

Title	Internationalizing the curriculum for STEAM (STEM + Arts and Humanities): From intercultural competence to cultural humility
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Publication date	2019-11-18
Original Citation	de la Garza, A. (2019) 'Internationalizing the Curriculum for STEAM (STEM + Arts and Humanities): From Intercultural Competence to Cultural Humility', Journal of Studies in International Education, 25(2), pp.123-135. https://doi.org/10.1177/1028315319888468
Type of publication	Article (peer-reviewed)
Link to publisher's version	https://journals.sagepub.com/doi/abs/10.1177/1028315319888468 - 10.1177/1028315319888468
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Download date	2026-09-04 09:00:47
Item downloaded from	https://hdl.handle.net/10468/9417

Journal of Studies in International Education

Internationalising the Curriculum for STEAM: From Intercultural Competence to Cultural Humility

Journal:	<i>Journal of Studies in International Education</i>
Manuscript ID	JSIE-18-0247.R2
Manuscript Type:	Original Manuscript
Keywords:	Internationalization of the Curriculum, Globalization and international higher education, Internationalization of teaching, learning and research, STEAM (STEM plus Arts and Humanities), Indigenous knowledge, COIL for STEAM, Interdisciplinarity, Transdisciplinarity, widening access
Abstract:	Internationalisation of the Curriculum (IoC) has proved essential to realise the potential of internationalisation as a driver of quality in Higher Education. The broadening of topics, bibliographic materials and other resources that result from it improve the breadth and depth of the content, making it more comprehensive, updated and relevant. Moreover, the Internationalisation at Home (IaH) strand that seeks to mobilise the informal and the hidden curriculum to bring stay-at-home students an international experience similar to that of those going abroad widens access. However, both IoC and its IaH subset have centred mostly around individual disciplines. This article proposes an alternative view of IoC that focuses on inter and transdisciplinary approaches to reviewing the curriculum, in particular STEAM, including indigenous knowledge as it does not separate the arts and humanities from science (STEM). Using case studies and quoting instances of best practice, the article demonstrates that the inter and transdisciplinary approaches advocated are better suited to pursue the learning outcomes sought by IoC.

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Internationalising the Curriculum for STEAM (STEM + Arts and Humanities): From Intercultural Competence to Cultural Humility

By

Introduction

Internationalisation of the Curriculum (IoC) has proved essential to realise the potential of internationalisation as a driver of quality in Higher Education. On the one hand, **at the most basic level**, the broadening of topics, bibliographic materials and other resources that result from reviewing a course or programme’s formal curriculum for internationalisation increase the breadth and depth of the content, making it more comprehensive, updated and relevant. And on the other, the Internationalisation at Home (IaH) strand that seeks to mobilise the informal and the hidden curriculum in order to bring stay-at-home students an international experience similar to that of those going abroad, and the advantages this represents for employability and personal growth, can be transformative, widening and democratising access (Beelen & Jones, 2015). **At a deeper level, a thorough IoC will go beyond the mere token inclusion of international examples, leading to pluralising the epistemological knowledge base. This is because ‘the “cognitive dissonance” (Festinger, 1957) that arises when we are confronted by new information that does not fit with our previous learning gives us a “surplus of seeing” (Bakhtin, 1986)’ that helps us develop new understandings (Ryan, 2015, p. 57).**

The same goal of pluralising the epistemological knowledge base is shared by inter and transdisciplinary approaches to higher education, frequently referred to with the acronym STEAM (standing for Science, Technology, Engineering, Arts & Humanities, and Mathematics/Medicine). However, so far both IoC and, to a lesser extent, its IaH subset have centred mostly around individual disciplines, without taking advantage of the synergies that inter and transdisciplinary approaches can afford. Perhaps because disciplinarity exerts enormous power and influence over the organization and production of knowledge in higher education and discipline groups are global communities, most IoC efforts have maintained that ‘discipline communities transcend national boundaries. They provide an organizational focus for universities and the curriculum across the world. They are at the heart of the process of IoC’ (Leask, 2013, p. 99). Edited volumes and journal articles have been devoted to exploring IoC in specific disciplines. See for instance the excellent collection by (Green & Whitsed, 2015), focused on business, education and health, while (Stütz, et al., 2014) have focused on medicine.

This article proposes that inter and transdisciplinary approaches to IoC, in particular STEAM, can greatly enhance how this curriculum is developed and taught. The reason to advocate these approaches is that they are better placed to pursue the main learning

outcomes sought by internationalising the curriculum as stated in the seminal book by Leask (2015, pp. 53-67): responsible global citizenship, graduate capabilities that include having global perspectives, and in particular intercultural competence in its traditional guise (Deardorff, 2006) as well as in the more recent formulation as cultural humility proposed by Murray-Garcia and Tervalon (2017), which I discuss in the second part of the article.

In the paragraphs that follow I first address the issue of the close affinity and overlap between the internationalisation of the curriculum and the Interdisciplinarity agendas in higher education, considering their various synergies and ways in which these can be unlocked. The second part of the article presents transdisciplinary approaches to IoC, that is, approaches that go beyond the academic disciplines to include 'the personal, the local and the strategic, as well as specialised contributions to knowledge' (Brown, Deane, et al. 2010 p. 4), including knowledge held by stakeholders and knowledge generated beyond the West. In particular, I focus on the benefits of incorporating indigenous knowledge to an internationalised curriculum for two reasons: firstly, because this makes the 'cultural humility' dimension of intercultural competence explicit, addressing expectations that internationalisation can be harnessed towards 'a more socially responsible approach that seeks equity and social justice', which in the long run 'will result in a higher quality sector' (de Wit, et al., 2017, p. 233). And second, because engagement with indigenous knowledge presents an ideal scenario to interrogate disciplinary modes of thought about concepts of knowledge.

Affinities Between IoC and STEAM

As I have argued elsewhere, there is a fundamental affinity between IoC and STEAM, as both approaches to the curriculum ultimately seek the same learning outcomes as these formulated by Betty Leask (2015) and frequently quoted:

- **Responsible Global Citizenship.** For IoC, this means understanding the necessity to engage with sustainability, equity and social justice. This is at the very core of STEAM, since our incapacity to address vital problems such as climate change, global health, urban violence or coping with biodiversity loss among other instances of sustainability, equity and social justice at risk, has been traced in large measure to the compartmentalization of scientific and professional knowledge and the sector-based division of responsibility in contemporary society (Lawrence, 2010, p. 16) (Snow, 2001 [1959]). In this respect, the IoC and the STEAM agendas overlap.
- **Global Perspectives.** For IoC, this means students should gain knowledge of other countries and cultures and competence in other languages. By the same token, reviewing the curriculum for STEAM can entail the inclusion of computer programming languages in arts and humanities curricula. Not only are these languages 'global' but in some instances they bear striking similarities to some aspects of human languages: both make use of grammatical structures that can be recursive; the same areas of the brain that process grammatical structure during reading are also involved in processing the grammatical structure of a programme when reading it. Moreover, there is a high correlation between music aptitude and programming ability, suggesting some relationship with the temporal structure of music. Last, in as much as human language involves the expression of human thought, and human thought can be structured and enclosed as sequence of symbols, that is another similarity.

- **Intercultural Competence.** This is frequently defined after Deardorff as ‘the effective and appropriate behaviour and communication in intercultural situations’ (2006), for which empathy and perspective-taking are essential. Empathy and perspective-taking in STEAM can be promoted by having students of science frame a problem from an aesthetic perspective, or vice-versa (see for example Long 2018). As for the need to become familiar with different cultures and the ability to transcend their boundaries as required, that is also a shared learning outcome: these are national cultures in the case of IoC, and disciplinary cultures in the case of STEAM. The similarities between national and disciplinary cultures can hardly be overstated: if national cultures claim sovereignty over a given territory, the disciplines have been described as ‘separate communities of practice with their own organisations, power hierarchies, questions to answer and [sometimes heavily policed] entry boundaries’ (Brown & Harris, 2014, p. 115). It could be said that both IoC and STEAM seek to provide a fuller, more rounded education to individuals by integrating knowledge produced in a variety of cultures through engagement with difference.

In addition to sharing learning outcomes, revising the curriculum for internationalisation and for STEAM both ascribe to imagination a privileged role. Indeed, imagination is at the very core of IoC. For Leask, the key difference between the IoC process and commonly used curriculum review cycles is ‘stage two, the imagine stage. It is essential and integral. It stimulates creative uncertainty through challenging the traditional and taken for granted [...] and inviting broadening and deepening of engagement with difference’ (Leask, 2015, p. 42). Likewise, STEAM perspectives strive to emphasise the role that imagination, traditionally associated with the arts, has had in the development of science: for instance ‘leaps of creativity in the formalised science are exemplified in the classification of life forms by Linnaeus, which differed significantly from those of Aristotle before him and Darwin after him [...] *For each inquiry across the ages, a flight of the imagination led to fresh scientific concepts and images which changed the interpretation of reality*’ (Brown, et al., 2010, p. 9) (my emphasis).

But perhaps more importantly is the democratising principle at the heart of both IoC and STEAM, as both ultimately seek ‘to position academic cultures as partners in the creation of new knowledge and practices among all stake holders in higher education’ (Ryan, 2015, pp. 58, in relation to IoC). The similarities in meaning that the inter and trans pre-fixes bring to discussions of culture (as in intercultural and transcultural) in the context of the national cultures relevant to IoC and of disciplines I discuss here is perhaps best conveyed by what Ryan has called a ‘transcultural’ approach to the curriculum. Drawing from Murray (2011), Ryan defines transculturalism as contact between two or more different cultures which results in ‘a new composite culture in which some existing cultural features are combined, while some are lost, and new features are generated’ (p.58). Transculturalism is a recognition that societies today are no longer monolithic (if they ever were). Like a fusion cuisine, says Ryan, a transcultural approach seeks to keep the best of different traditions and combine them to create new products or new knowledge and learning (p. 58).

In a similar manner, multidisciplinary research has been described as that which draws from various disciplines (ie cultures), each bringing a contribution towards the resolution of a problem; interdisciplinary research goes deeper, in that synthesis occurs and new knowledge is produced out of the combination. Juxtaposition of disciplines is at the very heart of Interdisciplinarity as it can reveal deeper connections among complex relationships,

‘thereby uncovering issues and hidden ideas between fields’ (Paracka & Pynn, 2017, p. 45). Juxtaposing can reveal greater depth of analysis and insight, expanding both *what* we know and understand and *how* we know and understand. And transdisciplinarity as mentioned above, takes into account knowledge beyond that of the academic disciplines, bringing all stake-holders into the equation (Brown, Deane, et al. 2010 p. 4). Transdisciplinary education is holistic, synthetic and multi-contextual.

Having students take part in international competitions such as ‘24-Innovation’ (Gardoni, 2018) is an example of a multidisciplinary, and potentially interdisciplinary IaH activity, that can tap into the synergies with IoC outlined above. Multidisciplinary student teams are given 24 hours to find creative solutions to challenges put forward by global businesses. The competition has as its main objective the exploration of alternative methods to teach innovation and is project-based, stimulating creativity. Partnerships with participating universities around the world are also strengthened in this way. Solutions are proposed by means of a video, which is uploaded to youtube. Students usually join the teams in order to attract the attention of recruiters and gain the prize that is offered, which consists of money or a summer course or semester at one of the universities involved (thus promoting study abroad). Being able to collaborate with international staff and students and with peers across disciplines brings about awareness of cultural differences, including those implicit in the academic disciplines, while also cultivating tolerance and curiosity. **Importantly, this activity meets the conditions outlined by Killick for successful intercultural learning: equality of status among participants; sustained engagement in a cooperative task; working towards a common goal; and having the support of relevant authorities (2017, p. 122).** As one of the organisers puts it: ‘students from various nationalities and disciplines in the arts or humanities and science who have participated in this challenge enter their teams sometimes viewing themselves as rivals, and even holding cultural biases against each other, but after those 24 frantic hours on the same boat they learn to appreciate what each other can bring to the team, and may even end up as best friends’ (Fernandez Montiel, 2018) (my translation).

As this section has shown, the affinity between IoC and STEAM is thus deep, and there are real benefits in unlocking their many synergies with an interdisciplinary approach to IoC. In the next section of the article I focus on what is gained by taking a transdisciplinary approach, in particular indigenous knowledge, into consideration. This will not only illuminate how cultural humility, included in the concept of IoC, can be made explicit, but it will also bring to the fore alternative ontologies and epistemologies that do not rely on an arts/science division.

Transdisciplinary Internationalisation of the Curriculum: From Intercultural Competence to Cultural Humility

In their article published in 2012 Jones and de Wit highlighted priorities for internationalisation in higher education **in its process of** becoming globalised. The first one was ‘the need to learn from other non-western national and cultural contexts—to understand the full extent of internationalisation as a phenomenon and what we can learn from each other in order to benefit students, employers and nations’ (cited in (de Wit, et al., 2017, p. 233). In 2017 that priority was re-stated as although it is clear that internationalisation in higher education has evolved enormously both thematically and regionally over the past 20 years, ‘the globalisation of internationalisation requires a more nuanced approach to its interpretation and delivery [...] It is timely to consider [...] whether we are learning sufficiently

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from other global contexts’ (de Wit, et al., 2017, p. 1). For this reason, a number of key questions were posed, including ‘whose and what knowledge is privileged in international education and what are the implications; how do we ensure that internationalisation advances collaborative research; and how do we integrate community-based learning and research in the work of internationalisation to ensure that outcomes are relevant (de Wit, et al., 2017, p. 2).

Perhaps partly as an answer to these questions and in any case as an attempt to take non-western cultures into account when considering the key concepts of internationalisation in higher education, Murray-García and Tervalon proposed a critique to the concept of cultural competence since it ‘traditionally implies a static endpoint, a sense of mastery or an ability to exert control towards a pre-determined outcome’ (2017, p. 19) and disenfranchised groups—quoted by the authors as those whose histories include enslavement, genocide, internment and economic exploitation—could find it unsettling. They proposed the concept of ‘cultural humility’ instead, defined as ‘a commitment and active engagement in a lifelong process that individuals enter into on an ongoing basis with patients [as they write from the perspective of health science], communities, colleagues and with themselves’ (Murray-Garcia & Tervalon, 2017, p. 19). The authors refer in particular to ‘privileged knowledge’ in the context of the politics of knowledge production in international education (p. 24).

It is my contention that a transdisciplinary approach that considers indigenous knowledge can enhance how IoC is developed and taught, both to address the priorities of internationalisation in higher education as it becomes globalised as outlined by de Wit et al. and to make the cultural humility dimension in the concept of IoC explicit. Because indigenous methodologies typically engage the metaphysical, the communal, the intergenerational, and the past, the present and future possibilities their impact in scholarship can be profound (Tuck & Yang, 2019, p. xvi). The following examples of good practice in this regard outline how this can be and has been done, and also highlight the benefits that are brought to professors and students, and indeed to the disciplines involved.

The first example is provided by a transdisciplinary curriculum in digital arts and humanities. Many of the tools and platforms the digital humanities rely upon are built for data formats that are useful to industry or science, focused on interoperability and standardisation to be able to connect technological systems, but are not amenable to depicting events, histories or narratives that are not necessarily linear, that is, that cannot be rendered as a temporal data point. In other words, they are not culturally specific, nor culturally sensitive. Scholars interested in both indigenous knowledge and digital arts and humanities have often remarked upon the difficulties involved in representing Indigenous sacred geographies and histories, as these are characterised by a multitude of stories that recount migrations, revelations and historical incidents, on maps, not least digital maps, where national and international borders ‘cut up what the stories cut across’ (Brooks, 2008). Thus teaching the students to see the cultural bias in the digital technology, or ‘the cultural codes that are largely invisible to the untrained eye’ (Vy Sharpe & Powell, 2018) is an important IoC and STEAM learning outcome. The assignment consisted of the creation of a timeline on the digital platform Omeka that could depict Haudenosaunee history, in particular an event called the story of the Sky Woman, who falls through a hole in the sky world until a flock of herons arrest her fall and place her on the back of a turtle, where she creates the world.

Powell and Sharpe report that discussions on how to make room, as it were, for indigenous history on the Western timelines employed by Omeka included the following

suggestions: assigning the story an arbitrary date range that would make it appear visually before any event in the chronological time when queried; employing network visualisations rather than a timeline, to attempt to convey the non-linear and interconnected nature of the Haudenosaunee way of narrating history; or simply providing digital versions of the traditional way in which the Haudenosaunee have preserved their history across generations, namely making a video of the oral account. (For a discussion of the ways in which digital technology itself resembles and even parallels traditional indigenous means of producing and sharing knowledge and of experiencing time and space, see X).

The impact on students was significant. Through discussion they demonstrated ‘a greater appreciation for the challenges present in digital humanities and a stronger appreciation of the need to foster equitable and respectful collaboration among experts in Native communities and academia’ (Vy Sharpe & Powell, 2018). The fact that the most sophisticated digital tools available (and to which the Haudenosaunee traditional oral archive compared favourably) at an elite institution such as this could not properly represent indigenous history also resulted in humility, ‘not a bad thing for Penn students to take away from a digital humanities course’ (Vy Sharpe & Powell, 2018).

The second example comes from a major curricular reform started in 2004 called ‘intercultural university’ (UVI) at Universidad Veracruzana (UV) in Mexico, aimed at widening access and making education culturally responsive and community relevant. Although it is estimated that 10% of the population of Mexico is indigenous, only 1 to 3% attend universities. Located in the state of Veracruz, UV is a public university in an area with a large indigenous, and traditionally marginalised, population of ethnic minorities: the Nahua, Totonaco, Mije and Zoque peoples. In this case, the indigenous peoples, as students, are also stakeholders alongside the non-indigenous students. Beyond simply widening access, the reform actually aspired to providing education that would respect and value indigenous cultures, in the words of a staff member, ‘not merely as a form of compensation, but seeking to question and transform the dominant western model of education [which separates science from the arts and humanities] so that it can incorporate the knowledge, and indeed millennial wisdom, of the native peoples of Veracruz [who do not separate knowledge in this way, but take a holistic approach instead]’ (Sandoval Arenas & Meseguer Galván, 2017, p. 174) (my translation). The socio-economic equity that de Wit et al allude to is important here, and so is epistemological equity.

To achieve this:

- Collaborative research relevant to the community is embedded throughout the undergraduate and graduate programmes, in partnership with civil society institutions in the state. This means the curriculum is flexible, depending on the specific needs and potentials of the region.
- Indigenous languages, which rely on different semantic codes and entail different ways to structure thought, are now taught and accepted by the university for the writing of dissertations. This seeks to redress the power imbalance by which speakers of indigenous languages have been disenfranchised and disadvantaged.
- A process of prior learning recognition has been set up for indigenous students. This process focuses on acknowledging, on the one hand, practical knowledge such as that related to agriculture, animal rearing, natural medicine, the traditional manufacturing of textile and clothing and sustainable ways to engage with the environment, among others.

And on the other hand, also socio-symbolic knowledge such as traditional rituals, the meaning of patterns on embroidery or basketry and so on. Indigenous knowledge includes technical knowledge and places an emphasis on reciprocal relationships with both human and natural communities. It is a positive alternative to the deficit model that focuses on what students do not know and which only recognises as valid knowledge from Western societies (Newberry & Trujillo, 2019).

At UVI, the reform has been implemented in close collaboration with the international office and with academic staff that oversee IoC (some indigenous peoples are in fact referred to as First Nations). The impact on staff and students has been considerable: for staff, IoC has been re-framed from an individual and personal experience of change into an inherently communitarian one, with social relevance more immediately apparent. There is a move too towards measuring the impact of mobility in terms of benefits to the community, in addition to benefits to the individual. For students from indigenous backgrounds, the transdisciplinary and internationalised curriculum they now have access to has resulted in a means to transcend parochialism, the formation of an academic habitus and the acquisition of social and cultural capital after Bourdieu, and therefore markedly improved employability prospects. At the personal level, this curriculum has been empowering, providing the means to enhance their self-esteem, often low as a result of the endemic discrimination and the high level of social, family and gender-related violence they face. For all students, the UVI has represented an extraordinarily rich source of IaH resources as the curriculum has been greatly enhanced by the inclusion of a broad diversity of cultural and disciplinary perspectives. It must be stressed that the transdisciplinary IoC the UVI provides is not singled out as ‘indigenous’ or ‘ethnic’ as in other similar universities in Mexico and beyond, but rather it is simply called ‘intercultural education for all’ and it is not separate. It is an alternative curriculum, part of the state university of Veracruz.

Beyond the lessons on widening access that can be learned from this case and applied to other minorities, the UVI experience can also be useful to those seeking ‘student engagement in a globalised world’ more generally (Green, 2019). ‘Students as co-producers’, ‘students as change agents’ and ‘students as partners’, are all approaches at the cutting edge of research on engaging students in international education, as a recent special issue on this journal demonstrates, and they powerfully resonate with the intercultural university model at UVI, especially in their collaborative and generative dimensions.

The third example seeks to provide a transdisciplinary IoC by combining the study of the arts (literature, including indigenous literature) with science (chemistry). At my own institution, X, we have sought to create a COIL course with our partners in ITESM Monterrey that builds on our institutional strengths. As is well known, COIL is a pedagogical approach rooted in situated learning that takes full advantage of online interaction (see (Rubin & Guth, 2015)). COIL is defined as

A teaching and learning paradigm using online technologies that develops cross-cultural awareness in team-taught learning environments where professors from two cultures work together to develop a shared syllabus, leading to experiential and collaborative student learning. The courses give new contextual meaning to the ideas and texts they explore, while providing students new venues in which to develop their cross-cultural awareness. Classes may be fully online or offered in blended formats with traditional face-

to-face sessions taking place at both institutions, while collaborative student work takes place online. COIL is a bi-lateral engagement, a two-way street, enabled by technology, but ultimately focused on enhancing human interaction across cultures so that people develop mutual trust and meaningful intercultural and academic dialogue (SUNY-COIL, 2017).

The COIL we aim to create will build on work previously developed by Dr Iacopino, whose area of expertise is nano-particles, in collaboration with Professor O'Machain, expert in medieval Irish manuscripts. Their joint work led to investigate and discover where in Ireland certain manuscripts came from, on the basis of the chemical composition of the inks, pigments and binding agents employed (Tyndall National Institute, 2017). On the X side, Dr Iacopino who has published and experimented extensively in the field of inks, was matched with Dr Vargas, who teaches a course on Medieval Hispanic literature at ITESM, usually focused on the literary texts themselves. To internationalise the curriculum for STEAM it is our goal that the COIL course includes consideration of the material aspects of the manuscripts on which they were written, and to expand it in scope so as to include Aztec codex.

The significance of the interdisciplinary aspect of the project is well summarised by Professor O'Machain as follows:

Irish tradition was preserved and transmitted from generation to generation in hand made, home-made, hand written books, from the early Christian period to right down to the beginning of the 20th C. Part of our understanding of that tradition [...] is an understanding of how these books are put together. So it is not enough to know the texts. To understand the texts one has to know the books: how they were bound, or were assembled, how the skin or the paper was prepared, and how the inks were put together. *And once we know that we will have better understanding of the people who made these books* [emphasis mine]. These were the scholars, the native scholars that are part of the European tradition, and part of the native tradition as well. (O'Machain, 2018)

Its significance from the IoC perspective will be, we hope, considerable too. Investigations of Aztec codex have already established their material composition, which similarly involved paper, hide and skin, and also colours derived from minerals, animals and plants. By juxtaposing the Irish and indigenous manuscripts of the same period and comparing them, we seek to provide students with a material basis to question, for instance, why alphabetic writing systems have been ascribed such a crucial role in differentiating history from pre-history. Aztecs never doubted that their pictorial way of recording history on the codex was writing, and that the records were historical (rather than 'pre'). It met the conditions of written history in that it recorded the past, was relatively permanent, and could be read and interpreted by readers other than their creators (Hill Boone, 2000, p. 28). Moreover, a variety of notational systems, such as musical, choreographic or diagramming in engineering encode knowledge and they are greatly superior to word writing for preserving certain types of information. Yet Aztec pictography (and Inka knot records) are traditionally placed at the bottom of a hierarchy of writing where the alphabetic system of Western Europe comes first, and Chinese ideograms second (Hill Boone, 2000, p. 29). We expect that the expertise of the teaching team will provide new contextual meaning to the ideas and texts

explored in Irish and Hispanic medieval literature that will, after Murray-Garcia and Trevlon, ‘interrupt and mitigate power imbalances that we create or have otherwise inherited and sometimes subconsciously or intentionally perpetuate or worsen’ (p. 27). The fact that the COIL course will rely on a digital technology that now is largely visual and in which images have a central stage as opposed to written words, just like on the Aztec codex, may add food for thought.

Conclusion

Internationalising the curriculum for multi and interdisciplinarity has many benefits, as I have outlined above, for students and staff and indeed for the disciplines themselves, as they are approached critically, allowing for better understanding of their scope and limitations and laying fertile ground for innovation. And a transdisciplinary approach to IoC that takes indigenous knowledge into consideration has the potential to increase these benefits even further. Responsible global citizenship, in particular as regards insight on sustainability and the environment, can be cultivated by engaging with indigenous knowledge. The same is true of developing global perspectives. But it is perhaps intercultural competence, and its reformulation as cultural humility, that is most advanced by bringing indigenous peoples to the curriculum, emphasising the ethical, and even emancipatory dimensions, of IoC.

Acknowledgements

The research for this article was funded by a Government of Ireland-Higher Education Authority Mobility award to Mexico from January to February 2018. I am grateful to

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