Future Learning Spaces: Space, Technology and Pedagogy

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AdvanceHE

Future Learning Spaces

Space, Technology and Pedagogy

A Case Study Series

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Future learning spaces in higher education

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An introduction

Learning can and does happen anywhere. Sometimes that learning occurs in classrooms (formal learning), other times it results from face-to-face and virtual encounters and interactions between individuals away from lecture halls and seminar rooms (social or informal learning). Space – whether physical or virtual, individual or shared – can have an important impact on learning. It can bring people together; it can encourage exploration, collaboration and discussion; it can also frame an unspoken message of exclusion, disconnectedness and disengagement (Oblinger, 2006). Higher education institutions are growing increasingly aware of the power of "built pedagogy" (Monahan, 2002) – the ability of spaces to shape and define how educators teach their students – and with it an attitude underlining the orthodox view of higher education learning spaces that has tended to treat space and learning as two related but separate domains of academic life.

Crucially, a significant amount of estates development is currently underway in UK universities. It comes at a time of major change for educational technology and modes of learning and teaching that is challenging the orthodox view of learning space. The changing educational requirements of increasingly diverse student populations have prompted more tailored, student-centred approaches to designing 'environments-for-learning' on and off campus. New strategies for enabling learning and accommodating the multiple demands on today's students have necessitated a rethinking of the use, design and location of learning space. Increasingly, approaches to learning are required to be flexible and networked, bringing together formal and informal activities in a seamless environment that recognises that learning can take place any time, in either physical and/or virtual spaces. From this contemporary perspective, space, learning and the effectiveness of the university more widely are intimately connected.

Impressive new buildings and innovatively designed spaces, on their own, are no guarantee that improved learning outcomes will be achieved. A sector-wide shift in emphasis from an 'instruction paradigm' to a 'learning paradigm' has meant that higher education institutions must now think about what it means to be a learner in these spaces (Kersch and Evans, 2015; Evans and Kersch, 2017). Relatedly, technology has brought unique potential for learning in higher education. Whether by stimulating engagement through the use of interactive systems and online tools, live-streaming international experts to augment in-class learning and teaching activities, or building and sharing content with peers online, technology has changed our ideas about learning space. What we know about how people learn has also changed our ideas about such spaces. It is increasingly acknowledged that there is value in encouraging informal conversation with peers away from more formal learning encounters; there is value in making regular use of hands-on, active learning, as well as making space for reflection; there is value in being able to receive immediate support when needed and in being able to integrate multiple activities when completing a learning project or task; and there is value in learning that occurs in authentic settings, such as the laboratory, clinic space or trading floor. As we have come to understand more about today's learners, how people learn and the ready availability of technology, our notions of effective learning spaces have changed.

Catalysed by this constructivist turn, digital technology and a holistic view of learning, contemporary learning space design must take into account a broad spectrum of learning activities and environments necessary for students to realise a richer educational experience. Higher education institutions are increasingly finding flexible learning spaces and informal collaborative environments successfully promote student engagement in the learning process. Here, the development of learning spaces supports innovative pedagogical approaches and

environments through the affordances of digital technology. However, despite the relationship between spaces and learning receiving growing recognition as a fundamental aspect of the debate on contemporary approaches to learning and teaching in higher education, and so ushering in a broader emphasis on learning space design as 'sites for learning'; our understanding of the complex interplay between spaces and learning remains largely underdeveloped, lacking a clear evidence base.

This publication

To this end, the national Flexible Learning Symposium, hosted by Advance HE in York on 22 March 2018, aimed to bring together cutting edge examples of effective and innovative efforts at learning space design and spatial practices. More specifically, the one-day symposium sought to bring together both academic researchers, senior leaders and estates personnel, presenting the opportunity for inter-professional and collaborative discussion to better and more fully understand and evidence the relationship and interplay between three established features of effective learning space design; namely, **Space**, **Technology** and **Pedagogy**. It was framed by an article length account by the symposium's keynote speaker Brett Bligh (Lancaster University) in which a new, research-derived, vocabulary for future learning spaces was outlined. This publication, in turn, captures and builds upon several of the case study examples presented at the March symposium; and in doing so, attempts to occupy the territory between abstract theorising about space-related issues and technical questions related to space, building design and academic practice. It is concerned with the use of space in teaching and learning, and related space design issues; campus design, in so far as it relates to learning; and organisational and managerial issues relating to space and learning. While the case studies presented within this publication are designed to be accessible to staff working at all levels and across functions in higher education institutions, it leaves the onus on you, the reader, to consider critically how space, technology and pedagogy hang together and are used and developed within your own professional context so as to realise learning environments that are truly future ready.

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Why we need to talk about learning spaces

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Introduction

The 2017 instalment of the US New Media Consortium's annual *Horizon Report: Higher Education edition* foregrounded the importance of a pivotal trend for technology adoption in the higher education sector: **Redesigning Learning Spaces** (Adams Becker et al, 2017, p3). It is a novel focal point: it runs against the grain of much everyday discussion about how technology influences human learning (and, indeed, broader repercussions for living and working). Technology in higher education has often been posed in opposition to space – seen as further undermining the importance of place with each passing year. The centrality of place-bound lectures and seminars to the learner experience is, the story goes, being rapidly supplanted by the "anytime, anywhere" provision of digitalised forms of higher education (cf Crook and Bligh, 2017). Even for higher education institutions themselves, digital networks, it is suggested, underpin strategies for escaping established place-bound identities, as universities seek to become global prestige brands – 'located' in international flows of information and recruitment rather than in some physical territory (cf Tierney and Lanford, 2015).

Yet the *Horizon* report argues that Redesigning Learning Spaces is one of the six "key trends accelerating higher education technology adoption" (Adams Becker et al, 2017, p3). If the report's contributing panel of 78 education and technology experts in 22 countries is not badly mistaken, then a large sectoral trend with considerable impact is being profoundly under-recognised and misunderstood. That misrecognition is the starting point for the present piece of writing, whose topic concerns how researchers and other stakeholders are currently talking about physical learning spaces – and how we might talk about them differently in future.

The present piece starts from two core convictions: about *higher education space itself*, and about *knowledge of that space*. Those issues are closely linked, of course – and, to many, what is said will appear uncontroversial. But each, in turn, has consequences for how we can, and should, talk about learning spaces – consequences that are often overlooked.

My basic convictions about *space itself* are twofold: that it remains a fundamentally important mediator of human learning, and that it is produced socially within institutions in contingent, contextualised ways.

Where institutions, educators and students take advantage of new technological developments, I suggest, their doing so does *not* render physical space less important. Instead, certain varieties of longstanding space, including some of the most taken-for-granted workhorses of higher education, are socially destabilised – confidence in their continuing usefulness gets shaken to some extent. Meanwhile, proposals for new forms of space emerge, with varying physical forms and representing varying stakeholder interests. Advocates of these proposals seek to ensure they supplant more established designs by making claims about suitability for desired practices and technological realities – and sometimes by wielding a discourse of 'newness' ("a 21st century learning space!"). Some new forms of space are actually taken up within institutions, and/or by some given teaching staff and students: those where key stakeholders have been adequately convinced by advocates' claims and not sufficiently discouraged by the required outlay. Conversely, other space designs are explored in sandpit settings, but for various reasons – justified or not – they do not get adopted more widely. In parallel, there is increased recognition of the centrality of various forms of off-campus or non-institutional space – including domestic and external workplace settings, cafés and moving vehicles. Those spaces also come to be seen as 'new' learning spaces, notwithstanding that they may have had longstanding utility for particular

segments of the student population, such as distance students, part-time students, commuters and those on professional placement.

One consequence is a heightened sense of contestation between myriad spatial forms, 'old' and 'new'. Whether closer examination of some 'new' space reveals it to be advantageous is, of course, uncertain. Some are eventually evaluated as *less* successful than the spaces they supplanted – though such evaluation is itself a contested institutional practice (Pearshouse et al, 2009). Nonetheless, changes in higher education space continue, in an ongoing way, within institutions. Spaces have varying degrees of influence on practices and experiences within institutions, and concurrently those practices and experiences have varying degrees of influence on the development of the learning spaces there.

My convictions about *knowledge and discussion of higher education space* build on this recognition that space production is, fundamentally, a human process. Space is institutional, social, contextual and historically developing as well as physical and technological; and the people involved have different interests, expertise, and authority. Such a complex reality provokes understandable uncertainty, frustration and anxiety, and key stakeholders are constantly vigilant for knowledge that appears to transcend that social messiness. If some researcher 'proved' that painting classroom walls in some shade of blue led to "15% better learning", then such knowledge would be attractive to many stakeholders – in part, because *what to do* with this hypothetical knowledge would be very obvious (get painting!). Yet the search for absolute or universal knowledge about learning spaces in higher education is likely to lead to, at best, partial and one-sided understanding. Furthermore, in common with many other social domains of investigation, I suspect that much insightful knowledge about learning spaces in higher education will *not* arrive packaged in that way. Instead, I suspect that our understanding of learning spaces will *necessarily* be uncertain, relative, deeply contextualised and represent different interests; and that it will need to account for persistent problems of a sociocultural nature. For instance, where:

+ Stakeholders have different ideas about what some given space *should* do – about what is valued as *successful* (cf Bligh and Pearshouse, 2011);
+ Accounts of the effectiveness of a particular space in practice are contested;
+ Attempts to transplant the design of a space, which has been judged to be effective in one place, to another location fails to reap similar benefits; or
+ The knowledge and conviction of some stakeholders (including researchers!) is judged to be incomprehensible by some other stakeholders – who therefore cannot make use of it.

In the remainder of this piece, I build on the notion that knowledge about learning spaces should be viewed as valuable to the extent that it guides stakeholders' thinking about the goals of particular spaces, leads to better comprehension by stakeholders of the different interests and positions of others (acknowledging, though, that comprehension is often rather different to consensus) and highlights the contextualised nature of how spaces work. Most of all, it is valuable if it provides a common vocabulary for reflection, exploration, discussion and debate. Those value judgements, of course, are closely linked – they are all fundamentally concerned with how we talk about learning spaces.

Below, I suggest my own research-derived *vocabulary* – one that can, I suggest, help stakeholders to conduct discussions and produce their own knowledge about learning spaces. Firstly, however, I set out a brief overview of the current state of *scholarly* knowledge and discussion about learning spaces in higher education.

The research discussion about learning spaces

Let us commence the discussion of academic research about learning spaces by returning to the Horizon report. Its advocacy of the Redesigning Learning Spaces theme is set out as follows:

> "As 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. Educational settings are increasingly designed to support project-based interactions with attention to greater mobility, flexibility, and multiple device usage. To improve remote communication, institutions are upgrading wireless bandwidth and installing large displays that allow for more natural collaboration on digital projects. Further, universities are exploring how mixed reality technologies can blend 3D holographic content into physical spaces for simulations like experiencing Mars by controlling rover vehicles, or to enable multifaceted interaction with objects, such as the human body in anatomy labs, with detailed visuals. As higher education continues to move away from traditional, lecture-based lessons toward more hands-on activities, classrooms are starting to resemble real-world work and social environments that foster organic interactions and cross-disciplinary problem-solving." (Adams Becker et al, 2017, p9)

It is worth noticing that much of what is described – a lecturing-is-dead agenda and the accompanying advocacy of project-based working, an emphasis on the mobility of learners and their use of multiple personal devices, excitement about the possibilities for remote communication and educational simulations – is not, in itself, so extraordinary. Such tropes have been a stock-in-trade of institutional educational technology communities and staff development courses for a good while. In some ways the *only* thing that is new here is the recognition of the spatial consequences. Yet the relations between technology and space in *Horizon* narrative are quite unidirectional: changes in technology are seen as both preceding and driving changes in space. Furthermore, in some instances, space seems described mainly as a container for technology, rather than as mediating practice itself. Clearly, the intended audience for the *Horizon* reports (policymakers interested in technology trends) will influence the narratives adopted. Yet the narrative here is hardly atypical: reflecting, in my view, lack of confidence and conceptual maturity in discussing space. The consequence is that prominent narratives seek legitimacy for learning spaces by invoking association with other, more prominently recognised phenomena. In this case, developments in technology sectors are invoked, but other discourses might equally draw on narratives about the popularity of part-time and distance education, the funding of higher education systems and changes in recruitment and student aspirations within a globalising economy.

What we can detect, then, is that learning spaces is an underdeveloped research field by contrast with those focusing on many of the other issues with which it necessarily interacts. Although there are sharp disagreements about how the effects of technology on educational practice should be conceptualised – see the report by Luckin et al (2012) for an extended discussion – there exists a substantial international and interdisciplinary evidence base, and a wide range of journals and conferences, on the topic. The same cannot be said for research on learning spaces.

A sense of being a poor relation has long permeated the small literature on the topic. An influential review article by Paul Temple (2008), for example, conveys the message even in its title – *Learning spaces in higher education: an under-researched topic*. "The study of learning spaces in higher education," says Temple in the introduction to the piece, "has not historically attracted a great deal of attention from scholars or researchers; the work of higher education has, implicitly, generally been considered as taking place independently of the spaces in which it was located" (p229). Temple's statement correctly implies that the paucity of research into learning spaces is especially disappointing *because* research into higher education more generally is burgeoning. Tight (2012), for example, reviews the wealth of higher education books and journals being published: his conspectus reveals that the issues receiving most attention are teaching-learning, the student experience, institutional management, academic work, system policy, quality and course design. Many of those categories actually look like fairly promising sanctuaries for some discussion of higher education learning spaces. Yet, alas, the issue is mentioned in passing on a single page across the 230 pages of text – something of an indictment of the underlying material that Tight is summarising.

Such widespread scholarly indifference has not, of course, prevented estates managers from investing, or students from changing preferences. As a consequence, there has been a pervading sense of *double*

inadequacy – that research on learning spaces receives scant attention by comparison to the enormous institutional investment in the spaces themselves, as well as in relation to research on proximate topics.

The obvious objection here is that, in the decade since Temple published his article, there has been an upwards trend in the scholarly investigation of learning spaces. However, I contend that the progress made has been incremental rather than radical in nature. Let us consider three more recent review articles to illustrate that point:

+ A report by Painter et al (2013), which examines evidence about *space design*;
+ A scoping study by Nordquist (2016), which focuses on *relations between space and curriculum* as they play out specifically within the disciplinary education of the health professions; and
+ A conceptual review by Ellis and Goodyear (2016), which aims to unpick the myriad influences of learning spaces on student *learning activities*.

Each of those review pieces highlights, in different ways, that research over the last decade has focused extensively on unpicking whether learning space design makes any discernible difference to a variety of stakeholder experiences and learning outcomes and reaching conclusions to the affirmative. A core point of emphasis, then, is on *legitimising* learning spaces as a research topic – understandable, of course, given widespread distrust about whether space is important at all.

For example, Painter et al (2013) highlight how their findings *support* notions that formal space redesign can indeed influence the classroom practices of both teachers and students, and that the broader campus-level experience does indeed influence student satisfaction and retention. Nordquist (2016) highlights accumulating evidence from a range of studies that compare particular classroom designs on a bilateral, quasi-experimental basis: among other things, Nordquist concludes that there are credible and positive results showing that new classrooms designs can indeed promote various aspects of learning (such as dialogue). On the other hand, there is certainly some hedging going on in these reports. For example, Nordquist counterpoints his positivity about space influencing *learner* practices by suggesting that, if *teachers'* behaviours are also to change, then the evidence is that space redesign alone will not be sufficient: active institutional faculty development strategies will also be required. What we have, therefore, is a narrative of legitimation that uses a sense of "positivity with conditions attached" as its ground. In my view, however, it is precisely questions relating to how learning spaces are effective *under particular conditions* that we need to explore.

Alongside those attempts at legitimation within the reports sit a range of particular *gap spotting* narratives. While such narratives are, of course, commonplace in scholarly review articles, what is noteworthy here is that many of the actual gaps being identified are framed as concerning research into particular space types. *We have more research into room types x, y, and z than into room types a, b, and c!* One particularly systematic variant of that narrative is offered by Ellis and Goodyear (2016), who position the studies they find along three axes: based on distinctions between teacher-managed and more informal spaces; between spaces provided by universities, by third parties and by students themselves; and between physical, virtual and hybrid spaces. Ellis and Goodyear's analysis highlights – among other things – that the literature focuses a heavy proportion of its attention towards research on the *configuration* of formal learning spaces and, in a somewhat separate strand of inquiry, towards *student experiences* in informal learning spaces (such as university libraries).

I do not wish to suggest, I should emphasise, that those full ranges – or the different kinds of spaces within them – are not worthy of investigation. There are, in point of fact, some interesting observations to be made even by interrogating the points of dissonance between the reviews. For example, Painter et al (2013) and Ellis and Goodyear (2016) each highlight a considerable interest in student experiences in informal learning spaces, whereas Nordquist (2016), with his more particular focus on education of health professionals, bemoans a dearth of research on the same issue. My reading is that the discrepancy is itself interesting: it highlights how perhaps too much of the research on student experiences in 'informal' spaces assumes that both the spaces and the experiences therein are not disciplinary. In turn, that implies a discomforting critique of how learning

spaces scholarship routinely compartmentalises the issue of academic discipline when investigating learning in higher education.

Yet, in light of my previously stated convictions about knowledge about learning spaces, my overarching reaction to those gap spotting narratives should be obvious: even where individual space types seem well covered by empirical investigation, that knowledge will only be useful if it takes into account the context of sociocultural practice rather than being viewed as applicable to all instantiations of those space types in universal terms. Indeed, from my perspective it would be more directly useful to map the research according to the sociocultural practices and experiences that are being described – and to highlight the gaps in the literature on that basis.

It should be noted that the three reviews do differ somewhat in the kind of knowledge about learning spaces that they suggest are valuable. The narrative arc in the review by Painter et al (2013) is particularly interesting in this regard. Early on in their report, the authors draw attention to how previous generations of learning spaces researchers – they refer to efforts in 1950s-70s US – foundered on precisely this issue:

> "Over the next 10 years, however, it became clear that psychology research paradigms were not set up to respond to the specific questions posed by the architecture, design, and planning professions and the kind of immediately applicable information these disciplines were seeking was not forthcoming. Aside from standards generated in the field of ergonomics for sizing spaces and furnishings to fit the human body, architects and designers did not receive the fact-based data trove they had hoped for. As a result, the potential connections between these two realms of knowledge were never solidified, and by the 1980s architects and designers had gone down their own pathways." (pp4-5)

It is interesting, however, to contrast those initial observations against Painter et al's own recommendations for the field, as presented at the end of their report. Those recommendations include creating "an agreed upon taxonomy of learning space" (p 29), producing "measures of behavior" that meet "the benchmark of reproducibility" (p29), and focusing more on "learning outcomes" (p30). Ultimately, it is difficult to escape the conclusion that Painter et al's suggestion for a future learning spaces research agenda – "rigorous, systematic, reproducible, and longitudinal inquiries that will yield insight into what works and what does not" – largely fails to escape universality of the "psychology research paradigms" of which they were earlier so disparaging.

To different extents, the reviews by Nordquist and by Ellis and Goodyear track a different path, with the latter authors in particular drawing attention to a range of emerging "representations and models" of learning spaces. "The purpose of doing this", Ellis and Goodyear state, "is to help people working in the emerging field of learning space research recognise commonalities and differences in what are sometimes quite implicit conceptualisations of relations between space and learning" (p173). I, of course, concur with that position, but it seems clear that many of the models that their review actually uncovers within the literature are ill-suited to addressing those aspirations. Ellis and Goodyear themselves acknowledge the attendant problems:

> "In addition to the dangers of relying on 'everyday' or unexamined concepts, fragmented conceptual frameworks impede collective advances in this field – it is unnecessarily hard for researchers and practitioners to see how new findings and insights build on what is already known if there is not some framework on which to build commonality of understanding." (p173).

At present, as Ellis and Goodyear highlight, the literature seems dominated by generalised representations (with the words 'space' and 'learning' placed within concentric circles, or connected by arrows); by typologies of learning spaces; and by process models that abstract away from the actual practices of teachers and students (pp175-179). Ellis and Goodyear do present their own "activity-centred" models of how we might see space as integral to human practice: sketching two models focused, respectively, on relations between activity, tasks, tools, people and outcomes (p179), and between social situation, physical situation, goal-directed action, embodied cognition, tasks and outcomes (p180). Yet Ellis and Goodyear go on to conclude their review by arguing the following:

"The review presented in this paper has a number of implications for future research involving university learning spaces. It suggests that studies of the connections between attributes of physical and/or virtual space, on the one hand, and student learning outcomes, on the other, need to pay attention to mediating factors – with close attention to what students actually do and the sense they make of what they do." (p181)

It is here that I concur most strongly with Ellis and Goodyear. It is my position that conceptualising how space is a "mediating factor" within the actual practices of higher education is a core aspiration, to which the scholarship on learning spaces has yet to provide any kind of satisfactory answer. The vocabulary I outline in a subsequent section of this piece is oriented towards precisely that issue of how space mediates practice.

A new vocabulary for discussion

In what follows, I have specifically attempted to create a vocabulary that is underpinned by research into learning spaces.[1] The reason for doing so is to support the possibility of boundary crossing between the conversations about learning spaces going on institutions, and debates occurring in the scholarly literature.

The specific piece of research that I am building on is an earlier piece co-authored by myself (Bligh and Crook, 2017). In that piece, Charles Crook and I attempted to categorise and conceptualise the various ways in which research papers published in educational research, technology enhanced learning and human-computer interaction venues discussed space as a mediator of educational practice. It should be emphasised that the vocabulary proposed here varies to a considerable degree from that earlier academic framework: it is *inspired by* that previous work rather than identical to it. Whereas the earlier piece categorises research stances, some of which carry distinctly normative views, the present piece is oriented towards encouraging stakeholders to reflect on their experiences and explore future possibilities within their particular institutions. It should also be emphasised that the proposed vocabulary deliberately bears very little relation to those specialised terms that are used by estates, engineering or architectural professionals; or within institutions to produce legalistic specifications for external tender documents or post-occupancy evaluation specifications.

Finally, it should be emphasised that the vocabulary presented below is *not* intended to be immediately intuitive or obvious. Instead, the vocabulary is intended to support reflection, re-thinking and re-conceptualisation – as stakeholders use it to explore their experiences and aspirations together.

The vocabulary I shall propose is based around six core concepts, wherein space is understood to be *transparent*, *enabling*, *stimulating*, *associative*, *cognitively integrated* and *socially integrated*. Those concepts are briefly represented on a poster, reproduced here, which I hope can be used to provide a friendly overview when stakeholders come together to discuss institutional space production (Figure 1). Each of those concepts opens up different possibilities for discussion and invites stakeholders to focus on a range of closely related issues, for which a range of supporting terms are also provided. Those concepts are outlined in sequence in the following six subsections, along with some reflection about the range of issues that stakeholders might wish to discuss in each case.

[1] Here, I shall not prescribe specific activities within which this vocabulary might be used, since the possibilities are legion, although I have written about that topic before elsewhere (Bligh, 2014).

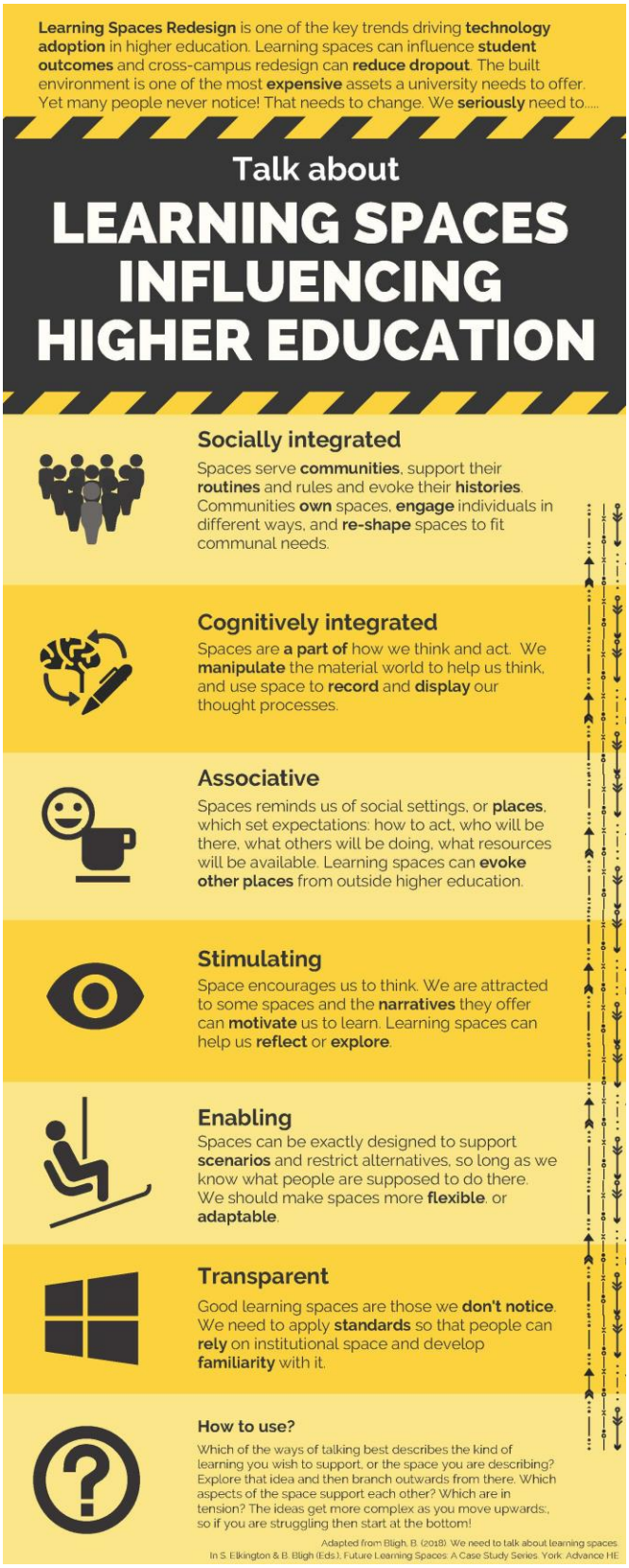

Figure 1: A poster overview of the vocabulary for talking about learning spaces.[2]

[2] PDF available online: https://archive.org/details/WeNeedToTalkAboutLearningSpacesFigure

The transparent learning space

The **transparent learning space** goes unnoticed by those using it to undertake educational work; the needs of the people working there have been predicted in advance and provided for in such a way that the space recedes to the periphery of their attention. That mode of mediation is possible because the transparent learning space is built upon well-considered *standards*. Some of those standards are derived from legal and professional frameworks that stipulate minimum or ideal levels for room temperature, lighting (including natural light), working space per person, and so on. Yet other standards are more noticeably local – such as where all teaching rooms across an institution are provisioned with the same technological control system, to increase the likelihood that people entering a given room will already be *familiar* with how to switch on the required devices.

The transparent learning space invites several assumptions: that what people will want to do there is to some extent predictable; that the task is to provide space that is adequate for the predicted purposes; that familiarity with other spaces can be used to support a cumulative, *disappearing* effect of transparency; and that learning does not depend on conscious interaction with aspects of the space. Any and all of these assumptions might be debated by stakeholders with reference to particular spaces. Of course, the transparent learning space might be a fragile construction. Whenever users must modify their learning practices because of available resources or spatial configuration, feel uncomfortable or irritated by some aspect of their surrounding environment, or indeed need to direct their attention to the space for any reason whatsoever, then the transparency of the learning space has been compromised. The extent to which that compromise is justified – or even desirable – is an important topic for discussion, especially in contexts where stakeholders are pushing for innovation to occur. Historically, estates and IT personnel within the institution might have sought to produce and maintain the transparency of learning spaces with little input from denizens; indeed, while space users might be consulted at predetermined moments in estate lifecycles, the very notion of transparency might be seen as mitigating against continual input from space users. One issue for discussion might concern the desirability of ongoing feedback from denizens about particular spaces, and how those sources of feedback might be integrated – so acknowledging both the localised experiences of denizens and the legitimate desire of estates personnel to maintain standard specifications across some range of spaces. The inherent tension within the concept of the transparent learning space concerns the extent to which educational practice is supposed to be carried out without regard for space or in otherwise frictionless ways; that tension invites us to consider what is *supposed* to be transparent and what is not.

The enabling learning space

The **enabling learning space** is a deliberately configured container that supports and resources a range of desired educational practices. The physical layout of the space invites, or makes it easier, for people to operate in particular ways; and, conversely, it may also work to discourage other forms of practice. That mode of mediation is possible because the space has been conceived as supporting definite forms of practice and thereby configured in exact ways; its form may radically diverge from other enabling learning spaces that aim to support other practices. That sense of *particularity*, or exactness, pervades the design.

The enabling learning space works by allowing its denizens to move in particular ways, to comfortably inhabit particular locations and postures, to access the particular resources they need to perform particular tasks close-at-hand, and to see and hear particular elements across the room – including, perhaps, other people and the resources they are using. The enabling learning space often offers *flexibility*, providing wheeled tables and other movable resources that allow denizens to reconfigure the space upon entry and to shift between different modes of practice at different moments within the same overall session. Yet the enabling learning space remains deliberately configured – that flexibility is not usually understood as an unrestricted charter for denizens to do anything they like, but rather as providing for convenient movement between different *scenarios* that are themselves still particular. Indeed, the enabling learning space may often also be a *constraining* learning space, one deliberately designed to exclude certain forms of action and reconfiguration. Where a room

has been configured to promote scenarios of small group working, for example, then practices of whole-class lecturing might be deliberately constrained by the provision of restricted sight lines that encourage teachers to rove between groups. Quite how and what a particular space enables and constrains, and the range of scenarios anticipated by the flexibility of the design offered, are, therefore, issues that need to be considered as mutually related within stakeholder discussion. The role of estates and IT personnel in orchestrating the enabling learning space has generally been to anticipate the particular needs of denizens, while managing the extent of possible change within the room in line with the spirit of its design. At a micro-level, doing so may be achieved by enforcing room layout rules: such as insisting that rooms must be returned to their original layout by close of session. Estates personnel may also have a preference for vocabulary of *adaptability*, which implies a focus on the professional management of changes to room configuration over time, rather than *flexibility*, which might be perceived negatively as unstructured, chaotic and permissive – allowing denizens to engage in inappropriate behaviour. That distinction is certainly worthy of discussion, since it seems plausible for mutual enlightenment to occur – including where denizens may come to see the value in those rhythmic, seasonal changes implied by the concept of adaptability. The inherent tension within the enabling learning space, therefore, concerns the particularity of the enabled practices and the degree of constraint and control that is to be enforced upon denizens; a tension that is sometimes manifest through establishing definitions of *adaptability* and flexibility for particular rooms (or room types) within institutions.

The stimulating learning space

The **stimulating learning space** is designed to *provoke* thinking and action through *sensory experience* and, most typically, is permeated by a desire to *prompt curiosity* and *reflection*. The stimulating learning space works by providing *experiences* organised around artefacts that are of interest to its denizens; and by *contextualising* those artefacts in ways that emphasise their relevance to educational practices – and to the other artefacts in the space – within overarching *narratives*. Denizens are being invited to *explore* the space and so to traverse the narrative. That exploration might involve ambulatory movement, such as walking around a university exhibition space or campus garden; but equally it might involve remaining in one location, perhaps seated and enjoying a moment of quiet reflection while looking at an information display or piece of artwork. Moreover, the exploration might be undertaken in a variety of social configurations, encompassing experiences ranging from the relatively *gregarious* (exploring with others, discussing, arguing, laughing, shouting) to those that are apparently *solitary* (exploring on one's own, engrossed in quiet thoughts and dialogue with oneself). What remains central is the provoking of sensory experience, most usually in the form of visual experiences but very plausibly including experiences based around the other human senses as well. It might be possible, for example, to provoke curiosity based on sensory experiences of touch or manipulation, or smell, or even by depriving particular senses – as is achieved when rooms are darkened. The narrative of the space, the senses that are to be stimulated as denizens explore, and the character of the sociality that ought to permeate the experience – all of these should form interesting bases for stakeholder discussion.

Two points of tension for the stimulating learning space concern the extent to which the narrative organisation is, firstly, prescriptive and, secondly, directly related to formal learning outcomes. In some cases, what is provoked might be more 'open-ended' experiences in both senses; some versions of the stimulating learning space may even manifest concerns oriented more towards affect and wellbeing than to cognitive knowledge acquisition *per se*. The engineering space that ostentatiously 'displays' those aspects of its construction that are relevant to the course being studied, the quiet garden where natural light and plant life help students to relax in the quiet moments of a busy day – both are, equally, instantiations of the stimulating learning space. Another point of tension concerns the extent to which denizens are empowered to alter or co-design the stimulating learning space. The most obvious metaphor for the design and management of the stimulating learning space and its artefacts by professional staff is *curation*, and exploring the meaning of that metaphor for a particular space might serve to open up questions of who the curators are and what power is accorded them.

The associative learning space

The **associative learning space** is designed to *evoke feelings* and *expectations* at an *intuitive* level. The associative learning space works by *mimicking* aspects of *other spaces* that its denizens will likely already be familiar with: cafés, domestic settings, corporate boardrooms, industrial plant and museum galleries are among the more prevalent choices. That mimicry may involve *importing* isolated elements of those other spaces, such as furniture or wall colour schemes, or it may involve designing the whole associative learning space as a *pastiche*. Initial discussions might focus on the kinds of spaces that denizens enjoy (or find productive); which elements of those spaces are perceived most central to their experiences there; and the extent of the pastiche that is possible and desirable within institutional space.

The underlying premise of the associative learning space is inspired by the commonly discussed distinction between 'space' and 'place', where a place is a *space with meaning*. People form, the premise goes, deeply meaningful relationships with particular places in their lives that may involve particular emotional states (such as comfort, conviviality or contemplation) and particular expectations (such as how to act, who will be there and what resources will be available). Those relationships, the premise continues, can be *leveraged* in other spaces where the same emotional states and expectations are desirable. The second part of that premise, in particular, is hotly contested by many human geographers, but that academic contestation has not prevented the associative learning space – from rooms with beanbags to full-blown cafés – from becoming increasingly prevalent in actual universities. All of those foundational issues might be frankly addressed in discussion, wherever healthy scepticism is raised. Yet there are a range of persistent tensions for how the associative learning space is manifest that will certainly need to be addressed, even if the broader premises are accepted by those stakeholders involved in the discussions. One such tension is that evoking associations is hardly something that can be achieved with precision; while another is that the associations being evoked are deeply cultural and societal. The associative learning space may thus inadvertently serve to exclude, for example by evoking confusion or unanticipated associations in people from disparate cultures and thereby disadvantaging particular denizens; while even denizens from locally dominant cultures may find that unwanted associations are evoked alongside those judged more desirable. The evocation of associations relies on denizens thinking in metaphors that *necessarily* have multi-voiced and vague interpretations. How far to take the metaphor is, therefore, a worthwhile issue to explore.

The cognitively integrated learning space

The **cognitively integrated learning space** is designed to be *a part of* the thinking and other actions in which its denizens are engaged. The cognitively integrated learning space works by providing a range of artefacts – examples include information displays, writing surfaces or equipment from some professional or industry setting – arranged so that denizens can interact with them during their educational working. Those artefacts, it is envisaged, will become an integrated part of denizens' thinking. For some people the idea of the cognitively integrated learning space will seem counterintuitive. We have become habituated to the idea that *thinking*, and other human functions such as remembering, deliberating and decision-making, occur within the biological organ known as the brain. Yet that is not how many learning scientists view the situation; instead, it is suggested, thinking occurs within *functional organs* in which the mind is *integrated* with other parts of the *body* (including the hands and eyes), with the *external artefacts* that are explored and manipulated, and indeed with *other people* in team working situations. All of those components should be viewed as integral to, and indispensable for, how we learn as human beings. Discussants should be encouraged to think through *particular examples* of their working, especially where the general idea initially proves too difficult to grasp. We sometimes use the common phrase *working out* to describe how we cognitively approach the problems that confront us, which does carry some of the correct connotations. The cognitively integrated learning space aims to directly support our efforts to do that working out and to communicate our thinking to others.

A range of interrelated tensions characterise the concept of the cognitively integrated learning space. One such tension is manifest because some forms of working out require focused thinking and individual action, while

others require team working and the display of working to others. Those priorities might simply be in direct tension for some spaces; but in other circumstances the core challenge is to support *transitions* between *moments* of working alone, in sub-groups, and across the whole room in plenary discussion – and the attendant transitions in how the associated tools and materials are seen as controlled by particular denizens. A second tension occurs between the notion that the space's artefacts are for manipulating and continually modifying, and the notion that they might provide a constant anchor point whose strength lies in their unchanging presence: once again this can often be productively viewed as the management of transitions between moments, this time between active working and the subsequent *ambient display* of information as a collective memory. A third tension arises where configurations of materials localised in particular spaces are difficult to move or to replicate elsewhere: this tension highlights issues of issues of transfer, both for students, who might rely – or have *come to* rely – on particular resources to undertake certain kinds of working out; and for professional staff, for whom cognitively integrated learning spaces can come to be seen as resource-intensive and associated with timetabling problems. Working out the kind of transitions that are required by denizens, and the extent to which those transitions can be reasonably supported, will be a worthwhile moment in stakeholder discussions.

The socially integrated learning space

The **socially integrated learning space** serves its denizens as a *community*. Denizens go there to *meet with* other members of the community and to engage in *routine* practices: whether those are the routines preferred by a denizen as an individual; or routines imposed by allotted responsibilities within the community, such as maintaining the space itself or its equipment. The s*ocially integrated learning space* often has some sort of *history* that is felt by its denizens as integral to their experience of the space. That history might be relatively short-term and personal – a particular group might attend the space often, having originally met there for some particular purpose and having enjoyed the experience. Understanding which spaces within an institution become socially integrated in that way will be a useful issue for collective reflection. Yet, equally, the history of a given space might be very longstanding – in some cases the space might have been used by succeeding generations of students over decades or centuries. In those instances, the attendant issue for discussion might be how to value, reinforce, or refine that longstanding social integration. In some cases, the history of the socially integrated learning space might be clearly visible: denizens might display their own work around the space, including on the walls; while, in other cases, the work of *preceding* generations of the community might be given a visual prominence. Either way, the fact that the space serves as part of the *heritage* of the denizen community might be consciously highlighted. To varying extents, the socially integrated learning space might feel ostentatiously *historical*, in the sense of evoking a prior historical period in its aesthetic; *threadbare*, evoking the shared camaraderie of students experiencing both intellectual discovery and financial thrift; and/or *disciplinary*, serving a community of denizens with a shared intellectual or professional mission.

One dilemma associated with the socially integrated learning space often concerns the nature of the learning that occurs there. The socially integrated learning space might be a bar or pub serving alcohol and offering games facilities; somewhere denizens might specifically go to *escape* their formal learning obligations for periods of time. Yet, nonetheless, their socialisation in that space forms an integral part of their overall educational experience. The socially integrated learning space might be associated with a student society – perhaps one focusing on media production, language learning, or sport – where denizens are more obviously learning particular skills, but with potentially uncertain relationships between those skills and the formal university credentials they are pursuing. Or, conversely, the socially integrated learning space might be very readily associated with formal disciplinary identity: one example might be a studio of the kind that so often sits at the heart of art and design disciplines. Understanding and valuing the *diverse* contributions that socially integrated learning spaces make is, therefore, an important point for discussion. Another dilemma associated with the socially integrated learning space concerns the issue of *ownership*. The socially integrated learning space might be 'delinked', to some extent, from the centralised estates management oversight mechanisms that cover most institutional space, and instead owned by some denizen community or academic department.

Such delinking sometimes brings with it the necessity of allocating responsibilities for the upkeep of the space, which may fall to denizens themselves, and the obligation to service ongoing financial costs imposed via institutional space-charging mechanisms. The latter may sometimes need to be met by academic departments or student societies. The advantages and implications of ownership therefore constitute an important issue for discussion and clarification – and, where the possibility exists, for negotiation between denizens and estates management.

Concluding comments

As the introduction explains in more detail, the present document arises from a symposium: *The Future of Learning Spaces in Higher Education: Space, Technology and Pedagogy*, hosted by the Higher Education Academy (now Advance HE) in York, UK on the 22 March 2018. When I heard about the event, I was immediately enthusiastic: learning spaces is an under-recognised field of enquiry. Yet, as the timetable emerged and was finalised, I realised that the event had unusual potential. The symposium having attracted both academic researchers and estates personnel, there was real potential for the kind of inter-professional and collaborative discussion about the topic that I have long sought to nurture and support.

And I was not disappointed! As the group convened to discuss learning spaces together, there was none of the negative stereotyping that occasionally dogs debates around the topic. At the start of the day, I presented (an earlier version of) the above vocabulary and handed out (an earlier version of) the poster diagram[3], and was pleased that the resulting discussion encompassed both professionals and scholars. Overall, the day accommodated both scholarly and professional presentations, each of which provoked intelligent questions from across the mixed audience. The presentations – some subset of which have been written up to form the remainder of this document – drew out various aspects of how spaces mediate educational practices. Overall, the symposium entirely reinforced my conviction that stakeholders of different stripes coming together to discuss learning space production can be highly informative and useful. The symposium itself, along with the document you are now reading, can serve as a useful indicator of why talking about learning spaces is worthwhile. My main hope is that readers of this document are sufficiently stimulated to generate more such conversation in the future!

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1. The Learning Commons at Northampton

Chris Powis, *University of Northampton*

Background

The University of Northampton moved from its existing campuses to a new, purpose-built town-centre campus in September 2018. The move allows the university to reappraise the whole notion of a campus and to build anew around learner needs and a pedagogic approach of active blended learning rather than replicate the existing campus design which had grown, albeit organically, to mirror the university's organisational structure. Although cooperation and collaboration across and between faculties and departments clearly did take place, separate buildings also facilitated silos. This is perhaps best illustrated through the way 'control' of space resided in individual areas, each with their own ideas and priorities for the use of that space. This led to a proliferation of small scale 'social learning' spaces across the campus, many of which were never used. The new 'Waterside' campus has no faculty buildings, no separate teaching blocks, no library or IT centre but at its heart is the Learning Commons.

Active blended learning needs a more flexible and open approach to ownership of space if it is to prosper. It "requires students to do meaningful learning activities, process new information and think about what they are doing with it". This can take place in a variety of ways, including online and physical spaces, but it is unlikely to involve the traditional lecture model. Active Blended Learning emphasises active engagement with resources and people rather than the passive transmission of knowledge in traditional large lecture theatres. In addition, all staff will work in shared spaces and we have moved to paperless working and a bring your own device IT policy for students.

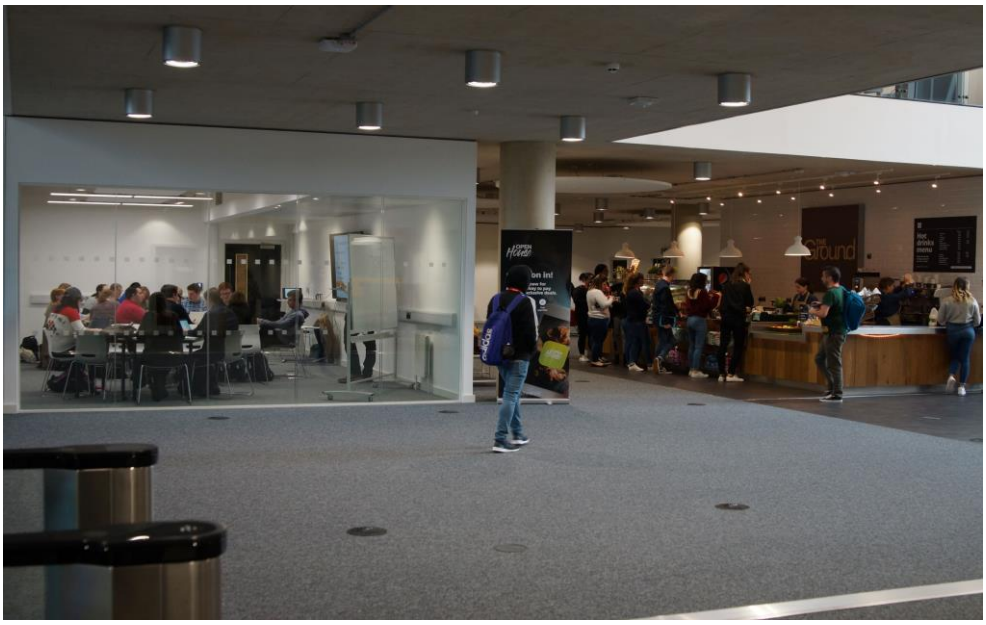

Figure 1: The Waterside Learning Commons (example space)

The Waterside Learning Commons blurs the boundaries between formal teaching and learning spaces (Figure 1), academics and professional services, people and physical resources by not identifying any area as belonging to one function or department. This will facilitate a more holistic/interdisciplinary approach which puts

learning at the core of campus design. The building brings together the three elements of the student learning experience (people, resources and spaces) and integrates them across one building (Figure 2).

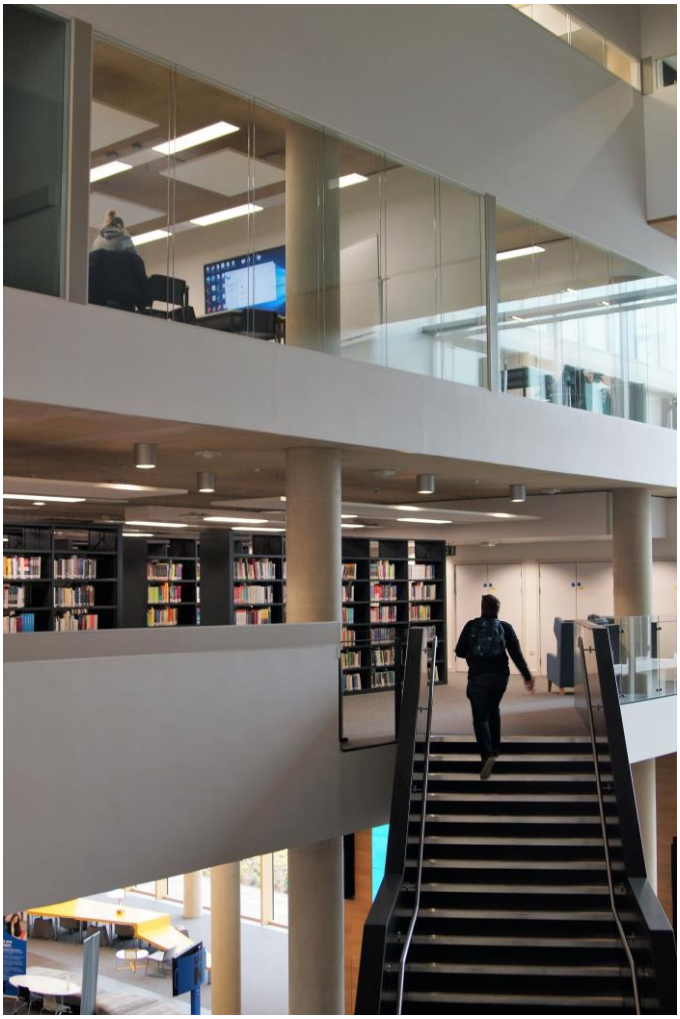

Figure 2: Example of integrated space

There are other buildings in the sector called Learning Commons but these are often IT rich, open learning spaces without a significant staff or resource presence. There are Information Commons which often replicate, and are usually managed by, the library which may integrate other central services but rarely contain formal teaching spaces or academics. There are also many examples of student centres offering a staff presence and learning spaces but not usually resources. Although radical, the Learning Commons has been informed by innovative space use from buildings across the UK, Europe and North America, the growing literature around user experience of space, particularly in libraries, 'sticky' campuses and research around our own students' ideas about, and use of, space.

The development of the campus, and the Learning Commons in particular, has been informed by a changing pedagogy, led by the work of the university's Institute of Learning and Teaching in Higher Education and a growing body of sector-wide research. This in turn has seen an incremental change in the use of learning spaces across the old campuses over several years. Active Blended Learning would be the heart of our learning and teaching strategy regardless of the move. Teaching had been taking place in open learning spaces, especially in the library, for years and services like academic skills development, employability, learning technology, cafes, exhibitions and university events had increasingly relocated to the library.

Boundaries were blurred, but the existing estate still encouraged a division between the faculty buildings, which is where most teaching takes place and the academics can be found, and other buildings 'owned' by different services which may or may not have been identified with learning.

This case study will concentrate on the development of the Learning Commons, the largest of the three ‘academic’ buildings and home to most of the managed open learning space on campus. It will explore the ethos behind the design and how we have moved towards an innovative, adaptable, technology rich and democratic approach to open learning spaces on the existing campuses to prepare staff and students for the new model.

Approach

The development of the ethos and its application in the existing buildings as well as its influence on the design of the new campus required input from a host of stakeholders. A steering group was established with a membership representative of all users of the Learning Commons. This meant not only academics, library and student services staff who would be based in the new building but also students and staff based elsewhere who would use the Learning Commons to deliver services (for example the student finance team). Alongside this the university disseminated information on the Learning Commons via face-to-face and social media channels to as many people as possible. All users need to buy in to the integrated nature of space and services and this group has been critical in fostering understanding, reviewing impact of pilots and disseminating information across the university about the Learning Commons.

To move to a Learning Commons approach has required all staff to embrace a different ethos in the use of space. This sees the whole campus as shared space with the facilitation of learning as its primary purpose. When manifested as a building the Learning Commons is therefore:

+ Innovative in welcoming change, facilitating new approaches to teaching, learning, resources and support and therefore proactive in combatting inertia;
+ Adaptable in that it is able to respond to change quickly in both its use of space (very little space is fixed in any way) and services which respond to student needs (Figure 3 and Figure 4);
+ Technology rich and enabled with a robust infrastructure that supports IT solutions to facilitate learning (Figure 5);
+ Democratic in the sense that all users of the building feel that they have a say in its development and that management of the space and services is transparent and accountable.

Figure 3: Example of 'adaptable' space on campus

Figure 4: Example of 'adaptable' space on campus

These guiding principles were agreed by all stakeholders early in the development process and together facilitate a much more integrated approach by staff. The organisation will not change: there will still be faculties, librarians etc managed through their existing structures. However, teams will have a greater capacity for working together under a common ethos than is possible in separate buildings.

Figure 5: An integrated ‘technology-rich’ environment

Outcomes

The impact of the change is yet to be fully felt. The Learning Commons at Waterside became operational in September 2018. Each of the principles underpinning the Learning Commons have been successfully run on the existing campuses but only Waterside will fully integrate them.

The design process for the Learning Commons was informed by a growing body of evidence in innovative use of space across the existing campuses. This made it easier for stakeholders to articulate what they wanted from the new spaces rather than, as has been the case in previous refurbishments, simply ask for more or less of the same. Active Blended Learning did not start with the move and so successes and failures from practice were learnt from and fed into the design process.

The creation of workstreams to oversee elements of the campus design brought together stakeholders from across the university to develop aspects of the design. These led in turn to a board that looked to integrate them into the overall planning. Senior management had provided a clear steer for the design, for example in articulating its relationship with the town or in a policy of smart working for all staff. The university’s commitment to Active Blended Learning also clearly influenced how the buildings developed. However, the development of the Learning Commons also involved meetings and discussions with academic, professional and students both individually and as part of stakeholder groups. Ideas and concerns from these meetings were considered by the Learning Commons steering group which led the relevant workstream for that building. There was little argument with the guiding principles and perhaps a surprising consensus on issues that might have been more controversial such as the lack of fixed PCs in open areas.

There was, also perhaps surprisingly, very little difference in emphasis or priority from each constituency. A completely clean sheet is an extremely rare situation and the lack of an overall owner of the Learning Commons made discussions more open than might otherwise have been the case. The building was explicitly neither a teaching block, a library, a student centre or a social space but all of these things and, as this was clear from the start, an integrated approach was easier than it might have been if any of those elements was being moved into an existing building.

The description of the building as ‘democratic’ has, again surprisingly, been controversial. This may be purely semantic or perhaps signal a cynicism that representatives will not reflect their feelings, but 'consultative' has

been preferred by some teams. There will no doubt be consultative exercises with stakeholders in future but it would not be practical to consult fully on everything and still be able to respond quickly to need. The Learning Commons steering group has changed to a Waterside operational steering group with similar but expanded membership to reflect, for example, use of the sports facilities. Membership is explicitly charged with gathering and reflecting the views, concerns and ideas of their constituency. They will also be expected to input to user experience (including staff), work both locally and globally and disseminate the results and actions decided by the group. This should ease the conflict between what is meant by democratic and consultative.

The campus is built and we will now need to review how the buildings work in practice and especially whether the Learning Commons ethos will offer the flexibility required for it to be successful as a campus. Building an entire campus around the learners is a radical step but the groundwork done on the existing campuses should ensure its success.

2. Learning spaces development at Abertay University – creating a 'sticky campus'

Dr Alastair Robertson, *Abertay University*

Background

In redesigning learning spaces, it is really important to stress the need to align the learning environment(s) and IT infrastructure with pedagogical practices. There is a significant body of academic literature on the positive impact pedagogy can have in terms of promoting students' deeper approaches to their learning and engagement with their chosen subject area leading to enhanced knowledge, understanding, critical thinking, problem solving and therefore attainment. Further, new technologies are opening up new ways of teaching and supporting student learning. This case study highlights how Abertay University has adopted such an approach.

Abertay is a relatively small modern university (about 4,000 students) in the city centre of Dundee, Scotland. The vast majority of our students are Scottish-domiciled followed by some EU and comparatively small numbers of RUK/international fee-paying students. We have strong links with local partner colleges and about a third of students enter with advanced standing into years two and three. As such, a significant number of students are commuting on a daily basis to campus. Academic achievement and retention are key themes for a modern university like Abertay with our particular student demographic.

In response to the changing context and through efforts to enhance the student experience, the university has transformed its pedagogic approach since 2013, catalysed by our new Teaching and Learning Enhancement Strategy. There are three strategic priorities: curriculum reform, incentivising student performance and raising the status of teaching. The development and implementation of the strategy has been previously published by the Higher Education Academy. Specific examples of changes introduced include moving from a 15 to 20 credit module structure, introducing new compulsory interdisciplinary electives for stages one and two to broaden our students' breadth as well as depth of knowledge, moving to a grade point average (GPA)-based honours classification system and electronic management of assessment (EMA). Since introducing these important changes, there has been a rise in the proportion of students graduating with good degrees and our HESA Employment Indicator has risen for the last four years such that this year we were placed seventh out of 18 Scottish higher education institutions. However, there are still challenges in terms of improving student retention, particularly among students entering from local partner colleges, graduate level employment and enhancing our students' experience more generally.

Accordingly, in 2016 the university entered the second phase of teaching and learning strategy development: learning spaces. Specifically, given the large number of commuting students, many of whom are first generation HE and work part-time (up to 15 hours a week), we wanted to make our campus "stickier" and more attractive for our students. "Sticky campus" is a very simple concept that originated in New Zealand after the Christchurch earthquake in 2011 destroyed all social spaces for their students on and off campus.[4] The sticky campus aims to provide the students with the right kind of environment and learning opportunities that they will want to come and stay. There is good evidence in the academic literature that commuting students are less likely to complete their course, get a good degree and are less engaged in co-curricular aspects of student life

[4] https://warrenandmahoney.com/articles/sticky-campus.

(e.g. clubs and societies) whereas students who feel part of their learning community and have a strong sense of belonging and connectedness with their fellow students and with academic staff are more likely to complete their studies, reach their potential and be successful in their chosen career (e.g. Tinto, 1975). These are key themes for a modern university with our particular student demographic and where the majority of our students come to university to improve their life chances.

Approach

As Director of Teaching and Learning Enhancement I was tasked by the university executive to lead this initiative from a pedagogic perspective. Consistent with Abertay University's approach for other academic reforms outlined above, we went back to first principles in terms of what we were trying to achieve and engaged extensively with identified key stakeholders. In this case:

- Students
- Student representatives
- Academic staff
- Academic managers
- Academic leaders (Heads of School, Academic Curriculum Managers; in larger universities these might be Deans and Associate Deans of learning and teaching respectively)
- Heads of Professional Services particularly Estates, Information Services, Student Services, Registry (timetables), Finance
- University executive (Principal and Vice Principals).

Scoping included desk-based work, open-invitation workshops and consultation meetings to identify key areas for development. In these sessions, colleagues were briefed on approaches adopted by other universities and the notion of a 'sticky campus'. They were then asked to identify what they felt was most important for the university right then and that would have the greatest impact. This process was very important to gain local ownership and buy-in which was vital for sustainable change although, in reality, the list of priorities drawn up by participants was largely anticipated. Prioritisation was earmarked for new science laboratories, library refurbishment and experimentation around new flexible general teaching spaces (Figure 1). The science laboratories and the library were chosen because they were clearly in need of upgrading based on feedback from students and staff and, in the case of developing new flexible general teaching spaces, the idea was to get a better understanding of what might be rolled out on a large-scale basis after this initial experimentation phase. In all cases we wanted to create 'sand box' environments that promoted active student learning and engagement.

Figure 1: Science lab

Figure 2: Collaborative learning suite

In September 2016, the university built a new digital classroom (the collaborative learning suite, see Figure 2), new science laboratories in January 2017 and refurbished the university library in summer 2017. A further low-tech, general and flexible classroom was fitted out in summer 2017. Accompanying estate development has been a significant investment in staff support provided by the Teaching and Learning Enhancement (TLE) team, supported by Information Services (IS), to ensure staff who teach in the new spaces are adequately trained in the use of technologies available. The various staff development activities can be summarised as follows:

+ *Awareness raising*: including promotion of the new facilities, posters, banners, running staff developments sessions, seminars and running the Postgraduate Certificate in Higher Education

Teaching (PGCHET) in the collaborative learning suite. The new facilities also feature prominently during open days with the aim of encouraging students to apply to the university.

+ *Improving knowledge and understanding*: an initial two-day training session for the collaborative learning suite has been supplemented by follow up drop-in sessions and online resources plus use of the collaborative learning suite within the PGCHET. Additional training for the digital technologies available in the new science laboratories was also provided. Encouraging the sharing of good practice among staff in the use of the new spaces has also been recorded and internally disseminated.
+ *Troubleshooting*: classroom support, one to one, user guides.

A full report on the collaborative learning suite trial and the experiences of staff with their students has been published within Creating the Digital Campus - active learning spaces and technology (Robertson, 2017).

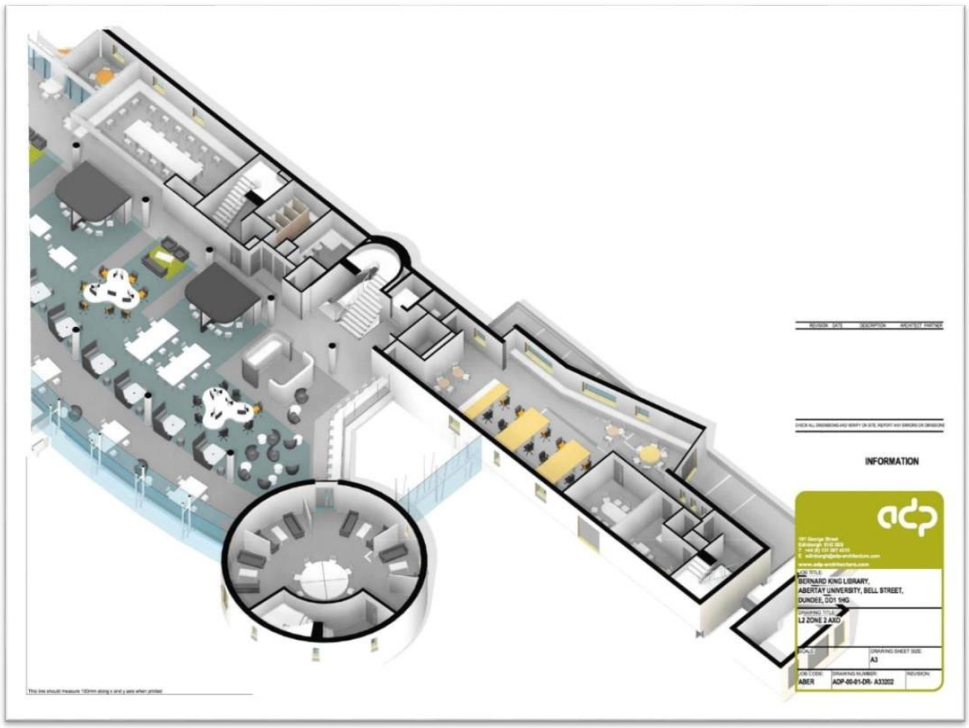

Figure 3: Plans for library second floor development

Figure 4: Bookable active learning booth

The ethos of this pedagogic approach has extended to our new library which now provides a range of formal and informal learning spaces for individuals or groups (Figure 3 and Figure 4). Starting on the ground floor there is a rich variety of social learning spaces including a café, laptop vending machine, some desktop stations, a variety of styles of seating and desks as well as our student one-stop shop "Support Enquiry Zone". The first floor contains bookable rooms, group booths, individual desktop computers, an IT training classroom and our creative design suite (inspired by the "Google war room"[5] for project work, design thinking etc) as well as laptop vending machines and lockers. Interactive, collaborative technologies feature prominently eg write-on walls, Smart Kapp whiteboards and Kramer Via Connect that allows users to connect and collaborate using their own devices (smart phones, tablets or laptops). Improving IT infrastructure is another key aspect of the sticky campus including better wifi, more charging points for users' devices and laptop vending facilities (see Figure 5 and Figure 6).

[5] https://www.thecoolist.com/google-ventures-best-way-foster-creativity-design-team-war-room/.

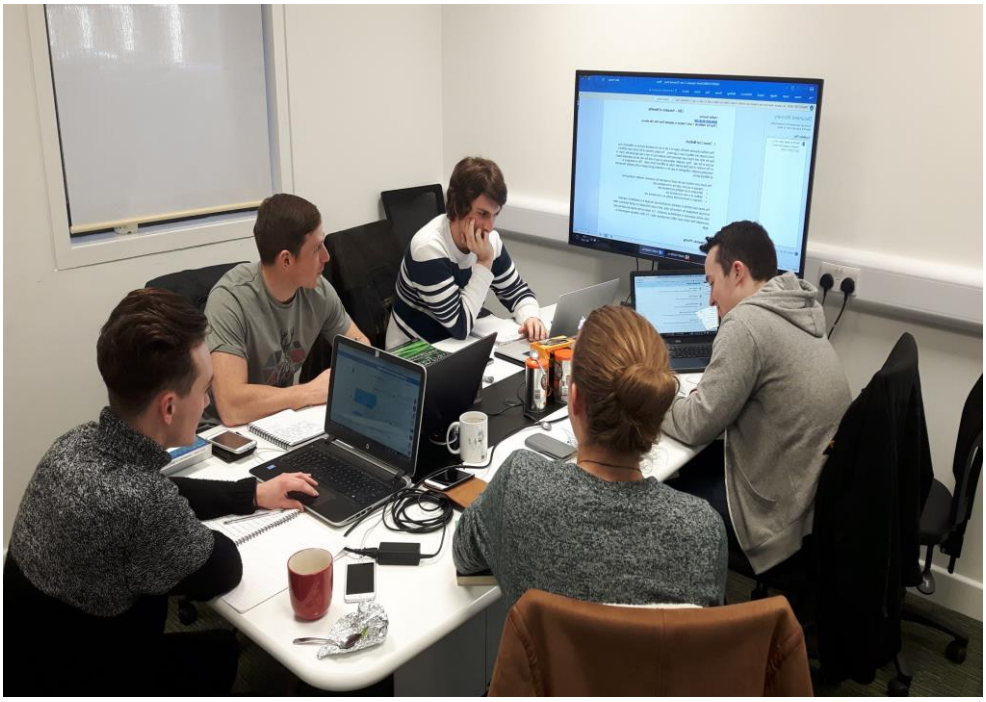

Figure 5: Write-on wall

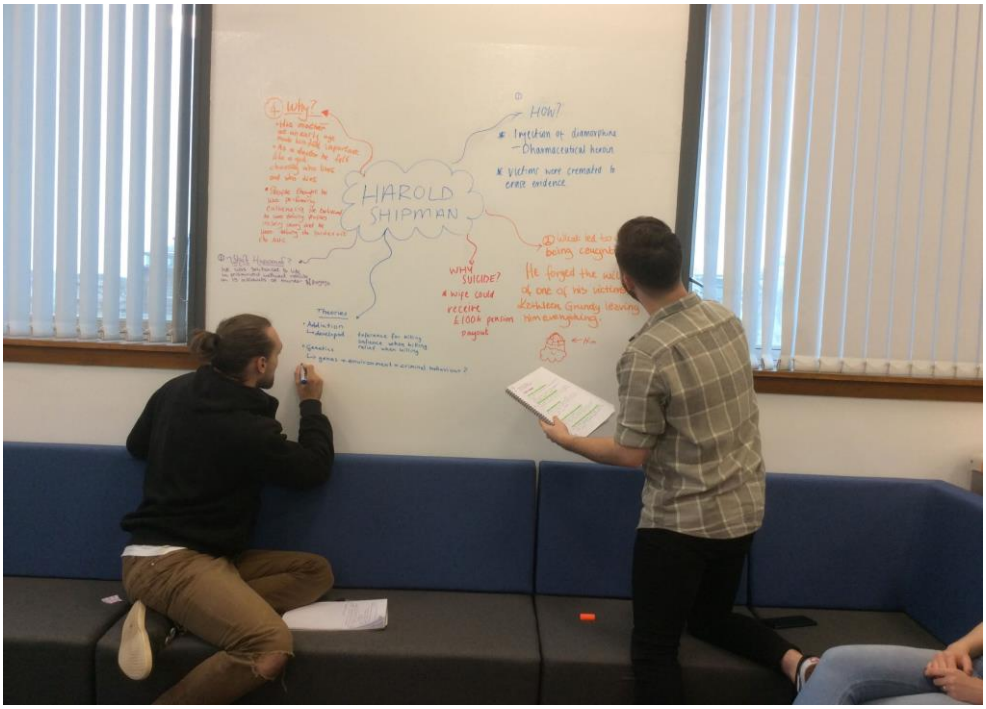

Figure 6: Bookable active learning room

Similarly, our science laboratories, as well as containing traditional equipment, have been fitted with Kramer Via technology screens at the end of each bench to which users can connect their own devices for data analysis and a camera that can record the instructor at the front eg performing a particular experimental technique. Adjoining the science labs are personal lockers, a soft seating area and more Kramer Via stations to allow collaboration outside of formal classes.

In all cases, the idea is to create more holistic, attractive and useful spaces so that students do not feel they just need to come on campus for class then leave.

Outcomes

As stated above, the main driver for Abertay University's estate development is to enhance our students' experience, to support retention and to help students maximise their potential. The notion of a "sticky campus" is particularly helpful given our students' demographic and the high number of commuting students. This article has focused on three priority areas, by way of illustrating our approach which is still in development.

In terms of the collaborative learning suite, its primary focus is teaching students. However, the room has also proved beneficial for wider uses eg staff development sessions, grant writing workshops and hosting interactive sessions with externally located participants. Students are allowed access to the room when it is not in use and it is now a regular occurrence to see self-organised groups of students working collaboratively in the room on various projects, which is very encouraging to see and good evidence that our campus is becoming stickier! The varied (academic) subject matter occasionally found on the write-on walls is further evidence of the range of disciplines using the room. In reality, the collaborative learning suite is probably 'over-specced' for general usage and that is why we will go for a simpler design for our future general teaching spaces. However, we wish to retain the principles of creating modern flexible learning environments that can be used in a variety of pedagogic modes including didactic delivery.

The library refurbishment has taken place over two phases during summer 2017 and 2018 with the most innovative new space development being part of the first phase. It is fair to say that it has been a significant success – the increased activity in the library is noticeable and this is borne out in the statistics. In 2017/18 there was a 20% increase in the number of students using the library, 23% more loans and student satisfaction increased correspondingly (responses to NSS question 19 – "The library resources supported my learning well" – increased from 85% to 88% in just one year).

The new science laboratories are a significant improvement in terms of both core science facilities and also the addition of digital technologies that are enriching the student learning experience. The most common usages of the new technologies are demonstrating scientific technique / skills / experiments by the instructor at the front of the lab to all classes via the new camera system projecting on to the various screens distributed at the ends of each bench, real time. Going forward then, the university is at an exciting stage of development. Valuable lessons have been learned through these new, experimental learning spaces. The plan now is to reform our teaching estate on a wholescale basis as part of our next strategic plan (2020-25) that is currently being consulted upon. Current challenges include enhancing space use, optimising timetabling and the overall profile of spaces within our estate. In terms of the last point, it is a turbulent time for universities in the short term, not least because of Brexit. This is a particular issue for Scottish universities where EU students' fees are currently paid by the Scottish government. Abertay University has about 17% EU students and it is anticipated that if they were charged fees post-Brexit, it would probably negatively affect student numbers with potential consequences for the profile of spaces required. However, regardless of the estate profile we are committed to creating a campus that is welcoming, engaging, attractive, flexible and, of course, very sticky.

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3. Working in partnership with students to design flexible and student-centred learning spaces: Teesside University Library

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Dr Anne Llewellyn, *Teesside University*

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Background

This case study explores an action research project to design and deliver refurbished learning spaces in the library at Teesside University, exploring the importance of learning space design for student engagement and learning. Students have increased choices about where and when they work and will therefore choose to work in spaces that they like. A study by Beckers et al (2016) into the learning space choices of higher education students found that students mainly conduct individual learning activities at home because of the opportunity to control their personal environment regarding concentration and comfort and to combine learning with other activities, such as listening to music. For learning with others they mainly used learning spaces in open areas, corridors, hallways, atria and lounges.

The design of learning spaces is increasingly being recognised as an important factor that motivates students and engages them in their learning and development (Hyun Cha and Wan Kim, 2015). It is therefore important to work in partnership with students in the design of institutional learning spaces, making them attractive places to work.

In 2012 the university executive team at Teesside University mandated a programme of library refurbishment, reflecting the vision of the Director of Library and Information Services to develop the library as a space for diverse student learning needs, moving away from traditional service-led drivers for space design (Bennett, 2005 and 2015; Lippincott, 2006). The Director of Library and Information Services led the project, which involved wide and diverse representation of all key stakeholders, including students, staff with academic roles and staff from estates. Radcliffe's (2008) model of learning, which integrates space, pedagogy and technology, underpinned the design.

The project was established to create effective spaces for learning rather than traditional model of library as a repository for resources. The library was not seen as an effective space for learning as it lacked natural light, had cramped learning spaces and the design led to a poor student experience, with multiple points of contact for enquiries.

Figure 1: Front of the library, showing no natural light at the corners of the building

Figure 2: Spaces in the library pre-refurbishment

The project also involved partnership working with external architectural and design partners and key stakeholders within the university, reflecting the context of this project within the strategic vision of university policies to enhance the holistic student experience.

A phased programme of refurbishment was initiated, starting with the ground floor in 2012 and culminating in the completed refurbishment of floors two and three in September 2017. This was to minimise the disruption to student learning as well as working within budgetary constraints. The ground floor phase was seen as a proof of concept to demonstrate the effectiveness of a student-centred approach to design and to evaluate the use of this space before further investment was agreed.

Figure 3: The refurbished entrance, demonstrating the single point of contact to manage student enquiries more effectively

The aim of the refurbishment was to develop the library as an on-campus space at the heart of the campus, which is a focus for learning, research, academic collaboration and contemplation. The concept of the library as a space for 21st century learning that drives and enhances the student experience was based on three core themes: a technology-rich environment; flexible layouts to accommodate different ways of working (Rex, 2014); and ambient and visually impressive spaces that motivate and enhance learning. Traditional learning spaces have become less relevant as pedagogies have changed (Dugdale, 2009). To reflect this, the refurbished library now provides a range of spaces for heutagogical (student constructed learning) and paragogical learning (peer learning) as well as quiet and silent spaces for individual learning.

Approach

Action research was used as a methodological approach to design and evaluate the first, second and third floor refurbished spaces. Action research is a cyclical process of collaborative inquiry that provides a framework that emphasises both actions in practice and researches those actions. As such, it is often used within educational practice to explore pedagogical changes. The use of action research enabled multiple perspectives to be incorporated within the cycles of action and research activity to inform the iterative process of phased design.

Within this project, there were two action phases and two research phases:

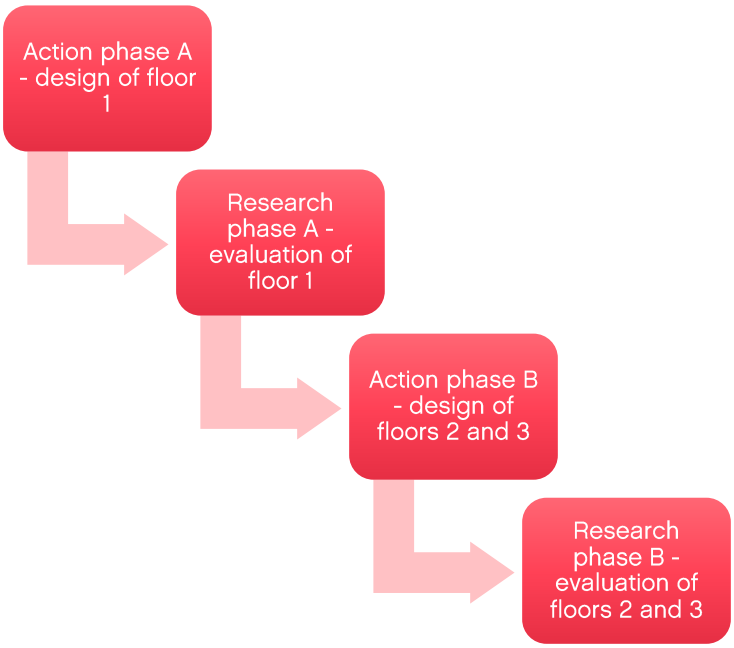

Figure 4: Diagrammatic representation of action research process

Throughout the action research phases we worked in partnership with students, involving them in a number of ways in the design and evaluation phases of the project in order to create student-centred learning spaces. Representatives from the student body sat on the project board throughout the duration of the refurbishment and evaluation. In the first action phase to design the first floor, student researchers were used to capture the student body's views about what constitutes a good learning space. In interviews with student participants, the student researchers used photographs to stimulate discussion about the use of spaces for learning. This informed the design of the first floor of the library.

In the second action phase, students were involved through design focus groups and as core members of the project team. We also worked in partnership with students in the evaluation of the learning spaces during both research phases of the action research project.

Mixed methods analysis was used to explore how the spaces are used, using both quantitative and qualitative methods, broadly based on the JELS conceptual framework for evaluating learning space design (Pearshouse et al, 2009). In the first research phase, first impressions data was collected by students and library staff and showed an overwhelmingly positive view of the refurbishment. Quantitative data was obtained through headcount data and observations and qualitative data was obtained through a small sample of students completing reflective narratives about how they used the spaces for learning over a one week period.

In the second evaluation phase, we duplicated the mixed methods analysis, using first impressions data, headcount data to establish usage patterns and a student-led research project, conducting focus groups with samples of students, in order to capture a wider view of how the spaces were used for different types of learning.

Outcomes

The feedback on the refurbished space has been very positive. The space has enabled students to learn effectively and flexibly and reimagine the way that they use spaces for learning. The findings are presented to reflect the three core themes that underpinned the design.

Technology-rich environment

The overwhelming majority of participant students agreed that the newly refurbished library spaces are an outstanding place for 21st century learning. The library is not only a visually impressive space but also a flexible learning space. 96.5% of the participants stated that the new library is a more advanced, technology-enabled environment, yet at the same time student friendly.

"One main feature that I have noticed since the refurbishments is that there are so many plugs available which allow you to charge all your devices nearby."

Figure 5: Collaborative working area

Flexible layouts to accommodate different ways of working

The refurbishment of floor one achieved its aim of providing collaborative learning spaces and the design promoted shared learning opportunities. The flexibility of the furniture in this area particularly facilitated this, allowing students to customise spaces for different ways of working. However, students also reported more limited spaces for individual and private learning and this was an important factor that was taken into account in the next stages of design. Following the completion of all the refurbishment, we found that all learning areas were used throughout the whole 24-hour period, leading us to the conclusion that the different types of space from collaborative to silent and contemplative provided the range of spaces to address different learning needs.

Some students clearly preferred the silent and quiet spaces for individual study. However, contrary to Beckers et al's (2016) finding that learning is effective where there are distinct areas for private and collaborative study, we found that the flexible layout and furnishings facilitated personalisation and ownership of the space, with students creating their own private space to accommodate their learning needs and preferences within the different learning environments.

"I was very pleased with how productive I was today and felt very comfortable working in the small space I made for myself. I used one of the individual workspaces by the front window. I like how it was separated from the rest of the library in the corner and would not be disturbed by any other noises around me or by other people walking around the library."

Figure 6: Quiet working area, demonstrating different types of furniture to enable student choice

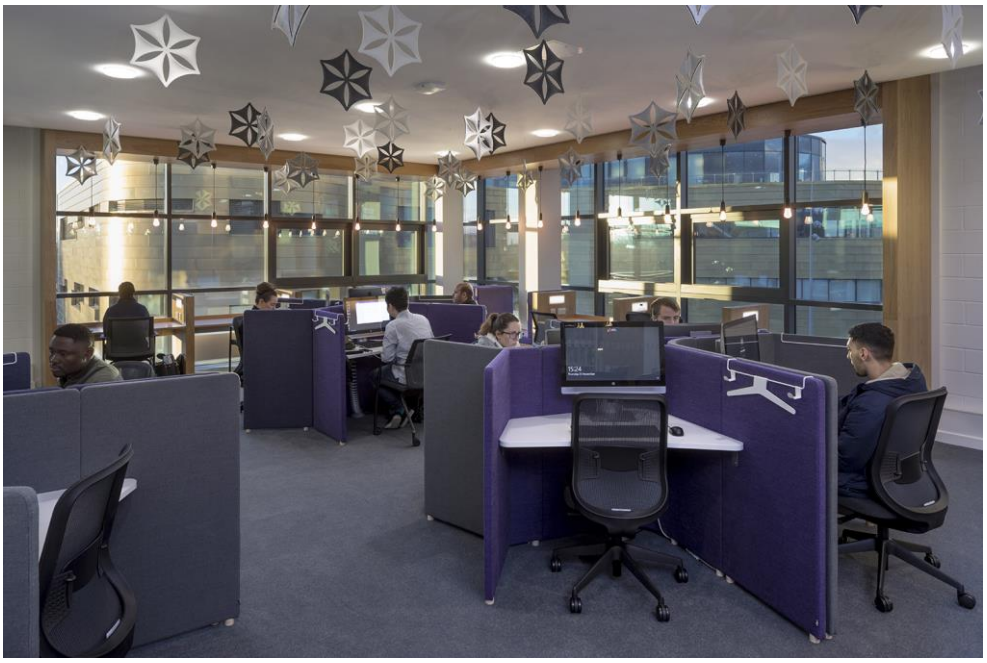

Figure 7: Silent working area

Visually impressive spaces that motivate and enhance learning

From this evaluation, we concluded that the visual elements of the space were very important and the vibrant colours and furnishings inspired creativity and motivation to work in keeping with Arora's 2013 study of student engagement with learning spaces.

"I feel the bold colour choices for the furniture promote creative work as they provide a relaxed environment."

Figure 8: Vibrant colours and furnishings creating a space that motivates learning

Students also commented on the playful nature of some of the spaces and how this facilitated more informal ways of working. The introduction of more natural light has also been commented on very positively, with both the observations and narratives demonstrating the popularity of the spaces near the windows, which provide a more ambient working atmosphere.

"*I like being able to look up from my work and have a view of the outside…*"

We also found that the nature of the space could transform the way that people learn. This was clearly demonstrated by one participant in the first research phase, who transformed from wanting to work individually to appreciating the value of working collaboratively. Within a one-week period, instead of seeing the library as noisy and busy, he started to see it as warm and social. This transformation was such that he completely changed the way that he learned.

In addition to the product model, the process of user participation from all key users and stakeholders has been adopted across a number of campus masterplan projects, from quite small refurbishments and the creation of informal learning spaces to the development of major new buildings and service design. There is no one panacea for learning and study spaces but the model for a variety of spaces that suit individual learner requirements or facilitate different types of assignment have certainly increased use of the library environment. The encouragement to further customise spaces not only aids the spatial flexibility but also helps to develop a sense of learner ownership.

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4. Classrooms for flexible, adaptable approaches to curriculum delivery – responding to staff and student feedback

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Professor Peter Hartley, *Edge Hill University*

Background

The Learning Futures programme

As part of a broader plan for transformation in learning and teaching across the institution, the University of Westminster has worked over the last four years to refurbish and update a significant number of its standard classroom spaces. Starting in the summer of 2014 and based on feedback from students and academic staff, the plan was for a five-year programme to address mainly general teaching rooms with a typical capacity of 30 to 40 students, though some rooms had capacities of up to 100 and one lecture theatre was also included in the programme. All rooms can be booked for teaching sessions in most subject areas and do not contain any specialised or subject-specific technologies.

At the time of writing (October 2018), a total of 92 rooms have been completed. The investment to date has been in excess of £12m. A further 20 to 40 rooms are expected to be addressed as part of the programme in the 2018/19 academic year. This broad approach is an important feature of the Westminster initiative – rather than focus on 'flagship teaching spaces', as some other institutions have done, the university wanted to refurbish as many standard classrooms as practicable to enable new forms of curriculum delivery as cost-effectively as possible.

Preceding the work on classrooms, the university initiated its Learning Futures (LF) programme, established to review both the structure and delivery of the curriculum. The LF programme had significant senior staff input and an appreciable budget that permitted the establishment of a dedicated project office and administrative team. A primary driver for LF was concern over NSS outcomes which consistently gave below-sector average scores for learning and teaching at Westminster. The NSS data was generally confirmed through other student feedback mechanisms internal to the university. In addition, at this time, the university executive had identified a number of significant risks and drivers for change going forward to 2020: likely future changes to funding, increased competition, raised student expectations and the demands for employability skills. Improving learning spaces was seen as one major way of responding to these challenges.

New Learning and Teaching Strategy and review of infrastructure

Learning Futures at Westminster had many goals at its outset, including reviewing curriculum structure, assessment approaches, the role of the student in the learning process and academic support for students. To underpin these goals a new Learning and Teaching Strategy (LTS) was developed through one strand of the LF programme. This strategy emphasised, more strongly than previously, the desire for a curriculum delivery approach generally characterised through its ability to stimulate active student learning. The new LTS also stressed the need for student partnership, inclusion of authentic learning opportunities to support employability

and an increased use of technology, with a view to making blended learning the norm. To support the changes signaled by the new LTS, a parallel strand of the LF programme undertook a review of infrastructure for learning and teaching. Though the review covered many areas of activity within the university that could impact on learning and teaching, perhaps not surprisingly academic staff focus groups consistently raised the issue of classrooms. This was always linked to discussion of ways to promote active learning, one of the key tenets of the new LTS.

Analysis of the comments made by significant numbers of academic staff (~150) showed clearly that they felt inhibited by the physical spaces they taught in. They identified a range of issues that made it difficult for them to contemplate more flexible forms of in-class curriculum delivery. Many of the problems cited were quite basic such as lighting, availability of sufficient whiteboard space and room blackout capability. Classroom furniture was also frequently raised as requiring attention. Most classrooms at this point had very standard single tables and chairs typically arranged in rows. Often these tables were heavy and therefore difficult to move, which made it hard to easily change the layout in the room. Audio-visual (AV) and information technology (IT) facilities were also identified as key to the set of lecturer's 'tools' within a modern classroom. The ease of use of the AV and IT was seen as critical in determining the extent to which they were exploited. Current AV/IT configurations were not considered to encourage nor enable student engagement. The standard equipment before refurbishment was a lectern with a computer linked to a data projector, displaying to a single screen at the front of the space. This setup was tending to drive a lecturer-centric model of operating within the classroom environment.

The conclusions, derived from the infrastructure review about the way that academics would ideally like to teach within classrooms, aligned well both with the stated direction set by the LF programme and the published literature in relation to best practice in learning and teaching. In addition, with the strong emphasis on increasing exploitation of technology enhanced learning (TEL) in the new LTS, much debate during the review focused on the limited transformational impact of TEL to date at the university. This was generally attributed to the state of classrooms alongside other significant issues including lack of time to integrate TEL into the curriculum and digital capability. Such barriers have been reported on by others as issues in the effective implementation of TEL (eg Oblinger, 2006). It is a fact that much of the literature about teaching excellence (eg Arum et al, 2016) seems to assume that lecturers can readily employ the most effective pedagogy if they wish. There is little or no mention of physical constraints on innovation in teaching practice whereas the experience of teaching staff at Westminster tells the opposite story – without significant change to the physical infrastructure, innovation in teaching will be hampered if not eliminated!

The place of technology enhanced and active learning

The general view of academic staff at Westminster in relation to the exploitation of TEL echoes the published literature. There are many case studies of the successful exploitation of online tools and systems to enhance learning and teaching in universities (eg Sharpe et al, 2006; Porter et al, 2014). However, despite this established potential for positive change, most UK universities are still trying to make sense of the place of TEL within overall learning and teaching strategies (Kirkwood and Price, 2014). This, in the main, is due to the continuing and understandable centrality of the physical classroom in curriculum delivery in most traditional campus-based universities (Fisher, 2016; Graham, 2012; Hakkinen and Hamalainen, 2012; Oradini and Saunders, 2016; Temple, 2007). Not only is the physical classroom a central feature but a particular design of that classroom is dominant and tends to encourage/reinforce particular styles of teaching.

The literature and feedback from the NSS survey, and now the TEF, places growing emphasis on increasing the use of various forms of active learning such as the flipped classroom (Saunders and Klemming, 2003), team-based learning (Michaelsen et al, 2014) and problem-based learning (Tritz, 2015). Further pressure for such a shift is derived from the needs of the workplace. Employers are increasingly seeking creative, collaborative and dynamic employees. Classes that engage in more active learning have the potential to enable students to acquire exactly the kind of skills that employers are demanding of today's graduates. All of this also

drives the need to have more adaptable physical spaces that are suited to a range of teaching and learning approaches (Mukerjee, 2014; Valenti, 2015).

Within the general debate in relation to TEL, there has been a particular focus on mobile learning in relation to classroom-based teaching, both at Westminster and more widely (Bishop and Verleger, 2013). We know that students use their mobile devices frequently while at university and would like to exploit them in learning (Beetham and White, 2013). Equally, we know that many academic staff are suspicious of these devices and often see them as distractions or only useful for surface learning (Garrison and Vaughan, 2012; Greener, 2010; Hanson, 2009; Outram, 2004). It remains quite common in UK classrooms for students to be told to switch off mobile devices rather than for them to be exploited as part of a curriculum delivery and engagement strategy. Given this reluctance on the part of some staff, it is perhaps not surprising that the most recent Jisc Digital Experience Insights Survey found that "only 41% of students in HE and FE agreed that their course prepares them for the digital workplace" (Jisc, 2018).

Developing new classroom spaces

Reacting to internal debate around the Learning Futures programme, identifying external pressures from a range of stakeholders for change, and recognising important trends in the published literature and concerns about increased competition, the university senior executive decided to support the five-year programme of classroom change. The goal was to build a range of flexible, adaptable spaces that could support a variety of learning and teaching approaches and would facilitate the integration of TEL into face to face delivery. Key in gaining financial approval for such a significant multi-year commitment was the proactive support of a number of senior executive level champions, backed up by the extensive review undertaken.

Approach

Framework for teaching room development

The refurbishment of the teaching space has aimed to enable staff to use the most appropriate pedagogy for their subject area and student needs by providing both a suitable working environment and appropriate and reliable technology which is effectively integrated into that environment. This approach is based on the notion of three interdependent factors: pedagogy, technology and space design – what we christened the 'pedagogic triangle', as summarised in Diagram 1. The institution's role is to provide both the appropriate space and technology which enable tutors to implement whatever pedagogic approach is most appropriate for their subject area and students. In an ideal world, the three factors will work in harmony to support student learning.

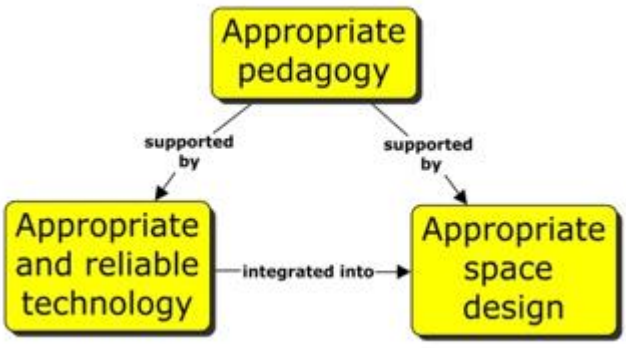

Diagram 1: The pedagogic triangle

This model is deceptively simple as each of the three components requires detailed investigation and analysis, and there will be significant variations in requirements depending on factors such as discipline area, teaching staff experience and expertise etc. The need to consider a broad range of organisational factors is reflected in the framework we developed to identify potential barriers and issues (see Diagram 2).

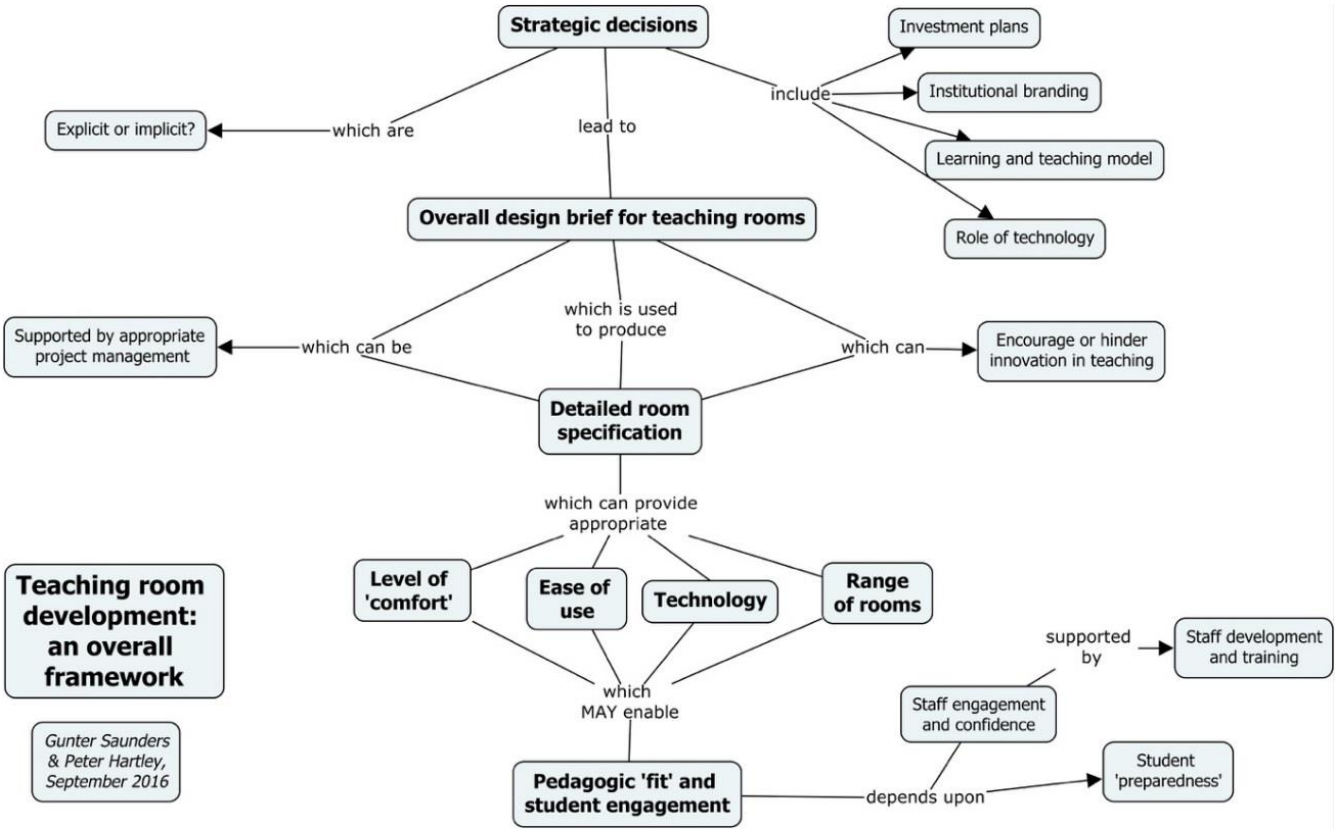

Diagram 2: An overall framework for teaching room development

This framework suggests several layers of complexity between strategic decisions on teaching accommodation, the details of the new physical room designs and intended outcomes such as improved student engagement. For example, the diagram suggests that effective room design *may* affect student engagement but you cannot guarantee that teaching staff will adapt their approach to take advantage of new facilities unless they have the necessary skills and confidence to do so. This issue has been recognised in other institutions where the impact of new 'flexible space' has been limited by staff operating in the 'same old ways'.

Particularly important factors in the Westminster experience were:

+ The sustained financial commitment;
+ Extensive consultations with staff and students to develop the overall design brief;
+ Development of a range of detailed room specifications to reflect different subject requirements and potential teaching approaches;
+ Follow-up studies to determine whether the new room designs did deliver the intended outcomes;
+ Staff development to support the programme.

A couple of important decisions were taken early in the programme which have profoundly influenced the development. These were, to standardise AV/IT as much as possible and to develop a range of 'room types' distinguished largely by the nature of the furniture within the room.

Standardising AV and IT within classrooms

It was considered key to the support and ultimate exploitation of technology that provision of AV and IT within the classrooms should be standardised as far as possible. This AV/IT standard does have some variations related mainly to type and number of display screens to enable flexibility (see Table 1 below). Standardisation means that teaching staff can rely on a predictable set of equipment and operations in every room and also makes maintenance and troubleshooting much easier from a technical viewpoint.

Type	AV/IT features
1	One data projector displaying to a designated main wall
2	One data projector displaying to a designated main wall but with additional independent displays on other wall(s)
3	Smart display board to main wall
4	Smart display board to main wall with additional independent smart board displays on other wall(s)

Table 1: Summary of different display configurations found within new classrooms at Westminster (excluding the active learning classroom type, see Figure 5, where there is a screen per table in addition to a main room display screen)

The AV/IT specification placed particular emphasis on the quality and reliability of wifi to ensure that staff did not experience qualms about network capability. This helps avoid issues of staff lacking the self-confidence to make best use of the facilities, which has been shown to impede development elsewhere (eg Greener and Wakefield, 2015). The specification also enabled particular functions such as ‘mirroring’ (where the image on any device in the room can be sent to the main projection screen) and the use of software which could encourage interaction in the classroom (such as Poll Everywhere and Padlet). Other smaller interventions had a surprisingly significant impact, such as providing hand-held presenters that enabled staff to walk around the room and still control on-screen presentations.

Room types

A decision was also made to produce several ‘room types’ as there was no consensus on one design which could satisfy everyone’s requests. As described above, AV/IT was standardised across rooms with variation mainly related to number and type of display screen – this created scope for technology supported group work. Room types are then further differentiated in terms of furniture type and layout. Different furniture (eg the plectrum tables illustrated below) and variable layouts allow staff to organise student groups in different ways. Usage has been monitored so that the mix of redeveloped rooms could be altered year on year to reflect demand. For more details on the design variations, see Saunders et al (2017b). The initial development offered five room types – more recently a sixth variant has been added with an even stronger emphasis on ‘active learning’. The sixth type of room is based on the ‘active learning classroom’ as typified by the TEAL programme (see, for example, Park and Choi 2014). Such rooms, by their very nature, encourage mainly group-based collaborative approaches to learning.

The types of room developed at Westminster (excluding the active learning classroom type) are summarised in Figure 1 below. Images of the range of classroom types are shown in Figure 4. In Figure 5 the active learning classroom is seen with a before and after image of the room concerned.

Figure 1: Summary of classroom types developed at Westminster

Figure 2: Images of classroom types at Westminster. Clockwise: standard tables and chairs (note in some classes these will be double tables where the top can be flipped upright and the table wheeled to the side of the classroom); informal sofas; tablet chairs on wheels; plectrum tables.

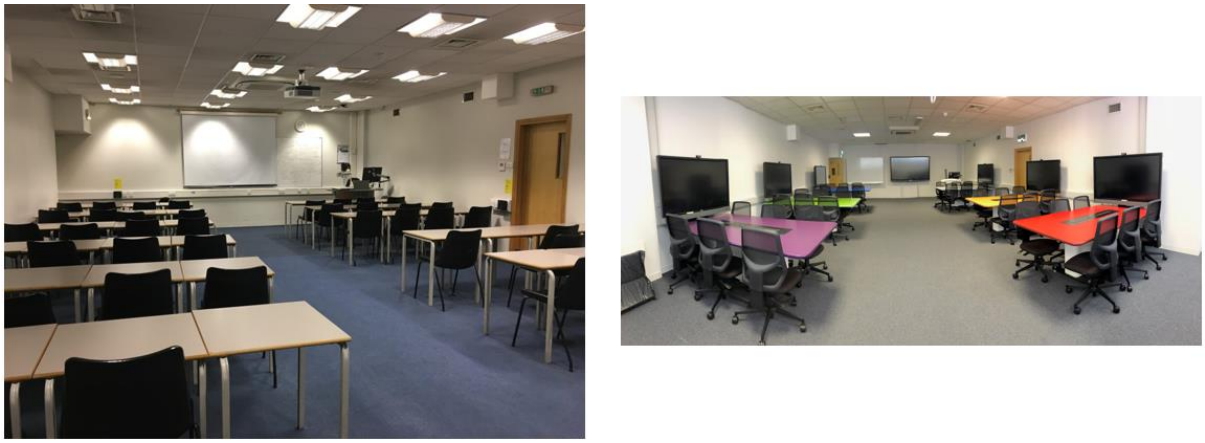

Figure 3: A before and after picture showing on the left a very standard classroom typical of the general classroom estate prior to the refurbishment programme. On the right is the same classroom developed as an active learning classroom.

Staff development and engagement

Alongside work on the physical spaces, a new programme of staff development in mobile learning linked to classroom activity has been put in place. With this new approach staff can take a short course through either distance mode, blended fashion or a face to face workshop to become familiar with some basic mobile learning approaches. They are then encouraged to earn a Westminster Digital Badge by reflecting on how what they have learned could impact on their own teaching. During the first 'run' of the short course on mobile learning in 2016/17, 62 academic staff completed the course and were awarded a digital badge for doing so.

A key contribution to the overall development was the 'classroom exhibition' that was held at the end of year one of the programme. This drop-in event enabled both staff and students to examine (and express their

opinions on) the furniture, room layouts and technology the university was considering. Equipment suppliers provided samples/examples in the hope of an eventual sale. The exhibition proved very popular and ran for a six-week period. Staffed by student helpers it attracted over 300 staff and student visitors. Comments that visitors made on cards as they moved around the 'showroom' were collated by the student helpers and used to inform decisions on some furniture types going forward. For example, group plectrum tables at the exhibition received such positive feedback that a number of classrooms refurbished in the months following the exhibition were fitted with such tables. Subsequently, in January 2018, a Jisc-sponsored roadshow was held to highlight specifically a particular type of active learning classroom design. This again attracted great interest with many staff, students and external visitors attending workshops or drop-in sessions during the month that the show was featured (see Figure 6 below).

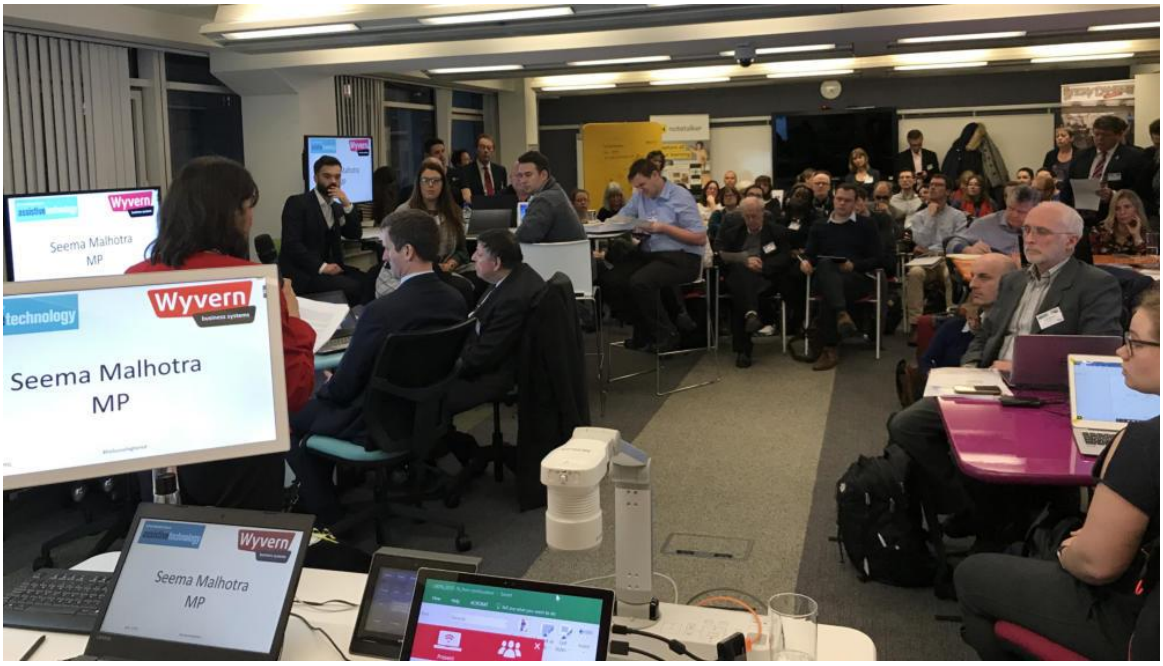

Figure 5: Attendees at an active learning classroom workshop offered as part of the roadshow held at Westminster in January 2018

Evaluation approach

Once new classrooms went 'live' during the first year of this programme in 2014/15, the project team used questionnaires and focus group meetings to assess how students and staff thought the look, feel and 'reliability' of rooms compared with old classrooms. The questionnaires were typically online and links to them were sent by email to those we knew had been timetabled in the spaces. We also used student helpers to speak with individuals (normally staff) and small groups (normally students) at the end of either morning or afternoon sessions. Finally, we also convened a number of staff and student focus groups during which we would discuss outcomes from analysis of the questionnaire returns and look to gather further views on themes emerging from analysis of the questionnaire data. Further into the programme we shifted our focus from views and comments mainly on the 'fabric' of the spaces to whether or not staff or students thought that the spaces were fundamentally changing learning and teaching approaches and experiences.

Outcomes

The views of staff and students on the changes in technology and furniture, together with other more basic needs (lighting, acoustics, for example) has been assessed through regular feedback from users of the new classrooms (see section above). This gathering of user feedback has been continuous, as might be expected

but, as the university has sought to settle on a smaller set of core classroom designs, the focus of evaluation has more recently been on the impact of the new rooms on what academic staff and students actually 'do' in them.

The initial feedback in this respect indicates some significant impact from both staff and student perspectives. Over 50% of academic staff providing a view have stated that the new spaces help them to exploit teaching approaches that they would not have tried or would have found difficult to implement in older classrooms. Over 80% of students agree that there is greater student engagement and activity in the new spaces.

Academic staff cite the changes to basics (acoustics, lighting, furniture) as key in enhancing how they can operate within a space. However, there is still room for further development. While most academic staff see the potential of the modern technology in the new spaces, a significant majority remain reluctant to exploit it fully, citing lack of confidence and support as the main reasons for this. While academic staff generally agree that AV/IT support is good for non-urgent issues, they are less impressed by the responses they obtain when trying something 'live' in class that goes beyond the basics that they are familiar with (ie using the data projector to display on a main screen alongside white or glass boards and possibly the visualiser). This is understandable, given the embarrassment that can be caused by trying some new technology-based approach that lets you down, for whatever reason, in front of a 'live' student audience. The university is currently seeking to address this through re-configuring AV/IT support to enable a more active in-class presence when appropriate. In part this may become possible through improving automatic monitoring of the systems and tools within a classroom to ensure better reliability, thus freeing up more support staff time for in-class activities. In addition, and perhaps most importantly, the university is embarking on a major project to raise up the digital capability and resilience of staff at the university.

In addition to the technology, the classroom furniture has generated a great deal of debate. While certain furniture arrangements (eg chairs on wheels, group plectrum tables) can support better student-centred approaches, without effective timetabling it can be very difficult to ensure that particular classes get the facilities that most suit their type and pattern of in-class work. At present the timetabling approach is very much one of fitting class sizes to space capacity. Little is possible at the present time in terms of taking into account the nature and type of teaching approach that an individual teacher favours. Equally, little can be done easily at present to enable a class to experience different spaces with different learning possibilities within a single timetabled slot. The university is currently reviewing its timetabling approach – the aim is to make better use of the timetabling technology it has to ensure the 'right learning activity' can be in the 'right space' at the 'right time'.

Next steps

Westminster is continuing into the final year of its current programme, this time focusing on the creation of more active learning group spaces such as that shown in Figure 5. It is also turning its attention on lecture theatres and has already developed one standard lecture theatre into a more active learning space (see Figure 7 below).

Figure 6: Before and after picture of 100 seat lecture theatre

Implications and transferability

The experience at Westminster does suggest a number of key factors that we believe are relevant to any and every institution which is planning either major refurbishment of existing teaching spaces or new build (Saunders et al, 2018) This can be expressed more simply as a series of questions. Does your institution have:

+ Strategic and implementation plans for teaching room development (based on pedagogy and not just on 'capacity' and 'efficiency)?
+ Senior management champions?
+ Pedagogic models to support specific designs?
+ 'Sandpit' area for experimentation?
+ Evaluation and feedback mechanisms?
+ Staff development to support adopters?

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5. Evaluating the impact of furniture and decoration-based adjustments to flat teaching rooms on student-staff-environment interactions

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Dr Clare Kell, *University of South Wales*

Background

The University of South Wales' vision is "to be the university of choice in Wales and beyond for students, organisations and communities who value vocationally focused education and applied research, which provides solutions to the problems that affect society and the economy". The Student Experience Plan (SEP, 2016), our Education Strategy, sets out seven strands of interconnected activity that, through focused critical engagement, will enable the vision into practice. Transformative Learning Spaces (TLS) is one of these strands.

In recognition of the university vision, the TLS strand is charged, in part, to "develop models for classrooms that allow for digitally rich simulation-based activity and that are conducive to team working and dialogue" (SEP, 2016 p14). During the academic year 2016/2017 the TLS steering group began a 'Big Conversation' around classroom spaces involving students, staff from academic and support roles, and external space consultants. We also visited other higher education institutions, undertook quick and messy student polls and, as we began to focus down on pilotable change plans, convened a mini-conference where staff and students could get up close to our year one data and vote on a change plan. The outcome of these activities was agreement that team working and dialogue were challenging to enable in traditional flat-floor classrooms with front-facing tables and chairs in rows. Resource to change furniture in two different size classrooms was agreed and a research project scoped to answer the broad question: what happens when furniture and decoration-based adjustments are made to flat-floor teaching rooms? The intention was to use the study outcomes to inform ongoing University of South Wales (USW) district curriculum work and the development and implementation of an enabling set of USW Estates Principles.

Supported by a USW-funded graduate intern (Charlotte Rowlands), we undertook a two-phase, year-long pilot evaluation study during 2017/2018. To ensure that the university maximised the learning from the project, we developed a two-tier governance structure: a project research group (drawn from interested support and academic staff across the university) who monitored and informed our daily project work and data anlaysis, and a steering group, including student voice representation, who oversaw the whole project and its connections with other SEP strands.

This case study describes the furniture interventions that were tested during the year, sets out our innovative approach to evaluation and, through an overview of the findings and observations, suggests some recommendations that might be transferrable from our context to others.

Approach

The focus of the study

The year-long project was designed in two phases. Phase 1 (September 2017-January 2018) involved the close observation of student: staff: environment interactions in two rooms that had been newly refurbished with a range of flexible furniture (see Table 1). Having established what impact bespoke furniture had on learning interactions, and assuming that these changes impacted positively on team working and dialogue, phase 2 sought to see if similar interactions could be enabled with existing furniture being arranged in different ways eg in islands or herringbone formations etc.

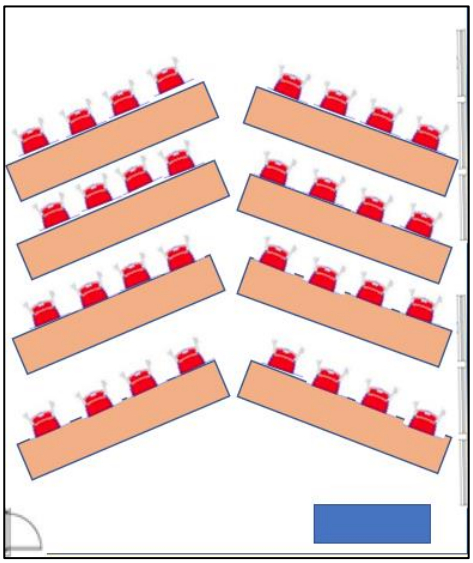
Phase 1 rooms

Classroom 1: Capacity 40 (reduced from previous 60)

Classroom 2: Capacity 30 (reduced from previous 32)

Phase 2 rooms

Classroom 3: Capacity 48



Classroom 4: Capacity 48

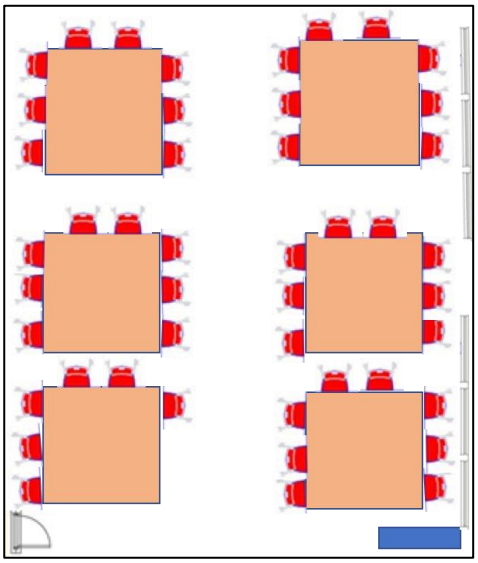


Figure 1: The layout of the phase 1 and phase 2 classrooms[6]

[6] Note: Phase 1 furniture included: wheeled, double-sided whiteboards, wall-mounted magnetic glass boards, wheeled chairs and tables. Classroom 1 also included one accessible table, high 'coffee shop' style seating, a plectrum table and fixed sofa. Phase 1 classrooms were located along a corridor that was also refurbished with sofas, high tables and break out areas.

Evaluation approach

Both phases of the project adopted an ethnomethodologically informed ethnographic approach (Garfinkel, 1968) to explore the overarching research question by making visible – and then using this visual data to try and understand – stakeholders' experiences of teaching and learning with specific focus on student: teacher: environment interactions (Gubrium and Holstein, 2000). In essence, the project drew on education sociology ideas that non-verbal and spatial interactions are sites of power, learnt and perpetuated through the social construction of everyday practice (Goffman, 1972). By focusing intensively on human and spatial interactions we hoped to make visible what it is like 'being' a learner/educator in the different spaces to understand the possible interplay between space and peer-enabled learning.

Following a stringent ethical approval process, we used multiple methods of data collection including:

+ Contact time visual ethnographic field notes (Kell, 2014) to make visible the proxemics (use of physical and environment space in teaching: learning: learning interactions), kinesics (the use of nonverbal communication) and footfall/hotspot movement maps;
+ Informal observations of space (social and classroom) usage during non-contact time hours;
+ Student voice captured through anonymous post-it note activities, informal interviews, and focus-groups; and
+ Observed teaching staff reflective video blogs recorded each week for the six to eight weeks they and their same student groups were using the spaces.

Ethnographic field notes were processed as thick descriptions, and analysed iteratively with cycles of data collection until saturation was reached and we felt we had an understanding of 'what is going on here' (Gubrium and Holstein, 2000). Table 1 summarises the data forms collected over the seven months of intensive data collection.

Observed hours:	Number of observed students:	Number of observed staff:	Completed staff vlogs:	Student focus groups:	Ad hoc out-of-hours room 'walk pasts':
60	**349**	**12**	**10**	**3**	**40**

Table 1: Summary of data collected during both phases of the project

Outcomes

As illustrated in Table 2, the study generated a wealth of data. This case study concentrates on the main research focus: an evaluation of what happened to student: staff: environmental interactions in the various teaching rooms. In this section we outline the key findings responding to our research question and broader emerging observations, before identifying some key recommendations and next step proposals.

a. Staff: student: environment interactions: making them visible.

Table 2 records the average interactions observed in each study location. Based on frequency data alone, Table 3 suggests that very different frequencies of all three forms of interaction (student: student, student: staff, and movement around the room) took place in classrooms 1 and 2 (though note, that these are average frequencies: there was a distinct step-change growth over the four months of the observation.)

	Student: student	Student: teacher	Footfall / pathways
Classroom 1	✔✔✔✔✔	✔✔✔✔	✔✔✔✔✔
Classroom 2	✔✔✔	✔✔	✔✔
Classroom 3 (herringbone setup)	✔	✔	✔
Classroom 4 (islands setup)	✔	✔✔	✔
Classroom 3 ('normal' layout)	Neighbours	Not past first row.	To door and back.
Classroom 4 ('normal' layout)	✔	✔✔	✔

Table 2: Summary of average observed interactions. The number of ticks indicates observed frequency

An initially challenging observation during phase 2 was the frequency with which classrooms 3 and 4 were returned to their front-facing format overnight. However, this provided a fantastic opportunity to observe teachers and students in the same room in different setups. Table 3 suggests that room layout had a major impact on all forms of interaction in classroom 3, with Classroom 4 enabling more interaction irrespective of the table layout. A consistent observation was the greater staff: student interaction enabled by the 'island' format over the 'herringbone' lay out.

But what type of interactions were going on? Were the same sorts of interactions making up the frequency count?

Figure 1 makes visible the forms of interaction observed in Classrooms 1 and 2. These in-time sketches aim to capture the location, body posture and broad activity of participants caught in the line of observation. There is no intention to be artistic or anatomically accurate but rather to capture, in the moment, the key features of the view. As reported elsewhere (Kell, 2014), professional vision (Goodwin, 1994) is a critical skill to enable data capture but, acting as a human video-recorder, the aim is to capture honestly what is seen with data processing and analysis occurring distinctly separately to data collection. Where black boxes appear on the images, these have been added later to conceal teacher identity.

Figure 1 captures four forms of interaction: staff sitting and working with students at their tables (see Figure 1a); students interacting freely with each other on focused activities, using and moving within the space and using, and often sharing, electronic devices (Figure 1b); students standing / sitting around and annotating the mobile whiteboards (Figure 1c); and students moving furniture to suit activity needs, to enable free but purposeful walking between groups and activity stations (Figure 1d).

Figure 1a: Teachers working with learners.

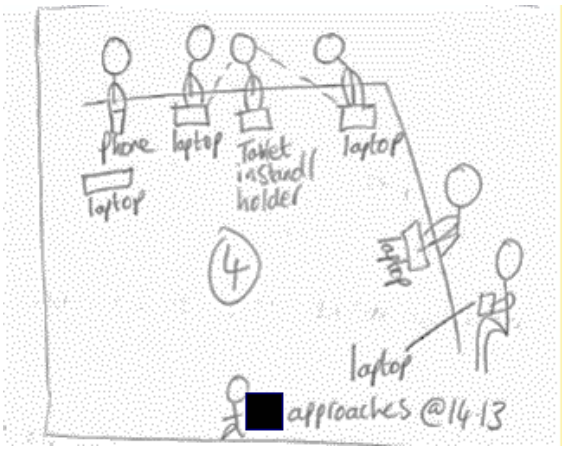


Figure 1b: Student mobility in the classroom.

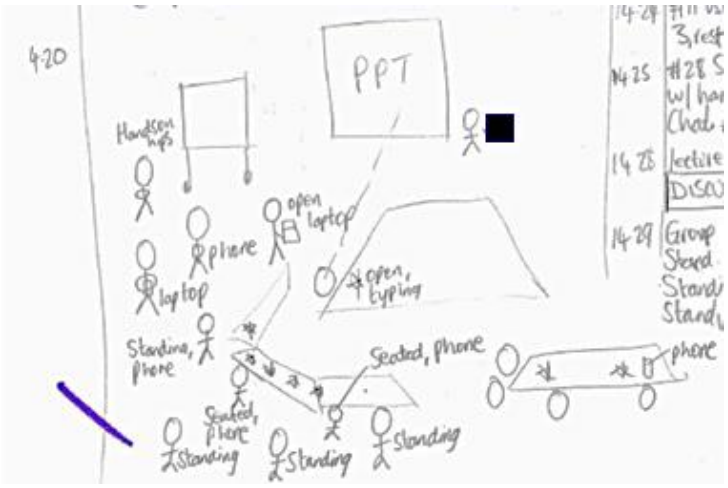


Figure 1c: Students working together on a visualisation activity.

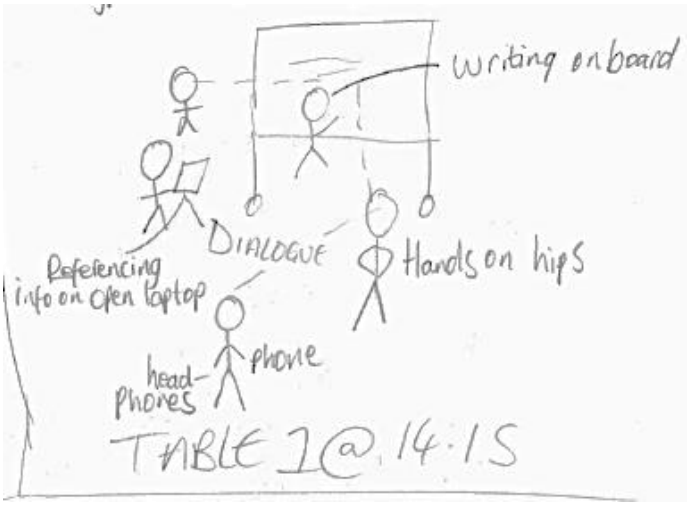


Figure 1d: The movement of tables and ensuing footfall.

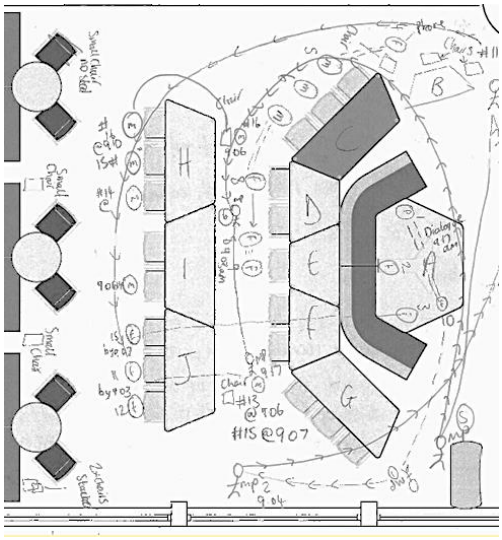


Figure 1: Four samples of visual ethnographic field notes

Figure 2 illustrates interactions observed in classrooms 3 and 4 when in standard format. Typically, staff were observed leading sessions from the front / lectern with direct communication limited to the front few rows and student: student interaction typically confined to immediate neighbours.

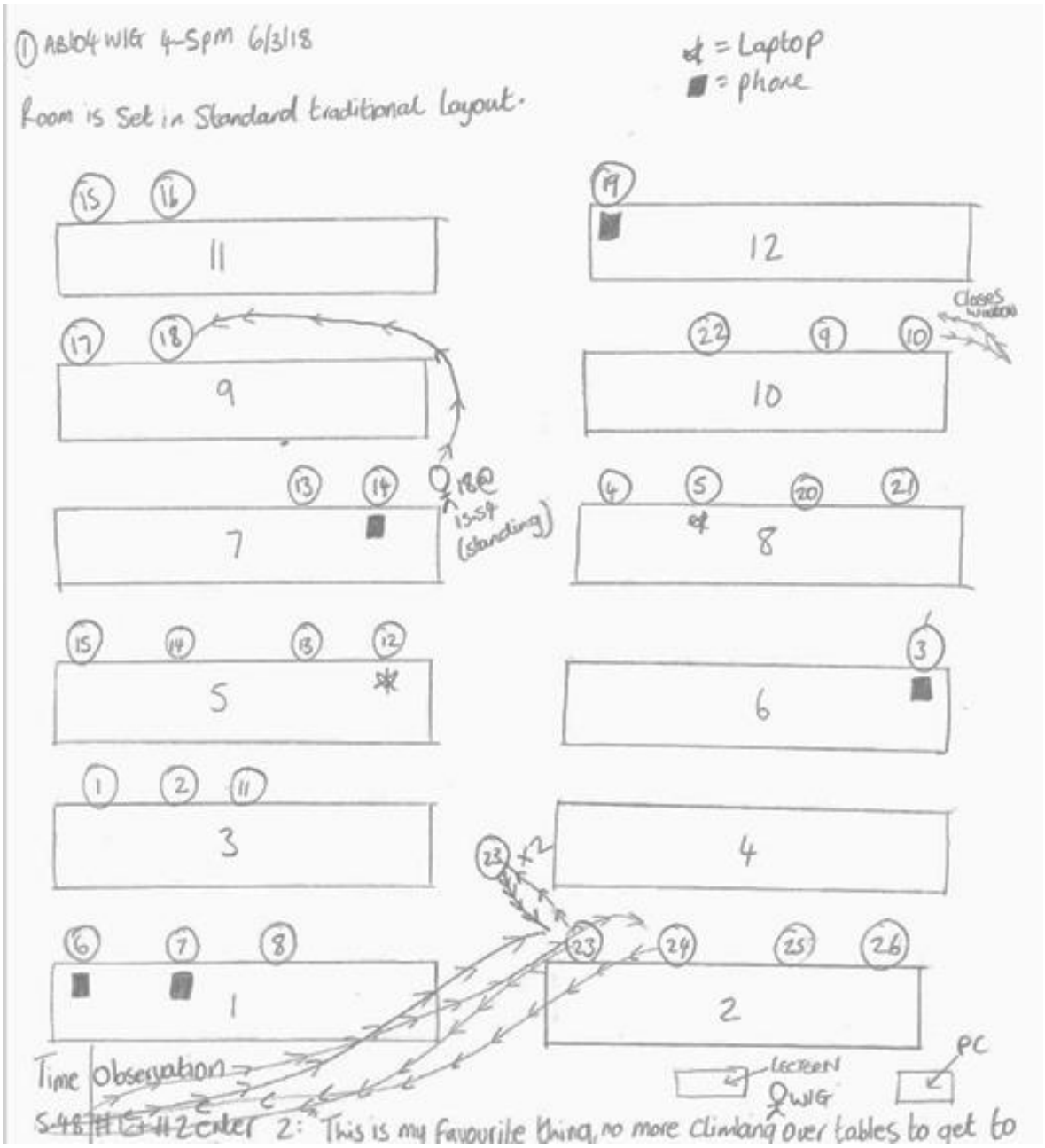


Figure 2: Interactions and movement in a 'standard' classroom layout

b. What is going on here? What do stakeholders say was taking place?

i. Making learning visible

A consistent feature of staff vlogs and student voice input to phase 1 was their reporting of a new feature of the learning experience: the ability to use a range of writing surfaces to make visible the thought processes associated with assigned class tasks. A lecturer commented: *"students are really developing their critical thinking skills here. I can actually see it – and they can see it too".* While a student noted that: *"I can see what the others are writing and thinking and I can see if I've got the same."*

These reports, noted many times across subjects and year groups, suggest that learning spaces that enable team working and dialogue, and the 'making visible' of the outputs of these activities, can have powerful learning to learn impact on students and provide learning touchpoints for staff. In practice the magnetic glass

wall boards were used with flipchart covering the glass due to challenges with the board pen visibility. The double-sided wheeled whiteboards were a unanimous success being used to make both staff and student learning visible.

ii. Planning for learning: shared ownership of learning / teaching spaces

As noted earlier, staff and student interaction did not alter immediately the furniture / layout was changed. In all cases students were observed to demonstrate, and reported, a sense of uncertainty when being invited to move furniture to suit the needs of the class activity.

During preliminary observations students and lecturers were observed using the classroom in a traditional manner. Even with flexible furniture arranged in islands, students sat facing the whiteboard and lecturers would stand and teach at the front of the classroom. As observations continued, students and lecturers began to feel more comfortable in the classroom and being observed. Lecturers, in their vlogs, reflected on their increasing confidence to deliberately plan learning activities that harnessed the potential of the rooms. By week three, field notes evidence staff and student willingness to move around and change the room setup in order to work in small groups. Specifically, the data evidences a shift in learning orientation with teaching taking place in non-front-facing interactions.

This reorientation of the classroom and the enabling of students to own their teaching spaces was picked up by students who noted that: *"I know I'm allowed to get up and move stuff around if I find it easier to work."*

In addition, the data records students increasingly using the flexible furniture rooms during non-contact time (both during in-day sessions and for off-timetable revision). When interviewed, students said: *"We've been here all day, we come here because we're allowed in and it's easy to work here."*

iii. Change over time: a mutual learning journey

Both staff and students recognised the journey they had been on to maximise the potential of the rooms. As the study progressed, staff were observed using the breakout areas and accompanying small rooms within their contact sessions, for example to offer different spaces for small group activities and problem preparation etc and students staying in the breakout rooms to complete work after the lecture had finished. Staff suggested that power and accountability had been transferred to students who were taking responsibility for their own learning and environment choices in which this learning took place and that, having seen first-hand the impact of environment use on learning, they now consider explicitly how classrooms' potential can be harnessed / challenges minimised as they plan their lessons – and this happens across their whole teaching provision. Similarly, students report feeling much more confident as learners and in their ability to share ideas with their peers. Several students hoped that the lessons learnt would be picked up by other staff using traditional spaces.

Recommendations and next steps

This study has generated a weatlh of data that shines new light on interactions in flat-floor teaching spaces. The findings have informed the development of new estate principles, space design requirements in future course reviews and, because of the extensive and positive feedback from staff and students about the portable whiteboards, a step-change in our basic classroom design. Through the estates principles the classification of classrooms is being altered so that many are now designated small group work rooms, permanently set up in islands or herringbone formations, and more flexible furniture is being purchased as the cycle of refurbishment progresses.

The findings have also highlighted the need for staff and student educational development regarding learning spaces: both pedagogical and space confidence. The challenges of growing the learning from this project to enable team working and dialogue in traditional classrooms cannot be overestimated. A newly created TLS

special interest group sparked a lot of interest at its launch and will be used to showcase space use practices and identify future study foci. First steps include focusing on the use of technology in learning and the use of non-contact time / social learning spaces.

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6. A mobile first approach for studio and workshop in art and design practice and performing arts

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Background

The New Media Consortium Horizon Project (acquired by Educause in February 2018) identifies and describes emerging technologies likely to have an impact on learning, teaching and creative inquiry in education. The 2017 report observed that “as 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. Educational settings are increasingly designed to support project-based interactions with attention to greater mobility, flexibility, and multiple device usage."

An 18-month experimental innovation project by Bath Spa University, funded in 2017 through a Hefce Catalyst award, explored student engagement by enabling students to co-create and share their learning experience in real time, using a variety of mobile digital capture devices and mobile, wireless displays. Driven through a research framework based on Activity Theory (Engeström, 2015), the project examined incorporating mobile devices into learning spaces to enhance student engagement.

Performance and art and design practice are typically dependent on the replication of an environment reflective of professional practice, from specialist workshops/studios to stage/presentation. In these spaces, the integration of technology to enhance learning and teaching is often marginalised, at odds with the physicality of the subject material and the learning environment. Open spaces with mirrors for dancing and acting, the physicality of materials such as paint and clay, a plethora of chairs and music stands and studio walls covered with drawings can all inhibit the use of technology. Learning and teaching in such spaces is predominantly practice based and is dependent upon the context, the learners and the tutor. In the performing arts, dancers, actors and musicians use spaces in different ways, but learning generally takes place in a large space such as a stage, rehearsal room or dance studio. Teaching is usually instructor led and involves the critique of both technical execution and artistic expression. Art and design learning takes place in the studio environment where the curriculum forges skills through practice, theory, dialogue and critique. These may not be seen as typical learning spaces, appearing unstructured in comparison to the classroom, but as Susan Orr states, "the studio helps structure what can and does take place when students learn, and it has been a central part of organised learning in visual arts for more than a century". Additionally, students in the arts may not operate well in a traditional learning framework. Ewing (2009) suggests that, "The twenty first century art student is a browser, inter-actor, co-author, producer and nomad just like every active cultural participant in an information or knowledge economy. They have grown up in a performative future where active participation is learning."

A report by Gensler Consultants (USA), Reimagining Learning (2015), identifies key ways in which learning takes place, specifically: “Acquire, Collaborate, Reflect, Experience, Master, and Convey”. Successful learning spaces need to be adaptable to support this diversity and have the flexibility to enable multiple modes of delivery and engagement. Our research explored the use of mobile devices wirelessly connected to displays to support these aspects.

Figure 1: Infographic from Gensler (2015, p4) Reimagining Learning

Approach

Brad Ferren, CEO of Applied Minds LLC, stated "technology is stuff that doesn't work yet."[7], Placing any new technology into a learning space is almost bound to fail since the space was probably not designed to take advantage of the behaviour enabled by the technology, and the users of the space, both staff and students, may not feel empowered to make changes. Negotiating spaces not designed for the inclusion of technology forced us to create alternative solutions. By using mobile technologies, we were able to overcome many space limitations.

Three key elements of Activity Theory framed our research:

+ Research activities are chosen based upon a need to develop new approaches to a task or situation from historical understanding;
+ The researcher and the participants work together to achieve a workable solution to a problem;
+ Unlike research with a scientific construct, the activity in question can change during the research as approaches are adjusted; the relationships are fluid.

The research was conducted in six spaces: a dance studio, a large open room for acting, a ceramics workshop, an etching lithography workshop, a metal workshop and a science lab. Each learning space provided different

[7] Brad Ferren, quoted by Douglas Adams, *How to Stop Worrying and Learn to Love the Internet*. Available at: http://www.douglasadams.com/dna/19990901-00-a.html (Accessed: 29/06/18).

technological challenges, including working around immovable furniture/equipment, poor wifi reception and other IT issues. The activities varied from dancing and acting to workshop-based learning through making.

The activities were captured on video using mobile technologies and then viewed on large screens in the classroom. Demonstration sessions in the art and design workshops were streamed real-time to the screens so that students who could not see through the crowded class could view the activity on the screen. Performing arts students reviewed and commented upon their performances using a critique modelled by the lecturers in class. Afterwards the videos were uploaded to our virtual learning environment for further use by the students. During all sessions a student employed as co-researcher helped to facilitate emergent ideas.

At the end of class sessions, the researchers, staff and students would discuss the effectiveness of the technologies and how they might be better used. The ideas generated from those discussions were then put to use in the next session.

Outcomes

Using mobile technologies enabled the visual arts students to engage more fully during the demonstrations and then to have access to the demonstrations afterwards. Dance students used mobile devices with a sports coaching app to record and analyse their performances and facilitate discussions about how to improve their presentation and structure of their performance.

As the instructors became more comfortable with the technology, they were able to find new ways to use them. The ceramics lecturer used a mobile phone for close up shots of clay working techniques relayed to a large screen brought into the workshop for the session.

Acting students were divided into small groups and their comedy sketches filmed using mobile devices as they performed to the class. After the performances, students gathered around the screen and participated in a lecturer-led critique of one of the performances. The videos were uploaded to the virtual learning environment where the groups could then access and critique their own performances. This formative assessment prepared the students for a summative assessment that would be based upon their self-critiques.

By using Activity Theory as a framework, the researchers were able to work alongside the participants, thereby facilitating an ongoing dialogue between students and staff. This approach enabled participants to try new ideas and refine the use of new and existing tools, renegotiating the relationship with technology and content delivery. The freedom of the framework allowed us to assume failure is acceptable and provided permission to ask 'what if we try X?'. Also, identifying the researcher as an ‘enabler’ gave the participants the freedom to try ideas and build confidence in trying new approaches. This process of discovery delivered unexpected yet positive outcomes for students and staff. Moving forward, we are continuing to work with some of the tutors to create a system for using the technologies so that they are not dependent on the help of the researcher.

Figure 2: Ceramics workshop. iPhone (lower left) live streaming to screen (centre)

Figure 1: © (2015) Reimagining Learning: Defining Strategies for Engagement. Available at: http://www.gensleron.com/cities/2015/7/6/reimagining-learning-defining-strategies-for-engagement.html (Accessed: 29/06/2018).

Figure 2: © Neil Glen (2018); Bath School of Art and Design, Bath Spa University.

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