Foundations and scaffolding: exploring literature and practice to build a new curriculum framework for TU Dublin

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Abstract

The IMPACT project at TU Dublin has been informed in part by the outcomes of the Co-CREATE project in 2019-20. Co-CREATE was a Team Teaching Fellowship project to support and underpin the building of a quality curriculum framework for the new technological university. A number of IMPACT projects have continued the work started within the Co-CREATE project to make it sustainable and embedded within the university. We present findings from one element of the Co-CREATE project which has informed a range of initiatives in IMPACT. This is the review of literature and practice undertaken to underpin the Co-CREATE project. The review addresses student voice and agency in curriculum design, enhancing sustainability in curriculum design, and the importance of interdisciplinary approaches in the development of new programmes and provision. Curriculum in higher education has been discussed in educational literature as a fluid and contested concept. It relates to product, often described as content and syllabus, but also process, socially and politically embedded with the potential for change in positive or less positive directions. We present our findings and insights, and the recommendations we have made to stakeholders in our institution. We reflect on the purposes of higher education in the 21st century, and consider the UN Sustainable Development Goals and how they relate to TU Dublin's mission and vision. We consider the place of graduate attributes, innovation, global citizenship and the impact of new technologies. We consider the impact of "connected" approaches to curriculum in research-intensive universities, and how these might be translated to the technological university context. We conclude with recommendations from the review which underpinned further work in Co-CREATE. These may be useful to others commencing this kind of work or reviewing curricula.

Keywords: curriculum design; higher education; frameworks; models; sustainability; global citizenship; graduate attributes; innovation

Introduction

What is a curriculum framework, and what should inform its construction? These questions are the focus of this paper, which presents the outcomes of a review of literature and practice to support the building of a new curriculum framework for TU Dublin. This review was undertaken to provide foundations and scaffolding for the Co-CREATE curriculum framework project immediately preceding the IMPACT project at TU Dublin. IMPACT has been informed in part by the outcomes of Co-CREATE. Co-CREATE was a Team Teaching Fellowship to develop a quality curriculum framework for the new technological university. IMPACT projects, particularly NorthStar (an online tool developed to support curriculum redesign), have continued the work started within the Co-CREATE project to make it sustainable and embedded within the university. The review of literature and practice undertaken in Co-CREATE addresses many of the themes of this IMPACT Special Issue, addressing student voice and agency in curriculum design, the enhancement of sustainability in curriculum design, and identifying the importance of interdisciplinary approaches in the development of new programmes and provision.

Curriculum in higher education has been discussed in educational literature as a fluid and contested concept. It relates to product, often described as content and syllabus, but also process, socially and politically embedded with the potential for change in positive or less positive directions. We present our findings and insights, and the recommendations we made to stakeholders in our institution. We reflect on the purposes of higher education in the 21st century, and consider the UN Sustainable Development Goals as a cornerstone of TU Dublin's mission and vision. We consider the place of graduate attributes and global citizenship. We summarise some recent development work on curriculum at other universities and conclude with the recommendations made for Co-CREATE which have relevance to curriculum design in many other higher education institutions.

Context: curriculum in higher education

Definitions of 'curriculum' in higher education are elusive (Hicks, 2018; Bovill & Woolmer, 2019) and often not shared. Curriculum and curriculum change are contested topics in literature, and sometimes challenging (Shay, 2011; 2015). This is because curriculum denotes knowledge, and how that knowledge might be managed and shared by those teaching with those learning. Higher education undertakes research, and shares research undertaken by other sectors in order to grow knowledge. Any discussion of curriculum therefore raises discussion

of the relationship between teaching and research. These concerns are situated within a changing landscape, where higher education in Europe, the US and Australasia has expanded rapidly in recent decades with changing patterns of participation, increased use of technologies, and funding models aligned with the expectations of different governments in different jurisdictions.

In Ireland, higher education has enjoyed strong levels of participation and a positive reputation internationally for the quality of its graduates. The third level sector inclusive of universities, institutes of technology and private providers, has expanded from the 1980s onwards, reflecting global trends towards higher participation and the massification (Henkel, 2000; Palmer, 2018) of higher education. Computerisation and the advent of Internet and web also brought change at the administrative level (for example with online registration) and with access to academic resources and courses of study online (Weller, 2014). Successive governments in Ireland and internationally have increasingly focused on how higher education contributes to their national economies. This may be directly, through research outputs, patents, spin-off companies, and employment, but also through the development of skilled and effective graduates.

Landmark reports such as Dearing (NCIHE, 1997) in the UK and Hunt (DES, 2011) in Ireland have established objectives and goals for higher education, with funding attached to the achievement of these. Policy at the national level in Ireland has required institutions to address inclusion and access, to increase participation by mature students and international students, and to develop graduate attributes and digital literacies. National frameworks of qualifications have been developed in Ireland and internationally, allowing for recognition of qualifications and credits achieved across different jurisdictions. Through the Bologna Process (http://www.ehea.info/), programmes in Europe have been aligned to facilitate student and graduate mobility. Semesterisation and modularisation have seen restructuring of the academic year and traditional 'courses' into programmes and modules. New professional services and fields of expertise have emerged in the third level sector to support these wide-ranging changes, including internationalisation, academic professional development, e-learning, access and inclusion, and community-based learning. But few landmark policy documents and the wider changes they have brought have addressed the concept of curriculum in higher education directly (Hughes & Tan, 2012). This may be because specific areas of knowledge, and in turn curricula, are associated so strongly with autonomous

disciplines within higher education institutions. The connections between curriculum and disciplines, and in turn research and teaching within the university, are complex.

Practitioners in higher education may lack time to reflect on 'curriculum' as a term, considering it either a given, or as something for other parts of the education sector (schools in particular) to deal with. Munro and Hughes (2012) identify a dearth of literature about curriculum in higher education, while Barnett and Coate (2005) identify the challenge of setting any boundaries around the term once all of the factors influencing programme design are considered. Literature has tended to focus on the mechanics of this process, rather than the underpinning theories and values influencing curriculum. Our review has identified recent and current work which develops this discussion by engaging with curriculum as it is enacted in higher education, and offering models and frameworks to support curriculum design. In the next sections, we present the methodology used for our review, followed by the synopsis, and finally its outcomes for Co-CREATE.

Methodology

A search of peer-reviewed literature and grey literature was undertaken with support from a subject librarian with expertise in the scholarship of teaching and learning at TU Dublin. A phase of brainstorming terms was followed by initial searches to validate these terms and alert us to synonyms and related terms. We decided to produce a synoptic review, that is, a condensed summary of existing curricula and practice nationally and internationally. Global parameters were set for the search: literature in the English language from 2009-2019 was included. Major themes were identified for the main search, corresponding to the headings used later in this article to discuss findings. Once the initial search had been completed, some further rationalisation of themes and sub-themes was undertaken to refine the major sections of the review. Seminal and key references for each major theme were reviewed.

Boundaries were set for this review with respect to other areas of work which were ongoing or recently completed within the University. For example, a Team Teaching Fellowship project examining assessment and feedback had been completed in the previous year with its own review of literature and practice. We did not therefore examine assessment and feedback. We did not review literature on e-learning and blended learning, but did include examples of curriculum design projects which explicitly encourage the design of blended learning elements in programmes. We decided not to discuss broader policy and quality assurance

infrastructure in this review, in order to focus on curriculum issues, but our findings are consistent with the recommendations of many recent policy statements and initiatives which were referenced appropriately.

Synopsis of Themes

Conceptualisations and potential definitions of curriculum in higher education

Research has explicitly identified the challenges of defining curriculum in higher education, and sought to explore what people mean when they talk about curriculum. The seminal works on curriculum in higher education call for connections to be made between teaching and research, and for reflection on values and educational philosophy (Barnett & Coate, 2005; Fung, 2017). However, the day-to-day reality for many academics is that curriculum is an ambiguous term (Fraser & Bosanquet, 2006; Hicks, 2018; Toohey, 1999) meaning any or all of the following:

- the outline of a programme or module;
- the full programme or course;
- the syllabus;
- module content;
- the learning plan or learning outcomes;
- assessment strategy;
- competences and requirements (particularly with respect to professional bodies).

Some studies have used interviews to elicit conceptualisations of curriculum from academics, and have demonstrated that perspectives on curriculum differ. This complicates the process of designing programmes as the underlying assumptions of different members of a disciplinary team will influence their decisions. Lecturers in higher education institutions have reported that they "experience curriculum development as a difficult, ambiguous and poorly defined process" (Moore et al., 2007, p.28). If one person intends curriculum to be the syllabus for their module, while a colleague intends it to be the full programme inclusive of time spent in placements or other activities, design problems could arise. Agreeing a working definition of curriculum is likely to enhance the chances of working effectively and consistently with a curriculum framework supportive of programme design.

Jackson (2011, 2016) offers a definition of curriculum as "all a student's experiences while they are studying at university - since most experiences have some potential for learning". For many practitioners, this view is too expansive, but it does call attention to how conceptualisations of curriculum have broadened in tandem with the changes taking place in universities over recent decades. Savin-Baden (2011) suggests that we need to reconsider notions of curriculum as being fixed on disciplinary knowledge, what she calls "the myth of the body of knowledge (BOK)" (p.131). Rather than focusing on the BOK, she references Barnett (2000) on supercomplexity and comments that we need "the development of curricula that equip students for an unknowable world" (p.132). Brew (2013) highlights the expectation that higher education should address a range of complex challenges: "about the speed of change; about increasing complexity and ambiguity; about globalisation and global interdependency; about the ways in which technology is changing how people communicate with each other; and about the huge physical and social problems requiring multi-disciplinary, global solutions", and that graduates work in "a postcolonial, pluralistic context in which people are required to deal with constantly changing knowledge, where every day people come across ideas that are not only different but radically different to their own" (p.603). Brew's response to this challenge is to open up the curriculum specifically to undergraduate research, an approach reflected by the work of Healey (2014) and the influential Connected Curriculum (Fung, 2017). Brew (2013) additionally comments that such research needs to be authentic – making new knowledge rather than uncovering what exists already. This is in the context that "universities should become scholarly knowledge-building communities where academics and students work together to learn and solve problems of the world" (p.609). Priestley and Philippou (2019) trace a similar shift in curriculum towards "a new focus on the centrality of the learner, accompanied by the development of active forms of pedagogy and a view of teachers as facilitators of learning" (p.2).

Others have taken this stance further and refer to critical pedagogy to address issues of power, control and politics in university curricula. Annala and Mäkinen (2012) offer the following definition of curriculum as "the intentional and dynamic process, which reveals the values and principles in relation to learning, knowledge and disciplines, and the cultural and political purposes of HE" (2012, p.4). Critical pedagogy challenges institutions to review curriculum in terms of whether and how it reproduces existing power structures and privileges or challenges them (Freire, 1996).

These explorations highlight the more abstract dimensions of curriculum alongside the process of curriculum design in universities. The argument being made is that students need not to acquire a body of knowledge but to be able to "critically evaluate both the world in which they live and receive knowledge" (Brew, 2013, p. 604). Priestley and Philippou (2019) summarise this by saying "Curriculum is - or should be - at the heart of educational practice" (p.1) and major challenges in society. They argue that, while education cannot be the "magic bullet" (p.1) for these problems, it "is a vital component in efforts to both create better and more cohesive societies, and to address the economic, social and environmental conditions that potentially destabilise modern societies" (p.1). They cite OECD research calling on education to address the challenges of climate change, economic uncertainty and mass migration. In light of this, they conclude that "systematic and nuanced thinking about the curriculum has never been more important" (p.2).

This leads us to thinking about curriculum not at the level of prescribed modules and contents, but curriculum design as an articulation of values, and perhaps then subsequently as "a high-level process defining the learning to take place within a specific programme of study, leading to specific unit(s) of credit or qualification" (JISC, 2014, p.2). The challenge for busy people in higher education is to create space to think about curriculum design, understood as something more abstract and values-based, while simultaneously designing within a National Framework of Qualifications and in alignment with institutional strategic priorities. Orientations towards curriculum inform programme design, but are also separate to programme specification documentation.

The process of designing curricula in higher education is under-researched (Bovill & Woolmer, 2019). However, in Ireland Donnelly and Fitzmaurice (2005) and later O'Neill, Donnelly and Fitzmaurice (2013) and O'Neill (2015) offer practical methods to meet the challenge described here. Their work proposes the importance of a sequential approach to curriculum development. Starting with values and theoretical stance, we can progress to the design of programmes and modules, inclusive of learning outcomes, teaching, learning and assessment strategies. Such approaches take curriculum beyond syllabus and course content, towards a continuous process which is socially constructed and values-based. It can be, and should be, influenced by social, cultural, and environmental changes. O'Neill's (2015) cyclical visualisation encourages us to think about curriculum design in a sequence from philosophy and values, consideration of appropriate curriculum models, programme learning

outcomes and structure, teaching, learning and assessment strategies, and only then the design of specific modules.

Viewing the design process as cyclical, with evaluation in-built and further changes identified, allows for continued innovation in curricula. The concept of a 'permeable' or semi-permeable curriculum has also been introduced in consideration of innovation. De Vries (2018), considering teacher education, defined the idea of the semi-permeable curriculum as "an open-ended core curriculum with a firm base in evergreen content around which flexible elements about new content can evolve". In higher education, practitioners have the design problem of raising professionals for an as yet undefined future. Therefore, a flexible approach to curriculum is essential in order to be able to adapt just-in-time and continuously. This is echoed by Hughes and Tan (2012), who coined the phrase "dynamic curriculum" for higher education. The aim of this flexibility is to make higher-education future-sensitive and adaptable to changes, on the one hand, in the work field and society and on the other, the needs of diverse cohorts of learners and stakeholders. Similar concepts have been described using the term "living curriculum" (Churchill et al., 2016).

Process or product, framework or model?

As will be evident from the discussion above, recent research around curriculum in higher education has focused on a distinction between process and product (Neary, 2003; Knight, 2001): is the purpose of higher education to relay or deliver a product to the student, or to engage in a process of co-constructing learning? O'Neill (2015) notes that this is not a case of absolutes and that many programmes will blend elements of both approaches. Process and product orientations reflect greater and lesser participation by the student in the design of curricula and learning experiences. This links with our values as educators and our theories of how learning happens. A product orientation will tend to focus strongly on disciplines, disciplinary norms and culture (Toohey, 1999), threshold concepts (Meyer & Land, 2005), subject knowledge, and learning outcomes (Gosling, 2009). A process orientation will tend to focus more on dialogue, experience, reflection, participation by students (Carlile et al., 2008) and potentially a critical stance on education (Freire, 1996). However, it is rarely the case that people commit absolutely to one orientation or the other: we see some elements of process and product in curriculum design which may be influenced by the nature of the programme, subject area, links with professional bodies, student profile and demographics, and a range of other factors.

Process and product orientations are reflected in some of the curriculum frameworks identified in this review. Bovill and Woolmer (2019) identify four frameworks that have informed research and theorising in relation to curriculum in higher education, and from which a range of models has been developed. Their analysis is useful although it is important to note that here (as elsewhere) the terms framework and model tend to be used interchangeably: "Biggs (1996) constructive alignment model; Fraser and Bosanquet's (2006) academic staff definitions of higher education curriculum; Barnett and Coate's (2005) Knowing, acting and being framework; and Bernstein's (1975, 2000) work on "what counts as valid knowledge" and "framing" (p.410). For the purposes of this review, we suggest that a framework can be viewed as the over-arching framing of approaches to curriculum design, with the models being structures and strategies we can use to design within those frameworks. A process-orientated framework implies the involvement of learners in co-creating their curricula, but this may be difficult to achieve in specific disciplines, and with the necessity to achieve learning outcomes. Bovill and Woolmer (2019) call for "further dialogue" (p.419) about curriculum to reflect on beliefs and examine the true scope for students to co-create the curriculum and co-create learning within the curriculum.

From the broader orientations towards curriculum described in the previous section, research and practice have led to the development of a number of models for curriculum design that can sit within an institutional curriculum framework. Such models support design but "are not a recipe" (O'Neill, 2010, p.2). Careful consideration is needed of how to use curriculum models (Ali, 2018; Akerlind et al., 2014; Trigwell & Prosser, 2014). Curriculum models facilitate discussion and decision-making in relation to the details of programme and module design: what will be learned and how? How will we know if it has been learned? For these discussions to happen, staff also need well-functioning programme teams and may also wish to include students, to involve academic developers or avail of continuing professional development (Engin & Atkinson, 2015).

Students as partners

The literature shows that the design of curricula will often reside with individual lecturers and their programme teams (Bovill et al., 2011), and will include consultation with employers and professional bodies where appropriate (Lawson & Wood, 2019). Students are consulted less often, and both researchers and policymakers have argued for a much stronger student role in curriculum design (European Commission, 2013; Bovill et al., 2011). Bovill et al. (2011)

argue for students to be involved in the design of teaching events and activities, courses, and curricula. Increasingly, the inclusion of the student voice has been seen as critical in developing curricula that are both appropriate and engaging. Integrating the student voice promotes a discussion around staff assumptions around the learning and teaching process and it moves the curriculum design process from a staff centric activity to a more inclusive endeavour (Brooman et al., 2015). Engaging students through involving them in the design of their own learning increases their commitment and leads to deeper learning with stronger outcomes (Bovill et al., 2011). Critical thinking and responsibility for their own learning are developed through these approaches. However, it is important that the inclusion of the student voice is not simply a 'tick box' consultative exercise; students should be equal, participative partners in all aspects of the process, not just the final approval stage (Seale, 2009). It is also important that academic staff and academic developers address resistance to students as partners in learning design (Bovill et al., 2011).

Students are the only stakeholders that experience a curriculum; their learning is shaped as much by the curriculum values as the actual syllabus. Understanding the student lived experience of a curriculum will uncover misconceptions and should reduce repeating curriculum design mistakes of the past (Mihans et al., 2008). An approach to curriculum design inclusive of students' voices could enhance diversity and inclusion in programmes too (Jessop & Williams, 2009). Including students in a co-created curriculum means that all stakeholders have ownership of and responsibility (Bovill et al., 2011). Examples of successful partnerships with students as designers of their own educational experiences have expanded in number in recent years and the UK HE Academy captured a range of case studies (2015). The work of Healey et al. (2014) has been influential but also highlights the challenges of this work: the need for partnership to be part of the institutional ethos, to develop shared understandings and values (recognising tensions), working ethically with students in this space, and considering appropriate contexts for such work. However, they also highlight the pedagogical benefits of rich and meaningful partnerships with students and "the possibility for genuinely transformative learning experiences for all involved" (p.7).

Graduate attributes

A further important dimension of much curriculum development work in recent years has been the integration of graduate attributes with programmes, defined by Bowden et al. (2000) as "the qualities, skills and understandings a university community agrees its students should

develop during their time with the institution. These attributes include, but go beyond, the disciplinary expertise or technical knowledge that has traditionally formed the core of most university courses. They are qualities that also prepare graduates as agents for social good in an unknown future."

Graduate attributes initially emerged around the time of the Bologna process as a means of responding to the requirements of the workplace. Producing employable graduates that meet employer expectations has been criticised for complying with the neoliberal agenda, particularly in the context of university education (Kalfa & Taska, 2015). The concept of global citizenship (discussed later) offers a useful counter to this argument, and despite criticism, graduate attributes increasingly underpin the preparation of graduates for employability, life-long learning and active citizenship (Oliver & Jorre de St Jorre, 2018). Graduate attributes serve as a useful framework to inform curriculum design, curriculum content, co-curricular activities, pedagogies and even the design of learning spaces (Hill, et al., 2016).

Of relevance to the design of a new curriculum framework are the systemic factors to the achievement of graduate attributes identified by Hughes and Barrie (2010) through a large-scale Australian project. Graduate attributes need to be conceptualised through a discussion around what their meaning might be, their importance and whose responsibility it is to implement them. Key points include staff development around graduate attributes, an engagement with the teaching and learning process and a whole programme approach to the embedding of graduate attributes in the curriculum. Other factors identified by Sparrow (2002) include customisation of graduate attributes within disciplines; change embedded in course review and development processes; implementation to focus on a few graduate attributes rather than all at once. Barrie and Hughes's (2010) research also pointed to the importance of students as active participants in the development and assessment of graduate attributes. More recent investigations corroborate the need for student engagement in the achievement of graduate attributes (Oliver & Jorre de St Jorre, 2018).

The recognition that graduate attributes should be contextualised, communicated and embedded throughout the curriculum has led a number of authors to report on the processes and challenges of mapping and embedding graduate attributes into the curriculum (Atrens et al., 2004; Bath et al., 2004; Bellew & Gabaudan, 2017; Jones & Killick, 2013; Mager & Spronken-Smith, 2014). Portfolio/e-portfolio approaches and capstone projects have been

highlighted as means to support reflection on learning, graduate attributes and transitions to the workplace (Fung, 2017; Shircore et al., 2013), and this resonates with work already cited in this paper which calls for more opportunities for undergraduates to do research, and for students to be more closely involved in designing their own learning.

In a rapidly changing environment, continuously reviewing the attributes to ensure alignment between an institution's chosen set of attributes and its range of stakeholders is of paramount importance. In a recent paper, Oliver and Jorre de St Jorre (2018) identify global citizenship, teamwork and communication, independence and critical thinking as key attributes for the graduate of 2020 and beyond. Global citizenship extends the concept of graduate attributes, and is another emergent and critical influence on the design of curricula in higher education.

Global citizenship

Literature in the area of global citizenship demonstrates broad agreement on how to define the 'global citizen' in the context of higher education. Lilley et al. (2017a, p.6) cite a UNESCO (2015) report which identified the need for forms of education that enable learners to address local and global challenges, as socially responsible, critical and ethical thinking graduates, a disposition consistent with the global citizen. Two conceptual lenses dominate the discussion around the global citizen (i) the neoliberal lens which places an emphasis on the development of individual professional skills and employability in an international context and (ii) the cosmopolitan lens which promotes the development of an intellectual mind-set which sees the individual develop the ability to understand and grapple with the economic, social, technical, environmental and cultural aspects of society (2017a, p. 7). The cosmopolitan view of the "global citizen" resonates with Barnett's (2011, p.451) ideas around the "ecological university" which he describes as "a university that takes seriously both the world's interconnectedness and the university's interconnectedness with the world". For Barnett, students develop as "global citizens" when they demonstrate concern for the world, and an understanding of their own possibilities in the world and towards the world. In a similar vein Killick (2012, p. 373) argues global citizenship education is the "legitimate business of the university".

The notion of global citizenship has been described as a disposition incorporating ethical, social and professional understandings (Lilley et al., 2015a). Tarrant (2010, p. 434) supports Dobson's (2003) view of citizenship citing issues of justice, the environment, and civic

obligations as key determinants of what it means to be a global (aka Earth) citizen. Morais and Ogden (2011, p.447) argue that while there is no particular definition of '*global citizenship*' three overarching dimensions of global citizenship are consistently noted in the literature: *social responsibility*, *global competence*, and *global civic engagement*. Within each dimension are multiple sub-dimensions that further reflect the complexity of the construct.

There is a dearth of research on what the process of 'becoming' a global citizen actually entails. Lilley et al.'s (2015a, 2015b, 2017) empirical work has shed some light on questions of meaning and learning processes around the development of global citizens in the university context. Key to their conceptualisation is the development of the global mind-set, "the generating center of global citizen learning" (2015b, p.235). They propose that global citizen learning occurs when students learn to consider other perspectives, engage more with emotions, assumptions, imaginations and "make interconnections of knowledge across complex contexts" (2015b, p.236). While there is agreement that the global citizen is a fluid concept and there is no "one size fits all" (2017, p.13), Lilley et al. (2015b) developed an 'identikit' or set of recognisable markers which offers an insight into what a global citizen might look like as a curricula outcome. Space precludes a detailed discussion of this work here, but in summary, the development of global citizenship in students in higher education contexts is encapsulated in the internationalisation dimension of curricula (IoC), particularly in Australia and the European Union. Evidence of the development of global citizenship in students in higher education is for the most part associated with mobility and international exchange. However, in light of the renewed focus on sustainability and the realities of post-pandemic travel, it is important to consider opportunities for bringing global citizenship to local curricula. Salter and Halbert (2017) argue that curriculum frameworks that "facilitate cosmopolitan ways of thinking and being, such as critical service-learning, present opportunities for a fourth wave of globalisation in higher education" (p.703), facilitating the development of global mindset. Lilley also points to a range of enablers with respect to incorporating global citizenship within curricula frameworks. She argues thought leaders are important here in promoting a "reflexive cosmopolitan leadership".

The global citizen construct needs to become more recognisable and tangible for students. Tarrant's (2010) "global citizen type" continuum ranging from a "personally responsible global citizen", to a "participatory global citizen" to a "justice-oriented global citizen" provides a very useful way for universities to articulate their expectations for the global

citizen as a learning outcome. Lilley (2014) cites The University of Bournemouth, UK whole of institution approach towards educating global citizens and promoting sustainability across the entire university organisation. This "social embeddedness" sees all university actors made accountable for their contribution to the university ethos of social responsibility and global citizenship.

Embracing the global citizenship construct as integral to a university curriculum presents an opportunity for the university to foster a transformative experience in students, educators and a broad range of stakeholders. Encouraging diversity on campus through internationalisation of programmes and student experiences generally will not, as Killick (2013, p.13) argues, in and of itself create "border crossings and inclusive communities of practice". Similarly innovative practices at the module level while often highly impactful if experienced in "isolated pockets of the formal curriculum" (Leask, 2009 cited in Killick, 2013) are unlikely to be transformative. Designing in a global citizenship ethos at the level of the university curriculum framework enables "the formulation of a more globally situated sense of self-in-the-world" (Killick, 2013). This outward-looking and inclusive outlook aligns well with enhancement of employability as well as the development of skills essential for the development of engaged global citizens more generally. Killick (2013) argues that students themselves are seeking this ethos. It resonates with their perceived needs and what they want to achieve as a result of engaging with higher education.

Sustainability

We have considered the place of higher education in the 21st century, the role of curricula in developing graduate attributes and global citizenship, and the potential for a curriculum framework to reflect institutional values and principles aligned to these objectives. Equally important is consideration of sustainability: as society slowly emerges from a pandemic, we are confronted with a worsening climate crisis and fluctuating political context in the Global North. Currently, the world faces huge environmental changes; these changes will have knock-on effects on our social and cultural norms. In an attempt to prepare for the future, in 2015 the United Nations (UN) published the Sustainable Development Goals (SDGs) (https://sustainabledevelopment.un.org/) with an aim "to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030" (UN, 2015) and to provide "a shared blueprint for peace and prosperity for people and the planet, now and into the future". The SDGs "recognize that ending poverty and other deprivations must go hand-in-hand with

strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests" (https://sustainabledevelopment.un.org/sdgs).

The SDGs relate to education in diverse ways and have become central to the development of institutional structures and strategies at TU Dublin (2019). SDG4, Quality Education, calls on educators and policymakers to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". The SDG4 Targets and Indicators (https://sustainabledevelopment.un.org/sdg4) highlight the place of post-compulsory education and university in supporting people who have missed out on earlier education or had an impoverished experience. Higher education also has a role in educating teachers (a further priority indicated) and in addressing open educational practices which have the potential to improve access to higher education.

Education has a role to play in bringing the changes sought in the UN SDGs. The discourse on sustainable development and the principles of sustainability are becoming increasingly important as citizens become more aware of the consequences of climate change. Albareda-Tiana et al. (2018) remind us of this call, and literature over the past ten years encourages a focus on sustainability in universities (Leal Filho, 2010; Lozano et al., 2013; Michelsen, 2016). Lukman and Glavič (2007) suggest that universities are change agents in promoting sustainability principles within society, with a critical role in sharing and enacting principles of sustainability. Initially, embedding sustainability into the curriculum was based on specialised content addition, or the creation of bespoke sustainability courses (Tilbury, 2019). More holistic approaches are now emerging, along with scholarship in this area. The curriculum is a mechanism to introduce sustainability issues, leading to opportunities for students to undertake related research and projects. Overton (2019) reports that Leeds University has designed sustainability into the curriculum through programmes and modules, and established a Sustainability Service to work directly with Schools. Higher education can act as a sustainability model with students and staff integrating transdisciplinary teaching and learning to allow the complex problems that underpin our current sustainability shortcomings to be answered. The curriculum framework guiding programme design is one lever for this process, and in enabling the necessary new kinds of connections between the disciplines. Nicolescu (2018) argues that "If the universities intend to be valid actors in sustainable

development they have first to recognize the emergence of a new type of knowledge—transdisciplinarity knowledge—that is complementary to traditional, disciplinary knowledge".

Furthermore, there will be need to redefine the values that govern the university and to open the university up to civil society and to the other places of production of new knowledge (Nicolescu, 2018). This need for greater interdisciplinary and transdisciplinary work is underlined by Millar (2016). We need courses designed to teach students about society's complex problems (Frodeman, 2014). This is reiterated by Hess and Collins (2018) who outline the need for changes in the higher education curriculum to combat the "pervasive misinformation" around the subject of climate change. They draw on case studies in the US and discuss strategies that could ensure a higher likelihood that the core curriculum includes education on climate science and climate change.

Curriculum frameworks at other universities

During this review, we analysed the websites of other universities and technological universities in relation to their approaches to curriculum design. The search prioritised institutions similar to TU Dublin but also universities in Ireland, and those in the UK which have disseminated strategic curriculum design projects over the past five years. This analysis showed similar concern with the themes of sustainability, innovation, global citizenship and graduate attributes in the work of other institutions. Connections between research and teaching were being renewed and revitalised with leadership at senior level, and this was most notable in traditional research-intensive universities. The Connected Curriculum (Fung, 2017) originating at UCL is the principal example here. Most importantly, the projects and initiatives we have seen reflected the evolution of thinking about curriculum beyond the definition of modules and programmes in single disciplines, and towards greater inter-disciplinarity with a greater role for students in designing their own learning.

Other forms of connection were seen in reviewing recent high profile curriculum framework projects in the UK. These addressed digital education, graduate attributes and students-as-partners approaches. The University of Edinburgh's Near Future Teaching project used a collaborative design process to develop four "plausible future worlds" and how digital education could be developed in each. The preferred future was evaluated with staff and students and also with school students and employers. It reflected a university community-focused perspective, "post-digital" in the sense of technology being fully integrated with

education, with a critical stance on data in education, an orientation towards choice in assessment and a playful, experimental approach to change. We also saw a focus on the design of the physical campus and how it is used. Following the Covid-19 pandemic, and it is likely that such work reconsidering the use of the physical campus will grow considerably over the next few years.

Conclusions

In this paper, we have presented key findings of a review of literature and practice addressing curriculum in higher education. While originally undertaken in the context of the Co-CREATE project, the review has wider potential to inform practice and particularly the development of sustainable practices into the future. In keeping with the goals of this Special Issue of IJAP, we reframe these findings as recommendations for practice and action points for sustainability.

First, the review showed the need to articulate what 'curriculum' means within the institution, so that colleagues can work with a shared understanding of what they are trying to construct. This definition needs to articulate values and principles with regards to teaching, learning and assessment, knowledge and the disciplines, and the purposes of higher education.

Second, it was clear consistently across this review that curriculum goes beyond individual programmes or their content. Curriculum is a process rather than a product, a process through which those teaching and students learning encounter knowledge critically, and generate new knowledge towards solving complex challenges in the world. The inclusion of the student voice in the development of a curriculum framework is essential in forming a meaningful engagement with students in their learning.

The climate crisis, and broader issues of social justice and equality have been articulated through the UN Sustainable Development Goals (SDGs). Responses to these challenges addressing the SDGs should be designed into an institution's curriculum framework and what is taught. A process approach to curriculum, and responding to the challenges identified in the SDGs, implies greater interdisciplinarity and transdisciplinarity. There are opportunities for more research and knowledge creation to be done by undergraduate students. Innovative curricula give these opportunities, but are also flexible and permeable.

UNESCO (2015) identifies the need for education to foster global citizenship through social responsibility, global competence and global civic engagement. Global citizenship can be achieved in higher education through mobility and international learning experiences, but also fostered locally if it forms part of the university ethos at the institutional level and is demonstrated through the curriculum framework. Graduate attributes reflect this aim too, as the skills and qualities that take cognisance of academia, work, career, lifelong learning, society and community. Such attributes can be integrated with curricula and developed incrementally.

As we move past the emergency stages of the Covid-19 pandemic, there is renewed emphasis on the role of universities in building recovery, and a new green economy. Such changes call for revitalised connections between research and teaching. We should seek to renew and energise the connections between teaching and research.

Finally, this review identifies the importance of continuing professional development for staff in the university, with support from leaders and champions at senior level to develop and adopt authentic and effective curriculum frameworks.

These recommendations can underpin the development of curriculum in higher education to support sustainable changes to practice, but more importantly, better learning experiences for our students.

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