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From Flagship to Flotilla? Findings from a Review of Literature on Learning Spaces in Higher Education, and Education for Sustainable Development



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Abstract

The development of physical and digital teaching and learning spaces in higher education has been the focus of attention from researchers in recent years. Teaching spaces on campus, and the campus itself, have been reconsidered in light of pedagogical, technological, political, ecological, and social changes influencing higher education over the past three decades. Spaces are historically under-researched in higher education, and the area is under-theorised with a failure to recognise space as a mediator of learning. The closure of most campuses during the COVID-19 pandemic prompted some reconsideration of the mediating role of physical and virtual learning spaces in higher education but there is little evidence of change or adaptation for resilience. Neither has research discussed in detail the connections with the United Nations Sustainable Development Goals (SDGs) and education for sustainable development.

This paper presents an analysis of the literature on teaching and learning spaces in higher education and considers potential implications in relation to Education for Sustainable Development (ESD). Evidence indicates that socio-material frameworks would be valuable in evaluating uses of space, and that more stakeholders – particularly students – need to be involved in planning, designing, and evaluating spaces for teaching and learning. The findings point to a need for multiple smaller and more flexible spaces. The paper proposes that higher education stakeholders should reconsider large-scale campus ‘flagship’

expansion with inherently high embodied carbon, in favour of a sustainable ‘flotilla’, repurposing existing spaces on and off-campus.

Keywords: Campus Architecture; Educational Development; Learning Spaces; Sustainable Development Goals; Sociomateriality; SDG 4; Teaching Spaces

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Introduction

The development of physical and digital learning spaces in higher education has been the focus of attention from researchers in recent years, and particularly since pervasive Internet access and information abundance have become realities (Oblinger, 2006; Temple, 2008; Weller, 2014; Weinbren, 2014). The NMC Horizon Report (2017, p.16) highlighted that “[a]s universities engage with strategies that incorporate digital elements and accommodate more active learning in the physical classroom, they are rearranging physical environments to promote these pedagogical shifts”. Changing how we think about physical spaces may in part be due to technology, but is also driven by pedagogical, social and political change. Pedagogical innovation, and political changes to encourage greater and more affordable access to higher education, have prompted reconsideration of how the campus is designed and used (Oblinger, 2006; Temple, 2008). In particular, there has been a focus on why we continue to gather in on-campus spaces, mostly configured to orient groups of students towards a lecturer at the front of the room (FitzSimmons et al., 2019). The sudden closure of campuses during the COVID-19 pandemic pushed this issue to the fore, and highlighted the mediating role of the campus in teaching and learning in higher education (National Forum, 2021; Oliveira et al., 2022). Several important reviews of literature and practice in recent years, along with funded projects internationally, have begun to re-examine campus design and how we use physical spaces to ask what kinds of changes might be needed and how these can be investigated.

This paper considers physical teaching and learning spaces in higher education campuses in a digital, post-pandemic and more sustainability-conscious era. The paper seeks to draw attention to spaces and how we think about them, particularly in relation to education for sustainable development and our campuses as sustainable learning environments and living laboratories for sustainable development (Favaloro et al., 2019; Mazutti et al., 2020). Despite a historical lack of research in this area, there is now a growing field of literature, with leading authors suggesting that learning spaces need urgently to be factored into strategic curriculum and assessment planning. Use of space also has a direct link with the sustainable development of our campuses and education for sustainable development. Theoretical work has emphasised that in addition, we need to consider how space represents the institution and mediates learning and teaching (Spire, 2022). Seen from this perspective, teaching and learning spaces are one means of communicating sustainability

to staff and students and engendering sustainable practices. However, there are few signs that practice is changing (Boys, 2017) and critiques have shown that there is limited research to inform the development of practice in this area, as well as an ongoing disconnect between those teaching and learning and those planning and building (Temple, 2018). There has not yet been extensive discussion of the connections between our use of teaching and learning spaces and the United Nations Sustainable Development Goals (SDGs) (UN, 2015), with some notable exceptions (Griffiths et al., 2019; Montiel et al., 2019; Schnitzler, 2019; Sinakou et al., 2019; Varone, 2021). Potential adaptations of physical learning spaces since the pandemic have not been adequately considered, perhaps as there has been an emphasis on returning to normal after the period of prolonged disruption. Given the evidence of loss of access to education during the pandemic, this is likely to need more urgent consideration (UN Statistics Division, n.d.).

It is timely, therefore, to review recent literature on learning spaces in higher education in order to make these connections and examine emerging patterns of use, appropriate theoretical frameworks enabling us to consider how teaching and learning are mediated by space, and the tools we can use to evaluate the effectiveness as well as the efficiency of particular kinds of space. Such a review was undertaken to inform the development of an accredited postgraduate module for staff at TU Dublin, *Post-Digital Learning Spaces*. For this paper, the lens of education for sustainable development as currently articulated in SDG 4, was used to return to the literature on learning spaces. The paper begins with a short description of how the literature review was carried out, and then progresses to discuss its main findings. These findings will then be discussed further in relation to the policy mandate of the UN SDGs and the growing momentum behind ESD. Conclusions will then be drawn with some recommendations for further discussion and consideration.

Implementation of the Literature Review

Context

The first iteration of this literature review was undertaken to inform the development of a new 5 ECTS credit postgraduate module at TU Dublin, *Post-Digital Learning Spaces (PDLS)*, offered as part of the MSc Education. The MSc Education is a two-year part-time postgraduate programme with participants including staff who teach or support students' learning in higher education, and colleagues working in learning and development in other

sectors. MSc modules are additionally available on a stand-alone basis for continuing professional development (CPD), and elective or optional modules such as *Post-Digital Learning Spaces* (PDLS) are popular with many staff at TU Dublin. The PDLS module stemmed from previous work undertaken by colleagues in the former Learning, Teaching and Technology Centre at TU Dublin (now Learning, Teaching and Assessment within Academic Affairs). In collaboration with our colleague FitzSimmons at Purdue University, Harvey, O'Rourke and this author investigated the adoption of Active Learning Classrooms (ALCs) through projects linked with the construction of the new TU Dublin campus at Grangegorman in Dublin city, and new buildings at the Purdue campus in the US. Presentations of this work at a number of conferences were positively received (Harvey et al., 2019; McAvinia et al., 2019) and interest in the topic grew amongst staff. The new PDLS module was validated in 2020 and has had two iterations, with successful completion by 19 participants to date. The module focuses on the changing nature of our interactions with the physical campus and includes evaluation of a chosen space by groups of participants. Participants present their evaluations of existing spaces for assessment, along with an individual assignment which includes a lesson plan for a chosen physical or digital space including a blend of technologies and addressing universal design principles.

Literature Review Phases and Strategy

A narrative review of literature was undertaken by this author in 2021 to support design of the PDLS module, and this was extended in 2022-23. The research strategy focused on the period 2016-present with inclusion of older seminal or widely-cited works. A pearl-growing approach (Farrell, 2017) supplemented the initial search. The search was constrained to include full-text works in the English language, and sources identified were predominantly peer-reviewed articles and books, although relevant academic blogs/social media and grey literature were also identified. Databases used were Academic Search Complete, British Education Index, ERIC, Google Scholar, JSTOR, ProQuest and Scopus. Abstracts were checked and works focusing on highly localised case studies within a single discipline area were excluded, as were works relating to the school sector. Identifying works in the English language meant including many works from the Global North, and so works from the Global South were actively sought where these were available in English. Keywords used were: “learning spaces”, “campus design”, “architecture”, “campus architecture”, “built pedagogy” in isolation and in combination with “higher education”.

Works using the term “campus architecture” to discuss information technology infrastructure were subsequently identified and excluded. Works addressing abstract conceptions of space (for example, the production of safe spaces by groups) were excluded at this stage, although their importance as part of the wider discussion of learning spaces is acknowledged. 318 items were retrieved in the original review before removal of duplicates and further scanning of abstracts and metadata for relevance. This led to the identification of 68 items for review. Literature was analysed and grouped thematically.

Key Sources

Before presenting findings from the literature review thematically, it may be useful to identify some of the key publications which influence the discussion that follows. Helpfully, some of these are reviews of literature and practice undertaken by other authors or agencies which supported validation of the findings from the current review:

- Oliveira et al. (2022), *Campus spaces and places: Impact on student outcomes - Review of evidence*, report for the Association of University Directors of Estates (AUDE) and the Higher Education Design Quality Forum (HEDQF) in the UK;
- National Forum (2021), *Next Steps for Teaching and Learning: Moving Forward Together*, report from the National Forum for the Enhancement of Teaching and Learning in Higher Education in Ireland;
- Elkington and Bligh (2019), *Future Learning Spaces Space, Technology and Pedagogy*, report for UK Advance HE;
- Patel (2019), *The Future of Learning Environments*, report for the UK Higher Education Design Quality Forum;
- Boys (2017), *Building Better Universities: Strategies, Spaces, Technologies*, a book arising from her research and professional practice.

Evaluative frameworks and toolkits were also identified which are shared here for information but not extensively discussed later. They include: the UK JISC’s Learning Spaces Infokit (<https://www.jisc.ac.uk/full-guide/learning-spaces>), Pearshouse et al. (2009) JELS review of available frameworks, FlexSpace Flexible Learning Environments Exchange (State University of New York, <https://flexspace.org/>), Learning-Space Compass (UK Higher Education Design Quality Forum,

<https://orca.cardiff.ac.uk/id/eprint/130710/>), Educause's Learning Spaces Rating System (<https://www.educause.edu/eli/initiatives/learning-space-rating-system>) and the UK's UCISA Toolkit (<https://www.ucisa.ac.uk/Resources/The-UK-Higher-Education-Learning-Space-Toolkit>).

In this paper, I have used 'spaces' to mean learning and teaching spaces. Barnett and Temple (2006) are widely cited having framed *teaching spaces* to mean rooms and settings in which formal timetabled teaching events are carried out, while *learning spaces* are those in which students learn individually or in groups but independently from timetabled sessions. In addition, Temple (2008) distinguished between spaces and *places*: places are made so by having social interaction and exchange. However, it could be questioned whether this distinction still needs to be made in an era of constant connection to others online.

Findings from the Literature Review

What is the connection between teaching and learning, and the spaces in which they happen? It might be anticipated that research focusing on teaching and learning spaces in higher education would seek to explore how spaces influenced teaching and supported positive learning outcomes for students, and indeed much research has focused on these issues. Attention has been given to the design and layout of spaces, changing this to facilitate new teaching and learning methods, or diagnosing constraints which need to be overcome (Alterator & Deed, 2013; Carolan et al., 2020; Carlos et al., 2023; Ralph et al., 2022). However, there is universal agreement that research on teaching and learning spaces in higher education (considering sustainability or not) is limited. Similarly, there are calls for much more research on the relationship between campus development and learning, with critical commentary of how disconnected they have been (Temple, 2008, 2018; Neary et al, 2010; Blackmore et al., 2011; King, 2016; Boys, 2017; Patel, 2019; Gravett et al., 2022; Oliveira et al., 2022; Spire, 2022). This is in contrast to well-developed literature in the schools sector.

Methodological difficulties have limited research or constrained the transferability of studies which have been undertaken. Temple (2008) critiques the research for a lack of evidence underpinning claims about space design. Terminology is poorly defined or used loosely (for example, catch-all labels such as 'active learning'), and methodologies for evaluating the use of spaces to show particular learning outcomes or find evidence of improvements have been limited or under-developed (Temple, 2008; Beckers et al., 2016; Patel, 2019). It has been

pointed out that research too often focuses on undergraduate cohorts, with a predominant focus on first year undergraduate groups, neglecting postgraduates and doctoral students (Maor et al., 2016; Zeivots & Schuck, 2018; Oliveira et al., 2022; Carvalho & Freeman, 2022). These issues may help to explain a further critique from Temple (2018), Beckers et al. (2016) and Neary et al. (2010) that there is little evidence of change in the design of campus teaching and learning spaces over some decades. However, the costs associated with campus development and the development of specific learning and teaching spaces are very significant, second only to salaries (Dane, 2015; Spire, 2022). Furthermore, these costs typically do not reflect environmental factors, such as biodiversity loss, carbon emissions and environmental health. Many authors have asked why, given a financial outlay in the billions every year for new construction and maintenance of existing estates we have such a poor research and evidence base to inform decision-making (Neary et al., 2010; Temple, 2018; Spire, 2022). It is also reported that in spite of extensive campus development in the US, Australia, the UK and Ireland, staff and students still report pressure on space and some groups feel excluded (Ralph et al., 2022). These issues will be unpacked further in the following sections.

Characteristics of Useful Spaces

Despite the limitations described, researchers have nonetheless established some characteristics of what staff and students want in teaching and learning spaces, and how spaces might be improved. Comfortable furniture, temperature control, easy access to catering services or ability to bring their own food and potentially to play their own music are highlighted (Beckers et al., 2016; Oliveira et al., 2022). Proximity to green spaces is also highlighted as being important for students and staff (Elkington & Bligh, 2019; Gravett et al., 2022), and sometimes outdoor and green spaces are used for teaching. Good connectivity/wifi is not mentioned in recent studies, perhaps because this is now assumed, but sufficient charging points for devices are mentioned (Elkington & Bligh, 2019).

The review undertaken by Oliveira et al. (2022) focused on specific questions around enhanced student learning outcomes and retention, analysing existing studies to distil the available data. They found that space was less important to students than social interaction and quality of learning experience overall. Almost 15 years earlier, Temple (2008) also reported this, that students are not concerned by space provided it is functional, clean and well-maintained. There is some limited evidence that learning outcomes are enhanced in new or enhanced spaces (Carlos et al., 2023), but with caveats that it has been difficult to identify whether the effects

are due to the spaces, the redesign of teaching methods, or abstract reasons such as the physical or affective response to the space. What does seem to be clear is that comparatively modest changes to facilitate teaching methods, or facilitate independent learning by students individually or in groups are welcomed and useful (Elkington & Bligh, 2019). Such changes might be relatively inexpensive – changes to furniture or décor rather than remodelling buildings or constructing new ones (Temple, 2008; 2018). Students will often choose to study at home because they have control over the learning environment, but the importance of libraries as learning spaces is also underlined (Temple, 2018; Patel, 2019; Oliveira et al., 2022).

By contrast, Boys (2017) and Spire (2022) have commented on the scale of campus development and redevelopment, the tendency of universities to imitate corporate cultures in the design of buildings and the “facilities arms race” (Spire, 2022) of institutions in competition with each other. Figures from the UK point to physical expansion of campuses even in the past five years, while in Ireland recent announcements point to ongoing expansion of campuses, particularly in the new technological universities (*Irish Times*, 1 March 2023), even as the Irish Government has put climate action under statute regulating its universities to put forward credible roadmaps towards net zero. While the development of estates and infrastructure is important, and has historically been lacking in Ireland, it is important to consider what evidence we have from staff and students about their use of teaching and learning spaces before investing to this extent. When we consider the environmental impact and carbon footprint of extensive construction projects, it is even more important.

Spaces need to be flexible

The majority of sources reviewed, including those which were wider meta-analyses or literature reviews concluded that teaching and learning spaces need to be flexible, adaptable, “hackable” (AUDE, 2021, p.34), customisable and usable in combination with each other depending on a student or teacher’s purpose at any given moment (Park & Choi, 2014; King, 2016; Temple, 2008, 2018; Beckers et al., 2016; Elkington & Bligh, 2019; Patel, 2019). Arguments for this flexibility were linked with developments in learning theories in recent decades, with the development of constructivist teaching and active, collaborative learning (Park & Choi, 2014; King, 2016), and the introduction of digital technologies over the past 30 years (NMC, 2017). There is a shift away from what Temple (2008, p.234) calls “*ex cathedra*” teaching from the front. More informal learning spaces are called for (Beckers et al., 2016) along with universally designed spaces (NMC, 2017; National Forum, 2021). Individual and group spaces are both needed – in fact more individual spaces may be needed since the emphasis on collaborative

learning has led to possible over-provision of group spaces (Beckers et al.; 2016; Elkington & Bligh, 2019).

Gaps in research

While the literature reviewed gave valuable insights, it also identified its own limitations. Teaching and learning spaces in higher education are under-researched and under-theorised (Goodyear & Carvalho, 2013; Goodyear, 2020). As has previously been mentioned, there are methodological limitations and a tendency to look for causes and effects based on room type or layout (Goodyear & Carvalho, 2013). More recent work has encouraged consideration of space as more than just the backdrop to learning, but as an important non-human actor (Goodyear & Carvalho, 2013; Goodyear 2020; Spire, 2022). From this perspective, a range of other theoretical frameworks and methodologies become useful. Activity theory and actor-network theory are two, and sociomaterial perspectives have been particularly evident in recent literature and will be explored further in the next section.

A further identified limitation of the literature is an emphasis on undergraduate learning and particularly a focus predominantly on groups of first year undergraduates. We need to think also about postgraduate students (Maor et al., 2016) many of whom may be working remotely or working in isolation, many more of whom might enrol with our institutions if they could access supervision and support more easily. Maor et al. (2016) found that online supports were valuable to doctoral students even pre-pandemic, especially when combined with e-portfolios. Others have pointed out the limitations of the physical campus for interdisciplinary work, which could better be supported through improved allocations of space to legitimise and give prestige (Friedman & Worden, 2016). Friedman and Worden acknowledge the “rich line of scholarship in the study of space which has emphasized how places are ‘produced’ by human agents who generate *meanings* of places that become consequential to their use” (p.131).

While research on spaces is limited generally, it is even more limited when addressing students’ home or living spaces. These should be considered as learning spaces since they are likely to be used for much independent learning (Oliveira et al., 2022). Space precludes full discussion of online, hybrid and hyflex learning in this paper but it is important to note that students now ‘attend’ programmes in multiple modalities and as MacNeill and Beetham have commented, “everything is now blended” (2023). Consideration of home learning spaces is also important in the context of rising accommodation and travel costs when students may opt to study at an

institution close to where they live (Patel, 2019), even if on-campus accommodation is offered, since this too can be very costly. Some studies have pointed to Tinto's work in the 1970s to highlight that students commuting and living long distances from campus are at risk of non-completion, but more recent studies are not in unison on this issue. Oliveira et al. (2022) point out that social media has had the effect of connecting students more effectively than living on campus. They nonetheless find that close proximity to campus is important for students, and (as will be discussed later) limits to socialisation during the pandemic were found to be very detrimental to students' experiences of higher education (National Forum, 2021). Pre-pandemic studies have highlighted other forms of socialisation to support students' learning outside timetabled sessions, for example Residence Learning Communities for undergraduate students in the US and Canada (Oliveira et al., 2022). Those sharing halls of residence are grouped by programme or discipline area. This has been noted to happen informally in shared accommodation (ibid., 2022), although it may be compromised by the current challenges to finding such accommodation. It may also be supported through extra-curricular activities and sports teams although again it is possible this is compromised when students are working jobs to support their studies.

What needs to change?

Analysis of the literature highlighted a number of potential changes that could be made in our thinking about teaching and learning spaces, and our practical implementations of those spaces. There are some obvious practical drivers to change too. Back in 2010, the *Learning Landscapes* project in the UK highlighted the increasing financial pressures on campus estates, citing building costs which seem vastly smaller than those of 2023 (Neary et al., 2010). Effective and efficient use of campus spaces, they argued, would enable better use of tight university budgets and this may be an even more urgent concern in the context of rising construction costs. Since the COVID-19 pandemic, other sectors have re-examined their uses of space – office environments have changed with blended and remote working. Office spaces have been adapted and reconfigured to accommodate specific collaborative working activities, what has been called “dynamic working” (Darmody, 2022). It is recognised that we are now in a “post-digital” era (Fawns, 2019), in which digital technologies are no longer new or special, but integrated with our spaces and activities. Gourlay (2020) points out that divisions between online and in-person teaching were already somewhat meaningless when members of the group can message each other in the lecture theatre and remain connected with other activities while in class, and those attending class from home are nonetheless in-person with other people in

webinar settings. Arguments have also been made that new spaces should resemble the new workplaces in which students will find themselves as graduates. This discussion previously focused on technology and digital literacies, but a question needs to be asked as to whether it now relates to hybrid and remote working in tandem with working in office spaces (Elkington & Bligh, 2019). Fawns (2019) suggests that we consider space in the post-digital world as active, open, universally designed. Bayne et al. (2020, p. xiii) remind us that “we are the campus”, the people are the university rather than the physical buildings, and that we should not “succumb to campus envy” (p. xii). Beckers et al. (2016), Elkington & Bligh (2019) and Patel (2019) are amongst those calling for consideration of teaching and learning spaces to be aligned urgently with strategic curriculum and assessment development projects in universities, and for students to be included as co-designers and co-creators of space. These calls are echoed in TU Dublin’s own Co-CREATE Curriculum Framework project (Ryan et al., 2020). Previously this author and colleagues (McAvinia et al., 2019) called for consideration of spaces in relation to open educational practices (OEP) and the use of open educational resources (OER). Wifi and constant connectivity, with student ownership of smartphones estimated at over 90% in 2017 (O’Rourke, 2017) have radically changed the possibilities around when and where we learn. While institutions stick with polarised discussion of on-campus and off-campus, students and staff are already connecting with each other online in the classroom and in-person outside of it. Opening up our thinking in relation to spaces allows the possibility for more open educational practices, to open up teaching and give agency to learners as contributors to knowledge and the community, seeking opportunities for experiential and active learning, and flexible forms of assessment (Cronin & MacLaren, 2018; Weller, 2014, 2018).

Rethinking spaces

From the discussion in the previous sections, it can be seen that research in teaching and learning spaces in higher education is developing stronger theoretical frameworks and methodologies. The evolution of the discussion shows less focus on space as a ‘cause’ of optimal or sub-optimal teaching and learning practices, and more emphasis on how space functions with other mediating artefacts in these activities. The discourse has developed towards viewing space as one of many mediating non-human actors in learning (Goodyear & Carvalho, 2013). Seeing learning spaces as one of many mediators of learning has the potential to transform how we view our campuses and rooms, but adds complexity to our efforts to research how spaces influence learning and teaching. There are existing theoretical frameworks

and methodologies to help with this, and an accumulating suite of toolkits and frameworks to support researchers and practitioners.

One of the most widely quoted aphorisms in literature on spaces comes from Winston Churchill, who commented on the reconstruction of the parliamentary chamber in London that “we shape our buildings and afterwards our buildings shape us” (Churchill, 1943). This has been interpreted to mean that we design for particular kinds of activities, but that spaces will influence those activities in their turn. In the case of university architecture and teaching and learning spaces, design was focused initially on management of what was a scarce resource – information. Teaching spaces were oriented towards reading (*la lecture*) from one source to many people, with note-making the means by which knowledge was stored and shared. Libraries were traditionally designed to store catalogued information and make it available to those with the privileges of accessing it while on campus. Information scarcity was the organiser for learning (Weinbren, 2014) but we have since moved to an age of information abundance (Weller, 2014) which is challenging many aspects of academic practice and forcing us to rethink how learning should now be designed (Goodyear & Carvalho, 2013). A strong response to the identified lack of theoretical work to support this process comes from those proposing sociomateriality as a useful means of thinking about space. The reader is pointed towards fuller discussion of sociomateriality in the work of Fenwick and Edwards (2012) and O’Leary (2020). From a sociomaterial perspective, humans interact in complex ways with non-human entities and with each other in their activities, meaning that it is impossible to isolate single elements as causing or producing certain outcomes. Fenwick and Edwards (2012, p.55) point out that “[i]n education, people constantly influence and adjust to each other’s emerging behaviours, ideas, and intentions as well as with objects, furniture, technologies, etc, through myriad complex interactions and fluctuations.” All of these interactions have complexity: because of the way interactions take place with reference to other people, to information, with objects and furniture and space. Sociomateriality offers a means to explore and investigate these complex interactions, and potentially to influence them in particular ways. Mulcahy et al. (2018) bring this theoretical framing to their exploration of spaces and comment (p.13):

space, like learning, is a practice—it is always in a process of being made... Thinking of the term learning spaces as something we do (stage, perform, enact), rather than something we have (infrastructure) affords acknowledging the multiplicity, mutability and mutual inclusivity of spatial and pedagogic practices.

Fenwick and Edwards (2012) point out that the traditional focus in educational research has been on the individual doing the learning, but that there is now a change towards taking account of “concepts, language, cultural mediation, and experimentation with environmental objects” (p.53). From the sociomaterial perspective, “[i]t is through the being-together of things that actions identified *as* learning, become possible” (p.54).

Learning spaces post-pandemic

The COVID-19 pandemic caused the closure of higher education campuses in many countries, including Ireland. This forced institutions to move online overnight, and compromised the possibility of full-time use of the campus for most of the next two years. In Ireland, pandemic restrictions across society were not fully lifted until February 2022. Two years of interruption led to the formation of new practices in working and learning (AUDE, 2021). Research into students’ experiences during the pandemic in Ireland showed that these were mixed, with some welcome changes and some significant challenges (National Forum, 2021). While students adapted to online learning, many felt they did not perform at their best in assessment (USI, 2021). Issues of isolation and anxiety have been highlighted in many studies (National Forum, 2021). Students in Ireland and elsewhere reported having a lack of suitable space to study at home (and some became homeless), lack of access to suitable devices or issues with connectivity (USI, 2021). As before the pandemic, they wanted more consistent use of online platforms and we know that disciplinary differences in online teaching need to be addressed (National Forum, 2021). Many students have called for recorded lectures to be retained (THE, 2021) and the flourishing of activity around Universal Design for Learning (UDL) (CAST, n.d.) since the COVID-19 lockdowns has shown that many staff want to develop their practice in providing accessible and engaging materials for all students. More broadly, many institutions are focusing on how to adapt and change programmes to suit more than one modality, and TU Dublin has recently formally approved four modalities for its programmes. These changes signal that while attendance at campus is still viewed as essential for many programmes, remote and blended learning will increase. The broader consequences of the pandemic and the subsequent Russian invasion of Ukraine in 2022 have triggered a series of sub-crises in Ireland, one of which is the lack of accommodation for students and a steep rise in the cost of living. A recent charity appeal in Ireland has called on the public to fund food and travel to campus for students in higher education (SVP, 2023). There is anecdotal evidence of lower student attendance in universities in Ireland and the UK (for example, Slapeta, 2022), classroom

management issues, and a sense from practitioners that the pandemic has a ‘long tail’ of issues which could take several years to address. Assuming no further COVID-related closures in education, it will be September 2025 before universities in Ireland will welcome first year undergraduates directly from school who have experienced no interruptions to their secondary education. However, we should be mindful of the disruption to early years and primary education which will continue to have effects for some years to come. Issues of attendance, when to attend and what to do when you are there, may need to be addressed further with our students but as yet we lack specific evidence to inform the direction of such research.

While we hope not to experience another pandemic in the short term, it is evident that unplanned closures of campuses will happen in the future due to extreme weather events, and in general interactions with campus will change as demographic changes occur in the Global North, meaning older populations returning more frequently to take shorter courses and fewer young full-time students (Bates, 2021). Changes in how curricula are being constructed, with partnership approaches and undergraduate research likely to play greater roles in years to come, will also influence how we use the campus (Ryan et al., 2020). The vulnerabilities of campus-centric approaches and campus dependency have come to light clearly since 2020: we relied on the campus for critical teaching and assessment activities (such as exams), and we did not see urgency in developing the digital literacies of staff and students. Researchers have found some reluctance to consider the longer term lessons from the COVID-19 pandemic in relation to learning and teaching spaces, perhaps because of the emotive response people experience when reminded of lockdown and the traumatic experiences they endured. Some have speculated that the strong emphasis on returning to campus full-time even though working and learning practices may have changed is a means of resolving these negative feelings. While staff are concerned about student absences, many do not see themselves going to campus as often as they did previously (AUDE, 2021). It is possible that office spaces may be repurposed with large numbers of staff working remotely for some of the time (AUDE, 2021) with more storage to support hotdesking and commuting, and more individual study space created for students. Even before the pandemic, Dane (2015) commented on the expense of building and maintaining large lecture theatres, arguing that no more should be constructed, and that existing theatres should be repurposed. Her work may be due further consideration at this stage. In a post-pandemic digital age, we have a porous campus which could potentially be defined as *when* we teach and learn rather than *where*. This has implications for how we think about ESD.

Discussion: Spaces and Education for Sustainable Development

Discussion of teaching and learning spaces, whether physical or digital, goes to the heart of access to higher education. Issues of access to education at all levels are discernible throughout the UN SDGs (UN, 2015) and therefore the SDGs should be integrated with discussion of how we plan, design, and improve spaces in higher education. It is also important that we move beyond SDG 4 and see the interconnectedness of the SDGs with spaces for learning in terms of the expansion of access to education, and authentic engagement with education. Providing adequate accessible educational spaces is the basis for the achievement of numerous objectives within the SDGs. In this section I have identified elements of SDG 4 and the other Sustainable Development Goals which connect most closely with this discussion.

SDG 4, *Quality Education*, includes targets to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”. Access to education is therefore explicitly part of this Goal. SDG 4.3 states that by 2030 (six years from now) we will have ensured “equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university”. This is a global challenge and in Ireland participation is affected by a lack of student accommodation, commuting and other costs. Meeting this commitment, and meeting it sustainably, will be difficult. With the same deadline, SDG 4.4 states that we will “substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship” and 4.5 seeks to ensure equal levels of access to education, with 4.7 aiming to “ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles”. This suggests that the purpose of *Quality Education* as framed by SDG 4 is to engender and develop sustainable modes of living and working. The expansion of the university sector in Ireland to include technological universities has the potential to offer thousands of people the opportunities discussed in these targets. However, the practical barriers to attendance may limit this potential and in turn, potentially limit progress nationally towards meeting the SDGs. The SDGs do not specifically address campus design or teaching and learning spaces but within SDG 4, Target 4.a says the aim is to “Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all”. Depending on the size, age, and location of a particular university,

this could represent another very challenging target. A question arises as to whether at least some elements of these targets could be met through enhancing remote access to university programmes, reducing the dependence on attending campuses. Evaluating the blend of offerings and offering more blended, hyflex or distance opportunities might address elements of the other SDGs, building digital literacies (SDG 5.b), seeing education as empowering (SDG10.2), and ultimately SDG 4.7, equipping people with knowledges and skills to live sustainably.

Taking this perspective further, SDG11, *Sustainable Cities and Communities*, speaks to the issue of spaces too. This Goal talks about the need to “make cities and human settlements inclusive, safe, resilient and sustainable”. Higher education aims to be embedded in communities and to support community-based learning. Whilst campus spaces and amenities have increasingly been opened to communities in which they are located, many towns and large urban areas of Ireland are without a higher education presence. The arrival of the technological universities offers an opportunity to reach into more of these areas rather than concentrating development on one or two existing campuses. SDG 11.a notes the aim to “Support positive economic, social and environments links between urban, peri-urban and rural areas by strengthening national and regional development planning”. Higher education could be one means by which regional development is strengthened, with a presence across a region rather than in specific centres. SDG 12, *Responsible consumption and production*, should also be considered in relation to how higher education estates are constructed and whether existing forms of development are sustainable. Can we “ensure sustainable consumption and production patterns” with a continuing focus on campus expansion, in order to bring people to one location rather than reaching out to where they are? SDG 13 reminds us of the critical need to “Take urgent action to combat climate change and its impacts”. It is important for all of us in higher education to reflect on how we respond to this Goal not only in our programmes and offerings, but in the ways we work, teach and learn. From a sociomaterial perspective, space is entangled with our activities in complex ways but our use of space could positively influence activities aimed at educating for sustainability. In other words, in order to educate about sustainability, we need to work in and use sustainable spaces. The SDGs speak to improved access to education for all people at all levels, globally and locally. Meeting the SDGs targets relies on education for sustainable development. The review of literature on teaching and learning spaces pointed to a need for flexibility, for potentially modest changes to support learners. The review demonstrated that socialisation and connection were more important to learners than the

physical characteristics and qualities of particular spaces. However, the review also showed an emphasis from management and leadership on expansion and construction.

It is perhaps time to reflect on the continued expansion of the physical campus and its flagship buildings in the context of institutions' commitments to the UN SDGs and government requirements to plan towards net zero. Evidence from this analysis indicates that higher education is likely to need a flotilla of smaller and more flexible teaching and learning spaces over time, and to develop attendance in multiple modalities (in-person, online, blended, hyflex or distance learning). It may be time to consider repurposing spaces in sustainable ways, particularly larger spaces. It may also be important now to consider consciously our expectations in terms of locating staff and students on campus with constant commuting to and from that location. Are such expectations founded on conscious choices and sustainable practices, or on a default view of how things should be done? When we consider the environmental impact of construction and maintenance of our estates, and a context in which attendance patterns will shift and change with demographic changes in the future, perhaps more creative and sustainable approaches are needed. These could involve supporting different kinds of attendance, some of which will be remote. Exploring these possibilities could help overcome the challenges of cost and accommodation students are facing currently, but also future-proof our institutions for a time when demographics change and attendance patterns shift with changes in our offerings (Bates, 2021).

If we sincerely sought to embrace a more sustainable approach to spaces, perhaps the use of other kinds of existing space could be considered too. In Ireland, the issue of vacant and derelict properties in many towns and cities has frequently been highlighted over the past year (*Irish Times*, 23 Sept 2023). At the same time, success stories have shown how new patterns of working post-pandemic have regenerated towns providing remote working hubs for former commuters (*Irish Times*, 11 June 2022). There is potential for higher education to embed itself within communities by providing their own remote 'hub campuses', repurposing existing spaces in these towns and cities. Students reported isolation and sometimes poor practical arrangements for their studies during the pandemic, but now many struggle to attend campus and report a poor student experience as they are not truly experiencing campus life (*Irish Times*, 13 October 2022). Hub campuses in their home towns could be co-designed with students and support their learning in practical ways, but also provide socialisation and connection with other students. The emerging theoretical frameworks and methodologies indicated in the

literature reviewed here would enable us to explore how best to do this with our students, perhaps adapting supports similar to Residence Learning Communities in the US and Canada. Oliveira et al. (2022, p.16) include the following quote from a student: “virtual learning may recreate the classroom, but not the campus”. Hub campuses could reduce the demands to travel and/or pay for accommodation, while providing students with spaces to study online or work collaboratively offline. A higher education presence could be established in many more locations than is possible when we start from the position of needing a large (and expensive) campus with a high carbon footprint. Of course, this is a speculative suggestion but the comments of Minister Simon Harris in 2022 are noteworthy: “It is not right or fair to expect people to have to pack their bags and leave home for four years to complete a university degree (..) All roads for education cannot lead to our big cities. We have to ensure people have the opportunity to study, live and work in our regions” (*Irish Times*, 26 April 2022). The technological universities have the potential not only to provide these opportunities, but to provide different kinds of teaching and learning spaces and to do it sustainably. Technological universities have adopted nomenclature that reflects broad regions or provinces – Munster, Atlantic, Shannon, South-East, Dublin – rather than one fixed city or town, running contrary to trends established over hundreds of years (Temple, 2008). This bold decision to break from the norm in associating a university with a large region rather than one urban centre offers a unique opportunity to reconceive the campus as when we learn, who we learn with, instead of a fixed point on the map.

Conclusion

This paper has presented a narrative review of recent literature examining teaching and learning spaces in higher education. The analysis of literature presented here show that we see a progression over the past two decades towards thinking of spaces as flexible, blended, accommodating different ways of working and learning, teaching and assessing whilst being integral to the wider environment. The triggers for these changes have been social, political and technological, most recently the shock of the COVID-19 pandemic. Some of these changes are in conflict with existing practices and the goals of many universities to expand and develop their campuses, providing “landmark showcase buildings” (Boys, 2022) influenced by corporate architecture, competition with other institutions and pressure to accommodate more students on campus (Spire, 2022). Universities have sought to provide flagship buildings but

the evidence is that a flotilla of smaller spaces, including spaces in other locations, could potentially be more useful.

The analysis presented here is limited by the boundaries set for the literature search, and these constraints are acknowledged. The author's perspective as an educational developer represents another boundary, and the review has perhaps demonstrated the need for educational developers to cross boundaries further into ESD in order to fulfil institutional and national commitments to the SDGs. The research reviewed itself identified its own limitations with a need for further theoretical and methodological work to generate a more reliable evidence base. Acknowledging these limitations, there is however evidence that in order to educate for sustainable development, we should closely consider the development of sustainable teaching and learning spaces, sustainable campuses. This implies consideration of whether more spaces or different kinds of spaces in different locations (both physical and digital) are now needed. Further research with the purposes of extending this review and developing ESD within the PDLS module will examine sustainable learning spaces, and the evidence for sustainable multi-modal attendance in higher education (Caird et al., 2015). The author expresses sincere thanks to the reviewers of this paper who have suggested valuable additional directions for this work.

Sociomaterial perspectives suggest that teaching and learning spaces are not neutral backdrops to lectures, tutorials or labs. Nor are spaces neutral for those fortunate to have had the opportunity to participate in higher education. In addition to learning experiences tied to particular settings, we may have fond memories of our own student lives. Fictional representations of university reinforce positive and often idealised images of on-campus learning. Yet, the reality is that many students have reported compromised experiences of campus life and this is unlikely to change in the short-term (Boys, 2022). In addition to considering the research evidence and alternative theoretical frameworks, perhaps we also need to reflect on whether we are modelling current strategies for learning, teaching and assessment using our conceptions and memories of being on campus rather than evidence from students themselves, and evidence of change around us.

References

- Alterator, S., & Deed, C. (2013). Teacher adaptation to open learning spaces. *Issues in Educational Research*, 23(3), 16.
- Association of University Directors of Estates (AUDE). (2021). *Blended Working in the Higher Education Sector: A review of the post-pandemic university workplace* (p. 35). AUDE. <https://www.aude.ac.uk/Resources/News/View?g=4241a799-9dc3-44fe-8131-33b7fc2bd955>
- Barnett, R. & Temple, P. (2006). *Impact on space of future changes in higher education (UK higher education space management project, 2006/10)*. (No. 2006/10). HEFCE.
- Bates, T. (2021). *Revising Teaching in a Digital Age: the impact of Covid-19*. Blog entry. <https://www.tonybates.ca/2021/12/16/revising-teaching-in-a-digital-age-the-impact-of-covid-19/>
- Bayne, S., Evans, P., Ewins, R., Knox, J., Lamb, J., Macleod, H., O'Shea, C., Ross, J., Sheail, P., & Sinclair, C. (2020). *The Manifesto for Teaching Online* (2nd ed.). MIT.
- Beckers, R., van der Voordt, T., & Dewulf, G. (2016). Learning space preferences of higher education students. *Building and Environment*, 104, 243–252. <https://doi.org/10.1016/j.buildenv.2016.05.013>
- Blackmore, J., Bateman, D., Loughlin, J., O'Mara, J., & Aranda, G. (2011). *Research into the connection between built learning spaces and student outcomes* (Literature Review Paper 22; p. 62). State Government, Victoria. <https://www.education.vic.gov.au/Documents/about/programs/infrastructure/blackmorelearningspaces.pdf>
- Boys, J. (2017). *Building Better Universities*. London: Routledge.
- Boys, J. (2022). Exploring Inequalities in the Social, Spatial and Material Practices of Teaching and Learning in Pandemic Times. *Postdigital Science and Education*, 4(1), 13–32. <https://doi.org/10.1007/s42438-021-00267-z>
- CAST (n.d.). *Universal Design for Learning Principles*. <https://www.cast.org/impact/universal-design-for-learning-udl>
- Carlos, V., Reses, G., & Soares, S.C. (2023). Active learning spaces design and assessment: A qualitative systematic literature review. *Interactive Learning Environments*, 0(0), 1–18. <https://doi.org/10.1080/10494820.2022.2163263>
- Carolan, G., Curran, C., & McCormack, A. (2020). New Technologies and New Spaces: Opportunities for Innovative Educational Environments. *Irish Journal of Academic Practice* 8(1). <https://doi.org/10.21427/JA9V-2C81>
- Carvalho, L., & Freeman, C.G. (2022). Materials and Places for Learning: Experiences of Doctoral Students in and around University Spaces. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-022-00328-x>

- Churchill, W. (1943). Parliamentary Records. Retrieved 16 April 2023, from <https://www.parliament.uk/about/living-heritage/building/palace/architecture/palacestructure/churchill/>
- Cronin, C., & MacLaren, I. (2018). Conceptualising OEP: A review of theoretical and empirical literature in Open Educational Practices. *Open Praxis*, 10(2), 127-143. <https://doi.org/10.5944/openpraxis.10.2.825>
- Dane, J. (2015). *Time to stop building lecture theatres*. Woods Bagot Public Research Paper 10 – 2015. Australia. https://img1.wsimg.com/blobby/go/cfc31b86-caf2-457d-bb77-50ba96945f42/150202_Time%20To%20Stop%20Building%20Lecture%20Theatres%20.pdf
- Darmody, J. (2022, August 23). How Fidelity changed its Dublin office for flexible working. *Silicon Republic*. <https://www.siliconrepublic.com/careers/fidelity-investments-dublin-office-flexible-working>
- Elkington, S. & Bligh, B. (2019). *Future Learning Spaces Space, Technology and Pedagogy*. Advance HE.
- Farrell, O. (2020). From Portafoglio to Eportfolio: The Evolution of Portfolio in Higher Education. *Journal of Interactive Media in Education*, 2020(1), Article 1. <https://doi.org/10.5334/jime.574>
- Favaloro, T., Ball, T., & Lipschutz, R.D. (2019). Mind the Gap! Developing the Campus as a Living Lab for Student Experiential Learning in Sustainability. In W. Leal Filho & U. Bardi (Eds.), *Sustainability on University Campuses: Learning, Skills Building and Best Practices* (pp. 91–113). Springer International Publishing. https://doi.org/10.1007/978-3-030-15864-4_7
- Fawns, T. (2019). Postdigital Education in Design and Practice. *Postdigital Science and Education*, 1(1), 132–145. <https://doi.org/10.1007/s42438-018-0021-8>
- Fenwick, T., & Edwards, R. (2012). Performative ontologies: Sociomaterial approaches to researching adult education and lifelong learning. *European Journal for Research on the Education and Learning of Adults*, 4(1), Article 1. <https://doi.org/10.3384/rela.2000-7426.rela0104>
- FitzSimmons, J., Levesque-Bristol, C., Bonem, E.M., Lott, E.A., & Parker, L.C. (2019, June), *Education Redesigned: Impacting Teaching and Learning through a Faculty Development Course Redesign Program*. Paper presented at 2019 ASEE Annual Conference & Exposition, Tampa, Florida.
- Friedman, J.Z., & Worden, E.A. (2016). Creating interdisciplinary space on campus: Lessons from US area studies centers. *Higher Education Research & Development*, 35(1), 129–141. <https://doi.org/10.1080/07294360.2015.1128886>
- Goodyear, P. & Carvalho, L. (2013). The Analysis of Complex Learning Environments. In *Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning* (2nd ed., pp. 49–63). London: Routledge.

- Goodyear, P. (2020). Design and Co-Configuration for Hybrid Learning: Theorising the Practices of Learning Space Design. *British Journal of Educational Technology*, 51(4), 1045-1060.
- Gourlay, L. (2020). Quarantined, Sequestered, Closed: Theorising Academic Bodies Under Covid-19 Lockdown. *Postdigital Science and Education*, 2(3), 791–811. <https://doi.org/10.1007/s42438-020-00193-6>
- Gravett, K., Baughan, P., Rao, N., & Kinchin, I. (2022). Spaces and Places for Connection in the Postdigital University. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-022-00317-0>
- Griffiths, S., Wong, M.S., Kwok, C.Y.T., Kam, R., Lam, S.C., Yang, L., Yip, T.L., Heo, J., Chan, B.S.B., Xiong, G., & Lu, K. (2019). Exploring Bluetooth Beacon Use Cases in Teaching and Learning: Increasing the Sustainability of Physical Learning Spaces. *Sustainability*, 11(15), Article 15. <https://doi.org/10.3390/su11154005>
- Harvey, J., McAvinia, C., O'Rourke, K., & FitzSimmons, J. (2019). *Transforming spaces: Fostering student-centered learning through the intentional design of formal and informal learning spaces*. <http://hdl.handle.net/10468/10711>
- Irish Times (2023, 1st March). *Macquarie in €250m universities deal*. The Irish Times. <https://www.irishtimes.com/business/2023/03/01/macquarie-in-250m-universities-deal/>
- Irish Times (2022, 3rd September). *Documenting dereliction in Ireland: 'Why have we accepted it as a country?'* <https://www.irishtimes.com/property/2022/09/03/documenting-dereliction-in-ireland-why-have-we-accepted-it-as-a-country/>
- Irish Times (2022, 11th June). *Can remote hubs transform the way we work?* <https://www.irishtimes.com/ireland/2022/06/11/are-remote-hubs-the-future-or-future-failures/>
- Irish Times (2022, 26th April). *Bringing higher education into every region of Ireland*. <https://www.irishtimes.com/news/education/bringing-higher-education-into-every-region-of-ireland-1.4842222>
- King, H. (2016). Learning Spaces and Collaborative Work: Barriers or Supports? *Higher Education Research and Development*, 35(1), 158–171.
- MacNeill, S. & Beetham, H. (2023, January 27). *Approaches to Curriculum and Learning Design across UK HE*. Keynote address, ILTA Winter Conference. <https://www.youtube.com/watch?v=xP8VMonRHhI>
- McAvinia, C., Fitzsimmons, J., Harvey, J., & O'Rourke, K.C. (2019). The openness of new learning spaces in campus-based institutions. *OER-19 Conference*. <https://arrow.tudublin.ie/ltcoth/66>
- Maor, D., Ensor, J.D., & Fraser, B.J. (2016). Doctoral supervision in virtual spaces: A review of research of web-based tools to develop collaborative supervision. *Higher Education Research & Development*, 35(1), 172–188. <https://doi.org/10.1080/07294360.2015.1121206>

- Mazutti, J., Londero Brandli, L., Lange Salvia, A., Fritzen Gomes, B.M., Damke, L.I., Tibola da Rocha, V., & Santos Rabello, R. dos. (2020). Smart and Learning Campus as Living Lab to Foster Education for Sustainable Development: An Experience with Air Quality Monitoring. *International Journal of Sustainability in Higher Education*, 21(7), 1311–1330. <https://doi.org/10.1108/IJSHE-01-2020-0016>
- Montiel, I., Mayoral, A. M., Navarro Pedreño, J., & Maiques, S. (2019). Acoustic Comfort in Learning Spaces: Moving Towards Sustainable Development Goals. *Sustainability*, 11(13), Article 13. <https://doi.org/10.3390/su11133573>
- Mulcahy, D. (2018). Assembling Spaces of Learning ‘In’ Museums and Schools: A Practice-Based Sociomaterial Perspective. In R. A. Ellis & P. Goodyear (Eds.), *Spaces of Teaching and Learning: Integrating Perspectives on Research and Practice* (pp. 13–29). Springer. https://doi.org/10.1007/978-981-10-7155-3_2
- National Forum (2021). *Next Steps for Teaching and Learning: Moving Forward Together*. National Forum for the Enhancement of Teaching and Learning.
- Neary, M., Harrison, A., Crellin, G., Parekh, N., Saunders, G., Duggan, F., Williams, S., & Austin, S. (2010). *Learning Landscapes in Higher Education*. University of Lincoln.
- New Media Consortium (NMC). (2017). *Horizon Report: 2017 Higher Education Edition*. <https://www.sconul.ac.uk/sites/default/files/documents/2017-nmc-horizon-report-he-EN.pdf>
- Oblinger, D. (Ed.). (2006). *Learning spaces*. Educause.
- Oliveira, S., Tahsiri, M., & Everett, G. (2022). *Campus spaces and places: Impact on student outcomes—Review of evidence* (p. 77). Association of University Directors of Estates (AUDE) and the Higher Education Design Quality Forum (HEDQF).
- Park, E.L. & Choi, B.K. (2014). Transformation of classroom spaces: traditional versus active learning classroom in colleges. *Higher Education* 68, 749–771.
- Patel, H. (2019). *The Future of Learning Environments* (p. 41). Higher Education Design Quality Forum.
- Pearshouse, I., Bligh, B., Brown, E., Lewthwaite, S., Graber, R., Hartnell-Young, E., & Sharples, M. (2009, June 1). *A study of effective evaluation models and practices for technology supported physical learning spaces (JELS)*. JISC. <http://www.jisc.ac.uk/whatwedo/projects/learningspaces08.aspx>
- Ralph, M.C., Schneider, B., Benson, D.R., & Ward, D. (2022). Separated by spaces: Undergraduate students re-sort along attitude divides when choosing whether to learn in spaces designed for active learning. *Active Learning in Higher Education*, 146978742211188. <https://doi.org/10.1177/14697874221118866>
- Ryan, B., Fleming, A., Deegan, C., McAvinia, C., O’Kane, C., Williams, D., Nevin, E., Bates, E., Darby, F., Harvey, J., Murphy, L., Coleman, M., O’Donoghue, M., & Duffy, N. (2020). *CoCREATE: Collaborative Curriculum Reimagining and Enhancement Aiming to Transform Education*. TU Dublin. <https://arrow.tudublin.ie/totarreports/1/>

- Schnitzler, T. (2019). The Bridge Between Education for Sustainable Development and Transformative Learning: Towards New Collaborative Learning Spaces. *Journal of Education for Sustainable Development*, 13(2), 242-253. <https://doi.org/10.1177/0973408219873827>
- Sinakou, E., Donche, V., Boeve-de Pauw, J., & Van Petegem, P. (2019). Designing Powerful Learning Environments in Education for Sustainable Development: A Conceptual Framework. *Sustainability*, 11(21), Article 21. <https://doi.org/10.3390/su11215994>
- Slapeta, J. [@JanSlapeta]. (2022, May 16). *Shock! 9am lecture—No one! Where are they? My first lecture for this cohort, so hopefully not reflection on me. I was told to give the lecture anyway, because some might be watching it streamed. 50 min discussion with chairs. Is this what Uni is now? Help @Sydney_Uni* <https://t.co/7khsXuI7lE> [Tweet]. X/Twitter. <https://twitter.com/JanSlapeta/status/1526072317411233792>
- Society of St Vincent de Paul (SVP). (2023). *SVP Education Appeal*. <https://www.svp.ie/educationappeal/>
- Spire, Z. (2022). University Estates and Postdigital Higher Education: Space, Place, and Being a University. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-022-00314-3>
- Temple, P. (2008). Learning spaces in higher education: An under-researched topic. *London Review of Education*, 6(3), 229-241.
- Temple, P. (2018). Space, place and institutional effectiveness in higher education. *Policy Reviews in Higher Education*, 2(2), 133-150. <https://doi.org/10.1080/23322969.2018.1442243>
- Times Higher Education (THE). (2022). *Covid, two years on: What has higher education learned?* (2022, March 10). THE Campus Learn, Share, Connect. <https://www.timeshighereducation.com/campus/spotlight/covid-two-years-what-has-higher-education-learned>
- United Nations (UN). (2015). *Sustainable Development Goals*. <https://sdgs.un.org/goals>
- United Nations Statistics Division. (2021). *SDG Report 2021 – SDG4*. <https://unstats.un.org/sdgs/report/2021/goal-04/>
- Union of Students in Ireland (USI). (2021). *Insight: Perspectives of Students. Next Steps for Teaching and Learning: Moving Forward Together*. National Forum for the Enhancement of Teaching and Learning. <https://www.teachingandlearning.ie/wp-content/uploads/USI.pdf>
- Varone, G. (2021). SDGs and emergency online learning spaces: Critical dialogue as a way to develop social responsibility in the “new normal”. *Proceedings of the Next Generation Global Workshop, 14*, 1–18. https://doi.org/10.14989/pnggw_14_25
- Weinbren, D. (2014). *The Open University: A History*. Manchester University Press.
- Weller, M. (2014). *The Battle for Open*. Ubiquity Press. <https://doi.org/10.5334/bam>

- Weller, M. (2018). Navigating the Open Educational Practice Landscape. *Irish Journal of Technology Enhanced Learning*, 3(1), 58–63. <https://doi.org/10.22554/ijtel.v3i1.38>
- Zeivots, S., & Schuck, S. (2018). Needs and expectations of a new learning space: Research students' perspectives. *Australasian Journal of Educational Technology*, 34(6), Article 6. <https://doi.org/10.14742/ajet.4516>