFU experts and City of Surrey staff to the Crescent Beach neighbourhood, which faces frequent flooding and the prospect of eventual retreat due to sea level rise. Students learned from this experiential opportunity to contextualize what they were hearing about flood resilience protection and participatory planning work in progress. Part of this learning was becoming aware of the lack of public, general awareness of the environmental challenges associated with effecting intrinsic learning about urban resilience in the communities they were visiting. As one student stated, becoming aware of flood protection strategies in place locally was not in keeping with their understanding of public perceptions of action:

> During our walk [around] Crescent Beach, it [became] more visible…how climate change is affecting our region - for example the planks that were used to capture sediment from erosion … was all new information to me. I don't think many people notice the efforts in mitigating climate change by the City.

Learning in a workshop setting

The workshop setting in both exchanges, with panels of experts as well as dedicated time for small group activities, large group discussion, and informal mingling at breaks, offered students an opportunity to engage with their international peers as learning partners. Although few were able to grapple confidently with the topic of resilience per se, most found it valuable to lay a social learning foundation for authentic dialogue about urban resilience in the workshop setting.

For both Dortmund and Vancouver exchanges, an added aspect of the workshop that students appreciated was the diversity of views on the topic of urban resilience. Students' comfort levels in coping with the multiple definitions and approaches operational in the field was helped by exposure to the array of researchers and practitioners, engaging constructively with the contradictions and with one another across their different lenses. One student summarized: "The [workshop] was very rich in information….and I found it interesting that the understandings of resilience differ widely as most of the panelists talked about resilience either [exclusively regarding] climate change, risk assessment or in the context of infrastructure or engineering in general." What was perceived as frustrating conceptual confusion before the workshop became a more valuable array of different opinions formed to suit different purposes within a diverse set of practices. Still, it was the instrumental practices rather than the intrinsic values of urban resilience that came through for students as the most valuable lessons to take away from the workshops.

Learning in a cultural exchange setting

Another facet of the overall field school design that students reflected upon positively was the value found in the cultural exchange. The immersive experience of figuring out daily life in a foreign country was eye-opening and interesting, in particular for those who had not previously visited the exchange destination country. The experience of cultural change, in a shared group context, proved valuable for students to consider and question their own understandings and opinions about their home and host countries. One German student reflected:

> The cultural differences were surprising [as] I didn't know Vancouver had such a big Asian influence... I [also] didn't expect Canada to be so much like the US, the car culture and the distances really stuck out to someone walking [to] most places.

More specifically, the immersive cultural experience helped students contextualize their own ideas about what urban resilience could mean in the host country context. For instance, one student remarked upon:

> how dependent people are on the car in North America. The [regional transportation system] tour showed us that people try to reduce this dependency but using the car every day is also a thing that is embedded in the different culture.

This cultural immersion and group reflection with international peers affected students' understanding of urban resilience, not only in demonstrating the challenges of developing resilience in the face of established contradictory patterns and habits, but also in demonstrating the different culturally-specific interpretations of resilience priorities. Grappling with these cultural differences was a constant fascination for students throughout the course. This fascination, and evidence of the social learning that was fostered at this cultural interface, bolsters our confidence in the unique value of immersive exchange with international peers as key to igniting new interest, and receptiveness to alternative solutions that may not have been previously conceivable. Students learned about one another's culture, their own culture, and themselves through this correspondence; their learning about resilience was reflected through this prism. In particular, given the disparity that students were coming to observe between the concerns of experts and the blindness of the general public around matters of urban resilience, this process of social learning may have been crucial for the trust- and identity-building work the students needed to do in order to situate themselves and one another somewhere in the middle of these starkly contrasting social groups, neither as ignorant as the general public nor as acutely adept as the experts.

DISCUSSION

The results of our experiment in pairing two international field schools in urban resilience indicate that this experiment added value for students, particularly for the introduction they gave to sites of practical resilience strategies, exposed them to experts as well as expert debate on how to approach the practice of urban resilience; and immersed them in a foreign cultural setting with peers. While forms of instrumentalist and intrinsic learning were achieved, instrumentalist learning was more clearly and immediately valued, whereas the intrinsic learning caused more

dissonance and was less likely to be valued. This leaves the question of what the concept of resilience offers to pedagogy and social learning in environmental and planning studies, about which our research has more critical commentary to offer. In this respect, what we found was that the concept of resilience was challenging as a frame for the field schools, not least because as a framing concept, resilience makes instrumental as well as intrinsic demands. That is, to learn to use resilience as a framing concept, students needed to learn to refer to the new context of the field school, and to their peers as well as the experts encountered there, in terms of resilient behaviors and qualities (Krasny et al. 2009). This kind of learning demands that the students demonstrate a suspension of their pre-existing belief systems, in order to engage with the more abstract and disorienting possibility of "transformative learning" (Mezirow 1991). Much as planners and environmentalists find with respect to transformation in society at large, in this "liminal" zone of learning, some students need more support than others (Mälkki and Green 2014).

Students entered their field school with diverse preparation. While this added to the richness of the student groups, it also made the work of coming together on common conceptual ground that much more daunting a challenge. Cultural dynamics of who was "home" versus "away" also came into play, as some students had strong negative reactions to hearing qualities of their home regions interpreted through the critical eyes of visiting international students. These critical social learning dynamics of our field schools provide a reflection upon the meaning that the notion of resilience may inflect upon field school learning in environmental and planning studies. Further, this discussion suggests possible directions for the development of pedagogical and social learning approaches to the concept of resilience as a means to bring learners to a better understanding of what is at stake when considering "transformative learning," as well as the nature of the social and contextual work that is demanded by any effort to approach such transformation.

Dissonance in understanding resilience as diverse, complex, and conflictual

All students recognized that "resilience" is subject to different, evolving definitions and interpretations, informed by literatures from engineering to ecology to psychology to urban planning. The majority of students acknowledged the connection between the abstract and ambiguous quality of the concept of resilience and its essentially multidisciplinary status. These students mentioned how various "specific contexts", "fields of work", and differences in "learning" and "experiencing" resilience influence individual perspectives or understandings. However, some students struggled to recognize the potential impact of instrumentalist tools of "doing" urban resilience when they observed such dissonance with more systemic failures in "being" resilient in the field school context. For instance, one student questioned the impetus to concretize a "common language," or an ontology of meanings of resilience, across the different urban actors in resilience planning when "the reality is otherwise." One student stated that despite resilience being "vague", "patterns" of usage were developing. Other critical contributions from Canadian students included sobering doubts about the transferability of resilience measures across contexts and recognition of the context-dependent nature of effective resilience work. Faced with the sheer diversity of perspectives and the different cognitive levels at which urban resilience was being discussed, suites of skills and expertise, and domains of action in which the course was immersed in the field school, some students struggled to see the added value of resilience practices to existing urban policy and planning language and action.

The other level at which student dissonance showed was in the gap between theory and practice. While the German students were struck by the high rates of automobile usage that they witnessed in Vancouver, seemingly exempt from public criticism for their contribution to climate change, was noted as a troubling gap between civil society readiness and action toward urban resilience in the Canadian context. Conversely, Canadian students noted that while the industrial and policy transitions of the Ruhr region demonstrated adaptive capacity, practitioners did not explicitly ascribe their efforts in economic and environmental transition and revitalization to building resilience, but rather thought of their work in terms of environmental sustainability. This fell short of students' hopes for a new synthesis of work toward integrated environmental and economic progress. Students were forming opinions about what intrinsic qualities are needed for urban resilience and facing disappointment that these behaviors were not always reflected in the instrumentalist approaches they were witnessing.

Challenges in learning from peers: an embarrassment of riches or engineering bias?

The learning partnerships themselves were considered by most to be a success in terms of the intercultural insight they offered. Nevertheless, they were less successful for the pedagogical purpose that they were initially designed to serve. The peer-to-peer relationships between the classes were meant to be mediums for culturally-embedded and personalized social, intrinsic learning about urban resilience.

Students' views of the success of their efforts to create an authentic social learning connection with an international peer were mixed. While students generally appreciated the opportunity to connect socially with their international peers, many felt ultimately unable to break through the initial social level of interaction to engage in joint learning about urban resilience. Moreover, students were divided on whether or not this kind of learning was worthwhile. Some clearly expressed that it was, and could name specific concepts and understandings of urban resilience that they learned from their peers. Others may have been less able to reconcile the dialogical work of engaging in peer learning with the richness of experiential instrumentalist learning components. They may have been affected by the yawning gap between the public status quo with respect to knowledge and action toward urban resilience, and the acuity of the experts, and unwilling to invest the time and effort in seeking where their peers stood in relation to this divide. This could be considered a demonstration of the gap between what is needed for intrinsic learning and what is needed for instrumental learning about urban resilience and constitutes an "embarrassment of riches" barrier to social learning in an international field school.

Considering the process of connecting intrinsic to instrumentalist learning about urban resilience was a challenge for many students. The opportunities to "break the ice" and interact informally online did not help much. As one student expressed, "As far as I am concerned, [none] of us communicated online about resilience with [our peers]. I guess the reason for this is partly that we did not have a common anchor point to which we could have [referred]." It was remarkable from an instructor's point of view that, across the board for all students, social and intrinsic learning were undervalued, even with the instructional design elements and instructor encouragement we put in place.

Building on this sense of missed opportunity for authentic interpersonal exchange or social

learning, some students expressed how an instructor-created "triangulation point" to start discussing resilience may have helped students move past the domain of general "get to know you" conversation and any concerns about what uncomfortable questions they might discover in seeking their peers' understandings of urban resilience thinking. In his seminal work on the social life of small urban public spaces, William H. Whyte (1980) identified the concept of triangulation as a point of interest that can draw the attention of strangers together and initiate an interaction that would not otherwise occur. More thought could be given to the design of emphatically pedagogical "triangulation points" into experiential and intercultural learning opportunities such as this one.

Reading between the lines of student reflections, it is possible that students' lacklustre success in learning from and with one another may be a result of the differential between the value placed on instrumentalist learning in the traditional classroom and the richness of intrinsic learning opportunities in the experiential learning environment. That is, the constant flow of activities, excursions, experts and professionals to tour, meet and hear from, added to the lingering sense that learning had to be mostly about instrumental content, made the value of the peer connection fade in importance. For at least some of our students, the immersive instrumental learning available was overriding in its impact and created a dissonance in which it was hard for students to make sense of the connection between intrinsic and instrumental approaches to urban resilience. Reflecting on the experience of learning about what it meant in practice to "clean up" an industrial watershed for the Ruhrgebiet to still be in the midst of transforming the Emscher River from the industrial open sewer it has been for over a hundred years into a natural restored watercourse, one Canadian student put it this way: "It's the difference between reading about the smell of the Emscher and actually smelling it." Engaging with a peer, even an international one, in critical discussion about how to think about resilience could not compete with the experiential force of the "smell of the Emscher."

While this finding appears to offer a strong endorsement of field school immersion for learning about urban resilience, the dark side of this "embarrassment of riches" is that, at least for some students, this kind of learning environment richness justifies an aversion to engaging critically with peers in a process of social learning about urban resilience from a societal position of decidedly compromised resilience. That is, it seemed like just too much for some students to risk trying to learn about urban resilience in dialogue with other learners, when the experts were so readily on offer, and where the gap between urban resilience understanding and action and mainstream understandings and conditions was so large. The risk of facing uncomfortable discrepancies in interpretation with peers, or, perhaps worse, uncomfortable understandings of one's own position and complicity with respect to mainstream conditions, was too great. Even though students acknowledged at face value the opportunity to challenge their understanding of their own position within the mainstream lack of resilience in their home region, they underestimated the cognitive difficulty this acknowledgement would pose. The gap between where they could see society needed to be and the position they could see that they occupied was too wide, and they dismissed the possibility of taking action personally: "[My] partner's view of resilience may be a little more well-rounded in comparison to what I'm used to in Metro Vancouver – I think they believe there are more social and human aspects to it. I probably agree with them but I think this is just a larger difference between a North American conceptualization of this versus a European one."

Different conceptualizations of how to learn about resilience within the different programs of study of German and Canadian groups may lie at the root of this cultural difference. Students who struggled with the conceptual ambiguity of urban resilience looked for a more compartmentalized and neat definition of the term, rather than the conceptual challenge of putting together fragments of knowledge from disparate sources, which, in the case of resilience, was required. Some students found it easiest to use the ecological, evolutionary, and engineering facets of resilience, presented to them by their German peers through their research project, to bring order to their own questions. Others suggested that the complexity and ambiguity of the definitions frustrated all meaningful attempts to define the term "resilience."

This barrier to peer learning could also be considered an artefact of an "engineering bias" in much of what the students experienced in the theory and practice of urban resilience in the field school context (given that none of the students were studying to be engineers). Without using the term "engineering bias," students noted that the planning and policy institutions they were learning from tended to emphasize "infrastructural", "financial", and "environmental sustainability" oriented programs. One individual reflected that resilience is specifically related to "risks, shocks, [and] vulnerability" while another linked resilience directly to "recovery from emergencies." Some students were able to look beyond these accounts and envision what else might be required for resilience "beyond physical infrastructure." These latter students, both Canadian and German, were more likely to value learning from one another and about a diversity of possible social and economic approaches to resilience, even though these may have been thinner to witness on the ground.

This difference in learning approach did not go undetected by the students. Canadians described the Germans as having a deeper conceptual and theoretical base, and a more technical spatial planning approach. This led to the greater likelihood among German students to discount the possibility of learning from their Canadian peers, whose basis for understanding urban resilience was more experiential, and to believe that their conceptualization of resilience was too different to invite meaningful comparison. The Canadian students, for their part, believed the German students to have a stronger basis for understanding resilience, although they believed themselves to have more breadth. The Canadian students were more likely to see the value of drawing comparisons and learning from the gap between what the German students knew and what they had experienced. One student summarized: "I believe we had a different basis and construction of the resilience concept in comparison, with similar underlying themes."

Learning about resilience in the flow of experience and drawing comparisons

Most students came to understand that the topic of resilience was a more vast and diverse field of study than they had previously thought, due to the exchange. At the same time, not all students found this new understanding valuable. Much as was found by Ban et al. (2015), some students sought more clarity than the field schools offered, and found the introduction of possible connections and complications to be frustrating; others were inspired by the possibilities of connection and integration across the different approaches to understanding and acting for resilience. One such student commented: "I found it inspiring to be able to view shared versions of resilience and … share these versions."

The experiential nature of the international exchanges brought with them intercultural

comparisons – often more ad hoc than structured and precise. Some students were made uncomfortable by the seemingly sloppy interpretations of their home places, or rejected the comparisons out of hand by concluding that "their cultural background influenced their understanding." While students generally agreed that it was "fun" and "good" to share their perceptions of one another's regions (street cleanliness, public transportation systems, types of vehicles on the roads, cost of living, expressions of politeness and rudeness in public places were all popular topics), seeing these differences presented back in research results was uncomfortable for some. Perceiving this discomfort as an aspect of learning about resilience was a step our students were not ready to take.

Another element of the learning quality of the immersive experience is that this experience invited, for many students, a mentally more passive attitude, even as it was more physically active than a standard course offering. Some students blamed themselves for a lack of background preparation in all of the new sights and experiences that they were exposed to. Others blamed the course structure for not having tested them on reading and background knowledge in advance. Students were absorbing a new context and a new set of understandings about thinking and action in urban resilience at their own pace, and many perceived this self-directedness as prohibitive of one-on-one peer learning. One German student reflected that connecting more explicitly with international peers would not have been productive: "our questions could not be answered by the Canadian students because they didn't look at resilience on the same level."

CONCLUSION: Forward for resilience in pedagogy and social learning

In conclusion, we offer the experience of our first pair of international exchange courses in the Ruhr and Vancouver regions as possibilities for continuing to advance learning about urban resilience. We found strong evidence that the value of learning from experience was recognized by students and found some evidence that learning from peers was valued, but that the latter sometimes sat in a trade-off relationship with learning from experts. In building upon the reflections of students and our own reflections as instructors and designers of the courses, we confirm the finding of Owens et al. (2015), that for social connections that support learning by feeling authentic and genuine, instructors need to allocate and facilitate time for students to break the ice with one another. In field school contexts dealing with intercultural peer-to-peer learning partnerships, there was a need to respect that the social demand for authentic peer relationships took precedence and priority over more instrumental learning objectives implemented in a peer-to-peer format. In addition, we confirm the findings of Ban et al. (2015), Heinrich et al. (2015), Yoon et al. (2016), and Shephard (2008) that expert learning can help with affective learning (Honwad et al. 2014). To this, we add the insight that different students and different educational cultures have varying readiness to learn from peers.

Interestingly, this element of readiness among learners is related to the concept of resilience itself. Whereas beginning a course with conceptual and theoretical background is essential for many learners, and leads to a feeling of confidence among students that they have acquired "depth" in a concept sufficient to engage in understanding and articulating what it means, this approach to pedagogy is not without its drawbacks from a resilience perspective. These drawbacks of "depth-first" learning that signal a lack of a resilience approach can include an unwillingness or inability to make connections with other conceptual approaches or

experiences of the concept of resilience, and an unwillingness or inability to treat learning from peers who do not have the same background as part of the challenge of learning about urban resilience. An experience-first approach, more aligned with the features of a resilience approach, has its own benefits and drawbacks, including a greater sense of breadth and a greater willingness and ability to think creatively about possible connections and alternative approaches to resilience. These differences should not be overlooked in course design.

Field school design opens up opportunity for immersive learning, recognized to be a rich educational experience. The students' appreciation of this aspect of field learning was evident in our course. However, we did not find this immersive experience sufficient on its own to generate an explicit valuing of intrinsic qualities of resilience. We expected teaching and learning about particular material conditions and response strategies to urban resilience challenges to lead unproblematically and in a self-reflexive way to students learning the skills and competencies they saw to be needed to respond effectively to resilience challenges. Despite pedagogical strategies put in place in order to encourage this second kind of learning as an accompaniment to the first, there was little evidence that the second kind of learning took place. We are left with a question for further research: is this reticence to engage in intrinsic learning a matter of pedagogical design, or is intrinsic or second order learning best pursued in a distinctive and separate stream from first order or instrumentalist learning about urban resilience?

We sought to design this research project and pair of international field schools in order to spur both first and second order learning about urban resilience. In this light, this research and pedagogical experience exposes significant gaps in understanding how and what to learn about urban resilience across disciplines, significant gaps in translating wide-ranging and integrative theories of urban resilience into concrete and specific policies and programs, and still other gaps in the resilience intentions of policies and programs and the readiness for implementation at the street level (Meerow et al. 2016, Meerow and Stults 2016, Stumpp 2013). In addition to providing immersive and interactive experiences in contexts in which professionals and citizens were engaging effectively in urban resilience response strategies, we aimed to offer opportunities for students to foster deliberation and decision-making skills, to build trust with their local and international peers and other participants. As per the City as Classroom model (Russ and Krasny 2017), we thought that we could enhance students' skills and aptitudes for collective action through bringing these closer to lived everyday experience – perhaps more so by the fact that we also expected them to act as guides and hosts of international peers. We expected in this way that our field school model could represent "new learning approaches and ways of organizing learning" (Stevenson et al. 2017, 57) that open a window to shift education in the service of sustainable development and "create new spaces for collaborative and social learning (Stevenson et al. 2017, 56). We intended that this model would allow students not only to be confident in their understanding of the meaning of urban resilience in planning applications, but also to place more value on the role they could play either as individuals or via work in environmental non-government organizations to contribute to change. However, what we confronted more directly as pedagogical researchers was that not all students are ready and equipped to accept, let alone advance "integrative ways of thinking" and to be engaged "in change and transformation" (Stevenson et al. 2017, 56).

Is there a trade-off relationship between content learning and complexity thinking in field school design in urban resilience? We have a responsibility as sustainability educators to address

this question, in the interest of ensuring that the immersive learning experiences we are offering our students are opening up, and not shutting down, opportunities for students to contribute to their own personal development as well as community development. When we convene a field school in urban resilience, do we need to make choices about whether to teach what to do in the face of urban resilience challenges, how to be in the face of these challenges, or how to learn in anticipation of acting toward urban resilience? On the one hand, we would be inauthentic to our own understandings of the demands of resilience thinking and action if we did not acknowledge to our students the partial, uncertain nature of our knowledge about how to design and manage cities and behavior within them for sustainability and resilience. On the other hand, considerable additional supportive work is demanded by this acknowledgement in order to build upon, rather than dampen, students' sense of hope for the future, and the utility of action. It is up to educators, in drawing attention to the uncertainty and confounded nature of even our most astute definitions of urban resilience problems and most advanced understandings of their specific solutions, to convince ourselves and our students of the space for hope within this uncertainty, because it is space for new voices, ideas, and actions (Russ and Krasny 2017).

As well as confirming and building upon past research, the recognized shortcomings of our field courses led us to devise a pair of possible remedies for future practice. A possible remedy for the trade-off between an emphasis on formative conceptual depth and experiential breadth is to design an explicit recognition of the respective and different value of "depth" and "breadth" learning into a field school. Such a design could include a conceptual introduction, with resources to back this up, but also explicitly acknowledge and ensure the need for openness to alternative views and experiences to understand and enact such a complex idea as resilience.

An additional possible remedy would be to provide further structure to our attempt to move students into the realm of second order learning about urban resilience, toward encouraging students to take full advantage of the opportunity to learn from their peers and challenge perspectives, including their own. This would involve designing a graded component into the field school that would demonstrate the value of learning from peers as a unique skill and opportunity offered within the field school experience. This graded component could look something like an exercise in understanding the relative nature of expertise, how to recognize what is trustworthy, how to put types of communication in context, and to exercise good judgment. These are indisputably valuable skills in building resilience in a social learning system, given the highly contested nature of concepts like resilience and the varied and multiple nature of expertise and other skills needed to adequately address the topic. It could also involve a specific "triangulation" exercise for peer learning pairs to engage in explaining particular resilience sites in partnership, to invite the exchange of perspectives and to ward off the trappings of localist pride.

At the same time, our international learning experiences in urban resilience left both Canadian and German students in agreement that a great deal more conceptual clarity about urban resilience is urgently required. Many students concluded that the lack of relevant and necessary resilience policy discourse was related to conceptual confusion about the nature and work involved in moving toward urban resilience. This exchange and immersive experience helped students relate learning about resilience to existing concepts, across the divide of their home and exchange contexts, across the gap between themselves and their peers, preferences and actual behaviours, and their present and future paths. At the same time, our experience

demonstrated the hard work ahead for instructors and students who attempt to integrate, in the evocative words of Owens et al. (2015, 314) "the hatchet of critical reflection and the seed of practical action." Lastly, student feedback and reflections indicate a necessity to continue work on improving and clarifying resilience understanding outside of engineering or infrastructural frameworks in internationally comparative contexts. We concur with Ban et al. (2015) that more analytical structure and support will be important in this work, and also point out that testing concepts with policies and programs on the ground are needed to advance the conceptual credibility of resilience, essential as well to making resilience a more operational frame in pedagogy and social learning processes alike.

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