

## Learning spaces in higher education: an under-researched topic

Paul Temple\*

*School of Lifelong Education and International Development, Institute of Education, University of London, UK*

The connections between the design and use of space in higher education, and the production of teaching and learning, and of research, are not well understood. This paper reports on a literature review on these topics, and shows that higher education spaces can be considered in various ways: in terms of campus design, in terms of how space can support the development of a university community, the needs of specialist spaces, and the impact of technology on space use. Space issues are central to the operation of universities, and further research is needed to illuminate the connections between space and institutional effectiveness.

**Keywords:** space; design; learning space; university buildings; environment

### Introduction

The study of learning spaces in higher education 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. In contrast with the schools sector, where the design of learning spaces has been a continuing preoccupation (see the survey by Clark 2002), several standard texts on teaching and learning in higher education (for example, Light and Cox 2001) do not mention the nature of learning spaces, even in passing.

In work which specifically highlights 'space' or 'environment', the meaning is usually related to the ways in which teaching and learning are conceptualised or organised, rather than to do with physical arrangements. Instead, consideration of space in higher education has commonly taken place either in the context of space planning, or as part of campus master-planning and architecture, rather than being seen as a resource to be managed as an integral part of teaching and learning, and research, activities. More recently, the idea of strategic planning of the university estate has emerged, linking decisions about the estate to wider issues of institutional strategy, but here the dominant concerns have been ones of space utilisation and financial effectiveness (Avery 1994; Higher Education Funding Council for England 2000).

But this situation is changing: recent notable studies of the connections between teaching and learning and space considerations are, in the UK, the report by the Joint Information Systems Committee (JISC) (2006) and the study commissioned by the Scottish Funding Council (2006), and a recent body of work from the United States, Australia, and elsewhere (Jamieson 2003; Dittoe 2006).

### The organisational context of higher education space

The technical/administrative specialism of university space planning is concerned with determining the appropriate amount of space to be provided for defined purposes, and maximising its use

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\*Email: [p.temple@ioe.ac.uk](mailto:p.temple@ioe.ac.uk)

once provided, by using various space management techniques (Abramson and Burnap 2006; Space Management Project 2006a). In the UK, from the 1960s, a set of figures calculated from time to time on behalf of the University Grants Committee from survey data – the so-called ‘UGC norms’ (University Grants Committee 1978) – dominated space planning decisions in universities. These figures effectively determined the size and, to an extent, the design of new buildings in the period of expansion of higher education in the post-Robbins period and beyond. Even when the UGC norms ceased to have official recognition once central funding of capital projects largely ended (and their formal status was only ever that of guidance), they continued to provide university planners with a defensible basis for making judgements on space needs.

As currently the average cost of space in UK higher education – taking into account capital, depreciation, maintenance and operating costs – is nearly £200 per square metre (Space Management Project 2006b, 6), achieving the most effective use of this valuable resource is a key management task. But the straightforward aim of maximising space use quickly runs into conflict with a range of other institutional objectives, notably those to do with teaching and learning, but also with research and the provision of internal and external services. Settling these conflicts is an unglamorous but essential management task throughout higher education. This aspect of space management is certainly related to teaching and learning, in that priorities are set, explicitly or implicitly, for certain teaching and learning uses as against others, in terms of the type of space provided, its location, and the time when it is made available (if it is made available at all). There is, however, little evidence that such decisions are usually informed by an understanding of the relationships between space and the teaching and learning that will go on within it (Barnett and Temple 2006, 11).

### **Can campus design help teaching and learning?**

The other main arena where consideration of space issues in higher education has taken place has been that of campus master-planning and the design of university individual buildings – where the opportunity arises ‘to express the mission of [the] university in built form’ (Edwards 2000, 3); or, as an American study puts it, to ‘communicate an institution’s purpose, presence and domain’ (Dober 1992, 3). However, thinking about spaces specifically to meet teaching and learning needs appears generally to be hidden from view in most accounts of campus design. Edwards argues that twentieth-century British campuses reflect a struggle, not between different views about teaching and learning, but between ‘place making and the expression of rational, technologically pure architecture’ (2000, 37) – the 1960s campuses of Sussex and York Universities being presented as examples of the former and latter tendencies respectively.

A critical analysis of American campus design (Whisnant 1971, 88) comes closer to asking questions about how the spatial organisation of the campus affects learning, arguing provocatively that campuses are, in effect, designed to exacerbate ‘division, tension, alienation and strife’ – though these comments relate mainly to inter-departmental rivalries. While Whisnant (radically, for the time) advocates giving students greater autonomy in organising their learning, his proposals for physical changes to improve learning focus on breaking down barriers between the campus and the ‘uncampus’ outside, and mixing teaching, research, administrative and social spaces within it to create a better sense of community.

This mixing and community-building was, in fact, one of the objectives in the planning of several of the UK’s 1960s universities. Ideas about teaching and learning were, contrary to Edwards’s view, central to this planning. The master-plans of both the Universities of York and Kent, for example, were based on assumptions (not obviously supported by any evidence, incidentally) about teaching and learning being enhanced by staff and students living together, and to an extent working together, in colleges. At York, a distinctive view of higher education guided

its early planning: 'Care will be taken to avoid the association of a particular college with a particular subject. This might ... work against the mixing of different interests and skills which is one of the chief purposes of university education' (University of York 1962, 10). A similar view was expressed by the founding Vice-Chancellor of the University of Kent, that each of its colleges should be 'a microcosm of the whole University' (Martin 1990, 130). Other 1960s universities took different planning approaches, but each had what would now be called a model of teaching and learning at the centre of its planning, which influenced campus design and space use.

But it is noteworthy that accounts of the development of most universities, new or old, offer few clues as to how learning spaces were conceived. For example, the published history of the University of Hull provides a lengthy account of the acquisition of its site, the appointment of an architect, and his conceptualisation of the campus (Bamford 1978) – but offers no information about what was thought would be the processes that might go on inside the new buildings, and how these processes might be reflected in design. Even an architectural practice as distinguished as Casson Conder felt able in 1958 to submit a master-planning proposal for the University of Birmingham which made no reference to the academic processes of the University which the plan was intended to serve (Casson and Conder 1958).

The role of the campus as a learning space appears from time to time in the literature, but is under-conceptualised: 'among the many methods employed to foster student learning and development, the use of the physical environment is perhaps the least understood and the most neglected' (Strange and Banning 2001, 30). Edwards offers one bold conceptualisation:

Taking a broad sweep of nearly a thousand years of university construction, it is possible to draw one significant conclusion. Of all building types none more conspicuously links new ideals of design and innovative technologies to the mission of development than the university. The exacting agendas of intellectual inquiry, of scientific experiment, and refined taste, are historically to be found in the design of many university buildings. For example, the sense of scientific rationalism is embodied in built form in the ancient universities of Oxford, Cambridge, Paris, Bologna and Turin. The ideals of democracy find expression in the layout of universities from Virginia to Cape Town ... the campus has never been an ordinary place. (Edwards 2000, 150)

Other writers (Whisnant 1971; Crook 1990) have similarly noted the signals that both campus design and the architecture of individual university buildings might send: many of these signals are about learning, broadly defined – as Edwards noted above, about a sense of the special, a seriousness of purpose. But what is meant when claims are made about epistemologies being 'found in' building designs? What is presumably to be understood here is that designers of university buildings may aim to reflect their own understandings of a building's purpose in its outward form. This form is then interpreted by observers in the light of their own understandings of the building's purpose, or through their skills in de-coding the socially constructed meaning of neo-classicism, say. If this is so, it must cast doubt on the sweeping claims writers such as Edwards make on behalf of university architecture: a university building is no more distinctive in this respect than, say, a Victorian town hall. This seems to be the view taken by Dober (1992) in his study of the (mainly, American) campus, when he notes that university 'landmark' buildings 'are cultural currency ... charged with allegorical significance and perceptual connotations and meaning' (5). University buildings seem important because people think that universities are important places.

### **A community space**

'Institutions of higher education are not merely places of instruction. They are communities', claimed the Robbins Report (Committee on Higher Education 1963, 193); and some campus designs have had community-building as an aim. One American university president makes the point by arguing that universities are (or at least, should be):

intergenerational partnerships in learning and discovery, with compelling moral purposes that include not only teaching and research but also service to society ... we are not just collections of loosely affiliated persons with convergent or conflicting interests, but institutions that make a difference in the world ... I emphasise the fellowship here among students as well as faculty members. (Keohane 2006, 2)

How do ideas of community and participatory governance in higher education relate to teaching and learning, and to space? This is an under-researched, but potentially important, field. It has been proposed that the physical form of the university is important in supporting its integrated nature, intellectually and socially, and that it is 'the preservation and development of this integrated form, with its dense network of connections, that provides many of the management and planning challenges in higher education' and which supports institutional effectiveness (Temple and Barnett 2007, 7). Physical space and intellectual space may, then, be connected through the operation of social networks.

Campuses and individual buildings as symbols or allegories may have a significance in supporting learning, where 'the physical and the emotional become inextricably intertwined to form an almost palpable "sense of place", one that has profound if not always clearly understood meaning to many members of the campus community' (Kuh et al. 2005, 93); but there seems to be little evidence on this point. Indeed, more broadly, what university leaders and their architects think people think about their buildings also seems largely unsupported by evidence. When university staff members and students are actually asked about the impressive new buildings in which they are working, their responses tend to fall short of ringing endorsements (Commission for Architecture and the Built Environment 2005). We may also note that it is surely the case that, around the world, the vast majority of university buildings are simply functional standard units, constructed to the designs and standards of other comparable buildings of their place and time; they have no grand message to send.

More recent thinking on 'flexible' learning spaces – spaces in which different groups may be undertaking different activities simultaneously and which lend themselves to a variety of uses (Chism 2006; Joint Information Systems Committee 2006) – has suggested how campus and building design can be used to facilitate learning, particularly informal learning. On the basis that much effective learning takes place as a result of interactions between students, designs need to provide a variety of spaces for them to work and socialise in together (Kuh et al. 2005, 206). (We may note that the design of primary school classrooms and play spaces has been seen in this light for about half a century [Maclure 1984], and that current advice on school design continues in this direction [Department for Education and Skills 2002].) However, cost-driven pressures in higher education to maximise space utilisation may have the unintended effect of reducing the opportunities for informal learning. For example, improving space utilisation by the central timetabling of space previously 'owned' by departments, where teaching took place and academics worked, reduces the possibility of casual encounters between academics and students (Barnett and Temple 2006, 10).

The importance of creating human-scale learning environments features in the literature. 'Through buildings, signs, and the landscape of the campus, the physical environment communicates messages that influence students' feelings of well-being, belonging, and identity' – and so aids learning (Kuh et al. 2005, 106). These writers offer an example of human-scale planning:

Although Miami university encompasses more than 1900 acres, it was designed to feel small. One can traverse the campus on foot in any direction in about 15 minutes. The campus is organized in quadrangles that enclose, and are separated by, green space ... The feeling of smallness also is attributed to the use of Georgian architectural style ... few buildings are more than three stories ... Miami is a campus, not a group of buildings in close proximity to one another. As one staff member observed, 'We have a mindset here that we're not as big as we are.' (Kuh et al. 2005, 106)

While standard accounts of teaching and learning in higher education argue that learning is a way of interacting with the world, and that knowledge is created by the students' approaches to learning (Biggs 2003, 13), almost nothing is said about how these approaches may be affected by how students feel about their place in the institution of which they are temporarily a part: is students' learning perhaps helped by their involvement in the creation of social capital, and their uses of it? It seems plausible that one of the influences at work on students, if only to a modest extent, is that of their physical surroundings: Rutter et al.'s 1979 study of secondary schools argued for a link between well-kept buildings, the school as an effectively functioning social institution, and improved learning outcomes. Rutter's team did not naively claim that a better physical environment would of itself lead to better learning, but suggested that it played a part in standard-setting generally and so helped to create a more effective social grouping (which we might think of in terms of social capital formation), which in turn led to improved learning. It is surely plausible, as Strange and Banning (2001) argue from a US university perspective, that similar interactions are in play in higher education; but I have found no convincing studies on this interplay between physical and social capitals, and learning. We propose that this is an area worthy of further empirical examination.

### **Form and function in learning spaces**

Of the main types of university specialist learning spaces, it is libraries (or learning resource centres, or information commons) which have received most consideration in the literature in terms of their changing roles in enabling learning. The library has traditionally been thought of as being at the heart of a university – and often placed there physically. Despite some predictions that the growth of on-line services would lead to a reduced demand for physical libraries, their development continues (King 2000).

Particularly in teaching-oriented universities in the UK, the learning resource centre places 'the emphasis on space and computer-based access, rather than on books and shelves ... [the aim is] to provide an exciting and flexible space in which students can ... study at their own pace, in their own time, using a variety of learning styles' (Edwards 2000, 90). This is one of the most noticeable space developments to reflect the learning needs of students studying what may be non-traditional curricula by new methods. A particular design challenge in such buildings is to allow for student group work, perhaps working with computers at a 'pod', while also providing quiet space for private study. The JISC study shows how a learning resource centre might try to do this, and be integrated with other learning spaces, allowing students to begin their work in one area and move on to another (Joint Information Systems Committee 2006).

Recent studies show how more traditional academic libraries may also be changed to take account of new approaches to learning – for example at Monash University, in Australia (Jamieson 2005); and in the redevelopment of the Perkins Library at Duke University, in the USA:

The Perkins Renovation Project is far more than an expansion of the library's space – it signals a complete reconsideration of the academic library as a physical place and a qualitative experience. The older Perkins reflected a traditional concept of the library as gatekeeper. Its interior spaces were devoted primarily to the processing, preservation, and security of printed collections, and its layout was confusing for all but the most dedicated of scholars. By contrast, the renovated Perkins embodies a 21st-century vision of the library as gateway and commons, a gathering place for learners rather than a warehouse for books. (Lombardi and Wall 2006, 2)

The huge changes seen in scientific and technological understandings in recent decades have had, according to one study, relatively little impact on space demands: there seems to have been an increase in productivity per unit of space, as a trend in the direction of smaller, more powerful items of laboratory equipment has allowed more scientific work to be carried out in a given

space (Barnett and Temple 2006, 14). Similar developments were detected in the art and design field, where digital technologies have meant that fewer large items of traditional equipment (printing presses, for example) were needed. As with other learning spaces, flexibility in design is sought in new or remodelled specialist spaces, to allow new scientific or other curriculum approaches to be implemented readily.

It is generally recognised in the literature that laboratories, workshops, studios and so on should be seen as spaces with important social dimensions, and that their designs should facilitate social interactions, as well as meeting standard operational requirements. Providing 'an island of reflection' in a central atrium, perhaps, or forming an internal 'street' linking related spaces, are possibilities that may support social interactions in new or remodelled buildings (Edwards 2000, 100). Providing nearby refreshment facilities and semi-private meeting spaces may also increase the likelihood of 'serendipity and story-telling' taking place (Edwards 2000, 100). A move towards larger, open-plan laboratories with shared facilities, rather than separate labs for each research team, with adjoining clustered staff offices, is another proposed way of stimulating this type of interaction (Guterman 2004).

### **The need for new design approaches**

Discussions of a student-centred approach to university design have naturally tended to focus on issues of pedagogy and the curriculum, rather than on the physical environment. Some writers have, however, noted that changed approaches to teaching and learning, including the need to respond to the demands of students from a wider variety of social and educational backgrounds, should carry with them new approaches to design – and that, in particular, teaching and learning should drive design, rather than vice versa (Jamieson et al. 2000; Jamieson 2003).

Rather little, however, is said about the precise nature of these new spaces demanded by new ideas on teaching and learning. It remains the case that a room, with tables and chairs, and a means of displaying information for all to see, remains the basic non-specialist teaching space in higher education. In some cases, a simple change in the layout of the chairs and tables in the room is proposed to facilitate a group discussion, rather than the *ex cathedra* layout of a lecturer at the front with ranks of students laid out before her or him – while acknowledging that large-group teaching may in fact demand this 'sage on a stage' layout. Preferences of both students and teachers seem to be rather similar: comfortable seating, convenient furniture layouts, temperature control and pleasant outside views feature strongly (Douglas and Gifford 2001; Scott-Webber 2004).

Where new building, or remodelling of an existing building, takes place, then greater scope is offered for new concepts to be introduced. This is now seen in new lecture theatre design, where curved spaces can bring the lecturer and audience closer together, and where the use of swivelling seats can allow the lecturer to move from a large-group session, to multiple small-group sessions, and back to a large group. Computer facilities built in to the furniture can, especially in quantitative subjects, allow students to work on examples given by the lecturer and obtain instant feedback on their work (Joint Information Systems Committee 2006). A simple opening-up of separate, awkward spaces can create a more attractive environment and more useable space.

In both new and existing learning spaces, attention to micro-design is necessary: 'the proxemics associated with seating arrangements in a lounge area ... can either promote or inhibit social interaction ... physical artifact messages of support or unsupport can take many forms, signalling a sense of belonging ... and a sense of role, worth and value ... such messages enhance or detract from students' ability to cope with college stress' (Strange and Banning 2001, 31) – and hence their ability to learn.

The Scottish Funding Council's recent study of learning spaces, carried out by the Alexi Marmot Associates architectural practice and the haa design consultancy (Scottish Funding Council 2006), argued that seven types of learning space could be identified in further and higher education. These space types were for:

- group teaching and learning, where flexible furniture arrangements were needed to accommodate groups of varying sizes, using varying layouts, preferably in square rather than rectangular rooms (the former being more adaptable);
- simulated environments, where practical learning can take place in technological subjects or nursing, say, and requiring space for observation as well as for performing the task in hand;
- immersive environments, such as 'HIVEs', highly interactive virtual environments, with advanced information and communications technology, possible in many subjects but more likely to be found in scientific or technological ones;
- peer-to-peer environments, where informal learning can take place, in cyber cafés, for example;
- clusters, where student group work can take place, for example in learning centres;
- individual work, in quiet areas;
- external work – areas outside the building suitable for individual or small group activity.

We should note, though, that similar ideas on new learning spaces have been under discussion for several decades: Hickman (1965) welcomed experimentation in the design of teaching rooms, noting the creation of novel horseshoe-shaped lecture theatres, 'special visual-aid classrooms' and other innovations. We may speculate on why innovations of these types have been so slow in taking root. An academic attachment to traditional pedagogic practices may be part of the story: 'old self-understandings and sets of values live within the new' (Barnett 2000, 28). A lack of clear evidence as to the learning benefits of these 'new' approaches may be another part of the story.

While much of the emphasis in the literature is on new or remodelled buildings, the impact on learning spaces of scheduled and day-to-day maintenance and cleaning should not be overlooked. As a Higher Education Funding Council for England (1998) study on university building maintenance puts it, 'An appropriate and well-maintained estate is ... critical to delivering the institution's core business objectives in a cost-effective way' (2). As we have noted, there is evidence that seemingly small matters of premises maintenance affect the sense of community cohesion and thus affect learning: the question is wider than simply the attractive presentation of the campus for marketing or image purposes. Maintenance matters: it is not trivial in supporting learning.

### **Technology and learning**

Technological advances have been presented as ways of improving pedagogy and/or reducing teaching costs for much of the twentieth century, but actual pedagogic practice has been stubbornly resistant.

However, it would not be correct to claim that technology and new forms of communication have not had an influence on learning and teaching processes, as certain practices have already been incorporated and become natural parts of the student experience. Kress argues that in this 'new media age' the screen has replaced the book as the dominant medium of communication. New media make it easy to incorporate multiple communication modes (image, audio, video), and these modes are 'governed by distinct logics [which] change not only the deeper meanings of textual forms but also the structures of ideas, of conceptual arrangements, and of the

structures of our knowledge' (Kress 2003, 16). If this is correct, then technology may be seen as changing the conception of learning itself: though the implications for learning spaces appear, again, to be limited. This does, though, lead to ideas of 'blending learning', based on a mixture of modes of learning, and requiring 'blended environments' (Milne 2006), with technology-enabled classrooms.

What implications do these rapidly changing technologies have for learning spaces? Flexible and adaptable – future-proofed – spaces are needed, as they always have been: the 1913 design for the Massachusetts Institute of Technology provided for ample duct space above the ceilings, which are now used for the cabling and other services that the architect could not have foreseen (Dober 1992, 21). The rapid spread of wireless networking has led to further change: one account suggests that 'What we're starting to see is the emergence of spaces that are designed around human rather than technological needs. The spaces are pleasant and have a nice ambience to them, and you can just use your wireless laptop there or whatever you may need to use; but the space is not built around that because it doesn't have to be' (Mitchell 2003); in fact, you can work just as people always have done with books.

It is also clear from the literature that the rapid spread over the last few years of the use of wireless-enabled laptops, and now mobile phones, using broadband networks, was wholly unanticipated in terms of the educational implications arising from individual mobility and flexibility in space use. No doubt the next major technological innovation will be similarly unheralded.

### **Some problems with research on learning spaces**

There is some limited evidence on the role of campus design, as well as the design of individual buildings, in supporting student learning. As learning is a social activity, campus designs are needed that create welcoming, informal spaces for people to meet and talk, and perhaps to work in small groups. The windswept, charmless plazas which are a feature of some 1960s UK universities – 'a preoccupation with imagery [which] led to architectural indulgence' (Darley 1991, 356) – presumably designed with the aim of creating social spaces, are not what is needed. One suggestion is that learning is helped by providing students with possibilities for a 'socially catalytic' 'third place', neither where you live nor work, a place to 'hang out', where new relationships may be explored and existing ones deepened (Strange and Banning 2001, 146).

A study by the Commission for Architecture and the Built Environment (2005) investigated the effect of new university buildings on staff and on student perceptions of their performance. Overall, some 80% of staff recorded positive impacts, with students at about 50%. The causes of improved student performance were, it is reported, attributed by respondents to three factors: 'First, they helped to motivate students in their work. Second, they facilitated inspiration amongst students, and finally they provided key facilities critical to course content' (39). It is hard to know what to make of these findings: how, exactly, did the buildings provide motivation? motivation for what? how did motivation differ from inspiration? and presumably any standard industrial shed that met purely functional needs could have provided 'key facilities'. The CABE study does not cast any light on which particular features of buildings provided these benefits (was newness itself inspirational, for instance?) – even if the report had made clearer what the benefits were.

A study of the impact on new buildings in the further education sector raises different problems. In this case, in considering the impact of the £750 million per year further education capital programme, a positive correlation was found to exist between capital spending and increased student numbers in the colleges benefiting from the spending. The data show that roughly every £10,000 of capital spending produced one extra student, with improved success rates in those colleges whose success rates were previously below average (Frontier Economics

2007; Lee 2007). However, the correlation does not necessarily point to a causal connection, as it is plausible that the colleges receiving the new funding were those that were developing new programmes and therefore attracting more students in any case; or where lack of space had previously limited student admissions. This is in effect admitted by the Association of Colleges in commenting on this study, saying 'high-achieving colleges end up getting more [capital funding]', though its spokesman went on to argue that student achievement was improved as 'students [are] doing better because they are inspired by their surroundings ... new buildings raise expectations and raise hopes. It sends a message to students that this is something different and better' (Lee 2007, 1).

It would be wrong to dismiss this claim simply because no data are advanced to support it. It is, for example, consistent with the evidence cited earlier that cleaner, tidier school learning environments lead to improved learning outcomes; this may be a similar case in point. What is not clear here is whether it is new buildings *as such* that have made the difference (if one exists), or the cleaner, brighter environment that has resulted; or, indeed, something completely different. This study raises more questions, then, than it claims to answer.

Claims about improved student learning in higher education through better space and facilities design are also put forward in the 2006 Scottish Funding Council report, drawing mainly on a number of studies from the USA. Although these studies have tried to achieve some methodological rigour by using control groups, considerable difficulties remain. For example, the Technology-Enabled Active Learning Project at the Massachusetts Institute of Technology involved 'media-rich software for simulation and visualization in freshman physics carried out in a specially redesigned classroom to facilitate group interaction'. The project assessed student learning before and after studying electromagnetism in the new learning environment, as compared with a control group of students taught under normal conditions. The experimental group members were found 'to have improved their conceptual understanding of the subject matter to a significantly higher extent than their control group peers' (Dori and Belcher 2005, 277).

But this was not a controlled trial in the correct sense of the term, as obviously the experimental group members knew that they were receiving special treatment, and it is improbable that the control group was not aware of this. The mere fact of selection or non-selection could be expected to lead to changed learning behaviour. Furthermore, aside from the technological emphasis and physical changes, different teaching methods were used for the two groups. A range of factors might therefore have led to the improved learning detected: the redesigned classroom could have played some, or no, part in this.

The conclusion from the literature points to the link between space design and learning outcomes being weak at best, and it may often easily be masked by a number of other factors. A high proportion of the literature makes unsupported, or anecdotal, claims about the benefits of new designs or new configurations of existing space. Where they are presented, empirical findings are usually flawed, as they either tend to report changed student attitudes (rather than learning outcomes), or where learning outcomes are reported, they fail to take account of observer effects of various kinds.

Moreover, other work in higher education suggests that students are not overly concerned about the spaces in which they work: 'it is clear', reports one recent study, 'that many of the physical aspects of the University services are not important with regards to student satisfaction' (Douglas, Douglas, and Barnes 2006, 261). Other studies (for example, Watson 2000, 76; Wiersjensen, Stensaker, and Groggaard 2002; MacDonald 2004) have similarly found that most students place emphasis on the teaching abilities and subject expertise of the staff, tutorial support, library and information technology facilities, and other matters directly related in students' minds to teaching and learning, rather than on physical facilities. Where respondents comment on the

physical environment and its link with learning, it can be unclear what they had in mind. Wiers-Jenssen, Stensaker, and Groggaard (2002) speculate that particular campus design features may support social interactions and so encourage positive attitudes about the university and hence to learning – a point also made, as we noted, by Strange and Banning (2001). Again, the link in the Wiers-Jenssen et al. study between space and learning is indirect – and so hard to detect.

Other recent studies suggest that findings showing that students give a low priority to space issues may have quite wide international validity. In a large-scale survey in a US public university, ‘faculty preparedness’ was found to be the key predictor of student satisfaction, and that ‘different perceptions of campus facilities and services have relatively little affect [sic] on the varying satisfaction of students’ (Thomas and Galambos 2004, 266). A study from universities in Singapore, using a different methodology and attempting to compare students’ expectations with their actual perceptions of their universities once their courses began, found that issues of course content, workload, learning and assessment were greater causes for concern than matters to do with the appearance of the university and its physical facilities (Tan and Kek 2004).

Although matters connected with physical facilities seem to be ranked lower by students than issues directly related to teaching and learning, this is not necessarily to say that the physical environment does not matter to students. It seems plausible that, if the students surveyed found the physical facilities to be acceptable or better, they would not raise them as concerns. Had they found them unacceptable, at least in comparison to the teaching and learning activities, they may have taken a different view. We may speculate that where students are broadly satisfied with the teaching and learning process, environmental matters may appear higher up their lists of concerns; but that concerns (justified or not) about teaching and learning may crowd out environmental issues. As with the findings from schools, then, the link in higher education between the physical environment and learning is a complex one, tied up with many other aspects of being a student and a member of an institutional community. But it seems reasonable to conclude that a good standard of basic building care and maintenance is a necessary, but not a sufficient, condition of good learning outcomes.

## Conclusions

Understanding the university space is an important element in understanding how universities work – in terms of teaching and learning, but also more broadly. This is a methodologically difficult area, but one that needs more attention.

As one part of this improved understanding, campus and university building design needs to give more consideration to the social underpinnings of learning. Providing welcoming and flexible spaces, including informal meeting spaces, should be seen as part of the support to learning through developing the wider learning landscape. The role that such spaces can play, and the most effective design ingredients for them, need further study. Clear technical recommendations are needed on the best ways of providing such spaces in different university settings.

It is speculatively suggested that certain design features can encourage new ideas and creativity. No evidence is available to support this claim, but further research should be encouraged. Meanwhile, efforts should be made to conduct evaluations of new learning spaces, in order to provide guidance as to the learning benefits, and financial and other costs, associated with them.

The apparent connection between day-to-day premises maintenance and learning may need to be drawn to the attention of institutional managements. It seems that small things may make a big difference to learning, rather than, necessarily, grand architectural statements.

We need a better understanding of the role of space in the dynamics of creating more productive higher education communities and its connections with learning and research. This should be the subject of further research. The literature throws almost no light on managerial

decision-making about space issues affecting students or staff; this is a topic where further work would be useful.

Technological change is said to be affecting the nature of learning itself, as well as the ways in which it takes place. The implications for the design of learning spaces seem to be limited, however; flexibility in space design should be the priority. The rapid (and unanticipated) growth over the past few years in the use of wireless-enabled laptops using broadband networks has meant that the need for specialist information technology spaces may be declining. Further technological change will be equally unpredicted. Future-proofing in space design terms can best be achieved by providing comfortable, pleasant spaces which can be readily used in a variety of ways.

The university, space, and learning are intimately connected. Untangling them is perhaps impossible, as well as unprofitable. Nevertheless, greater sensitivity to their interactions seems likely to be worthwhile; it seems possible that relatively small improvements may be amply rewarded in learning benefits.

## Note

This paper is based on a literature review carried out on behalf of the Higher Education Academy, published in 2007 (<http://www.heacademy.ac.uk/ourwork/research/litreviews>).

## Notes on contributor

Paul Temple is senior lecturer in higher education management at the Institute of Education, University of London, where he is co-director of the MBA programme in higher education management. His research interests are in institutional effectiveness and change in higher education. He has recently finished working on a Framework 6 project on university change across Europe, and is now involved in an international project on university-business partnerships.

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