JISC

JISC Final Report

"A Study of Effective Evaluation Models and Practices for Technology Supported Physical Learning Spaces"
(JELS)

Final Report

Ian Pearshouse, Brett Bligh,

Elizabeth Brown, Sarah Lewthwaite,

Rebecca Graber, Elizabeth Hartnell-Young, Mike Sharples

Learning Sciences Research Institute

University of Nottingham

1st June 2009

Table of Contents

Acknowledgements

Executive Summary

The aim of the JELS project was to identify and review the tools, methods and frameworks used to evaluate technology supported or enhanced physical learning spaces. A key objective was to develop the sector knowledgebase on innovation and emerging practice in the evaluation of learning spaces, identifying innovative methods and approaches beyond traditional post-occupancy evaluations and surveys that have dominated this area to date. The intention was that the frameworks and guidelines discovered or developed from this study could inform all stages of the process of implementing a technology supported physical learning space. The study was primarily targeted at the UK HE sector and the FE sector where appropriate, and ran from September 2008 to March 2009.

Our initial investigations showed that although institutions were keen to advertise new or innovative learning spaces, the practice of evaluating such spaces was not made readily visible and was thus harder to identify or track. A key finding to emerge from the study was that if evaluations were undertaken they occurred as part of an internal institutional process, typically prompted as part of a student satisfaction survey, of which the outputs were not ordinarily deemed to be for external consumption. This has limited the extent to which knowledge sharing about learning spaces has been promoted across the whole educational community.

In the main, during the course of the study we found few new methods or technologies being used for evaluation purposes, with only 20% of evaluators interviewed reporting using Web 2.0 or multimedia technologies to enable them to conduct their evaluation.

Even though the need to evaluate the teaching and learning within a space was recognised by most institutions, this tended not to be the main driver for the evaluation. The strongest driver of (internal) evaluations was the National Student Survey. The ability of existing post-occupancy/student satisfaction surveys to address this appeared to be the main reason why more extensive and innovative methods for evaluation were not being developed. There was also a desire to ensure that the institutional space was being used in line with design ambitions and that occupancy/footfall had increased.

Less than a third of evaluations studied made use of any sort of baseline data, therefore limiting the extent to which impact could be fully assessed. A tension also existed between evaluation studies and research into student learning; an evaluation that proposed to go beyond the 'student experience' might be seen as a research activity and so not warranting central institutional support.

There were some exceptions to these broad findings, one of which was the framework and methods being used at The University of Sheffield by Professor Philippa Levy and her colleagues in CILASS (Centre for Inquiry-based Learning in the Arts and Social Sciences). These are outlined later in this report (p16).

In summary, the study identified a need for the educational sector as a whole to reconsider how to evaluate physical learning spaces, so as to more clearly assess how they satisfy design intentions and teaching and learning needs. As a step towards addressing this issue, we have proposed a conceptual Framework for Evaluating Learning Spaces (FELS). It builds upon input gathered through the interviews and at the project workshops. This framework is intended to offer a common vocabulary for evaluation, based around the interplay of five key factors: intentions, context, practice, designs and procedures. Broadly, it prompts the following questions: Why is the evaluation taking place? What is being evaluated? How will the evaluation be constructed?

The framework may be used to identify existing patterns within current evaluation studies, as well as a checklist to prompt new and more insightful evaluations in the future. The framework needs to be extended, tested and validated with 'live' cases in order to prove its utility. We welcome reviews and comments on the framework as a basis for enabling new and more innovative evaluations of learning spaces in the future.[1]

---

[1] See our online community at **spacesforlearning.ning.com**
or join our mailing list, **learningspaces@nottingham.ac.uk**, by visiting
http://lists.nottingham.ac.uk/mailman/listinfo/learningspaces

Background

Many UK universities are constructing new technology-supported spaces for student learning, and this trend is matched internationally. While research into user requirements may inform design decisions, there is a pressing need also to develop tools for investigating interactions between users and spaces, and for testing claims made for the improvement of learning (Comber and Wall, 2001). The Scottish Funding Council (2006) suggests that despite reviews of learning such as the work by Bransford et al. (2000) identifying learning through reflection, learning by doing, and learning through conversation, there are few empirical studies that link this body of research to the environment in which learning takes place. Smith's (2008) briefing paper concludes that "the physical campus will remain at the core of educational provision" but recognises that as technology changes along with the understanding of the way that people learn, these spaces will also need to evolve and change.

New spaces and technologies disrupt the old modes of teaching and learning as they are often based on a shift from a transmission model to a deliberately flexible, student-centred approach. The roles of academics and library staff, in particular, are affected. However, a review of literature conducted for the Higher Education Academy (Temple, 2007) found that the role space plays in creating productive higher education communities is not well understood, and that a methodological study on evaluation, including costs and benefits, should be conducted. Similarly, the Scottish Funding Council (2006) found that while there had been several studies relating space and learning outcomes in the US (e.g. Oblinger, 2006) in general it was difficult to separate the effects of space from other factors in teaching and learning. Therefore any straightforward cause-and-effect model is unlikely to be useful.

Various organisations are producing case studies, mainly focusing on the design outcomes (e.g. JISC, 2006) in areas ranging from reception and service areas through learning cafes and social spaces, teaching and vocational spaces to whole learning centres. The JISC-funded study into the Design and Management of Open Plan Technology Rich Learning and Teaching Spaces Study (Watson et al., 2007) looked at 24 case studies of large open plan spaces with a variety of study environments. Its sub-report, Guidelines for Managers, advises on the key strategic, physical, psychological and operational design and consultation process to be undertaken, and suggests planning for post-occupancy evaluation utilising Web 2.0 tools.

This project particularly supports the JISC strategic aims of promoting the development, uptake and effective use of ICT to support learning and teaching and to support research. It is informed by several disciplines, including architecture and environmental psychology, geography, sociology, cognitive psychology and other learning sciences (e.g. Maslow, 1943; Soja,1989; Csíkszentmihályi, 1990; Wenger, 1998). Since technologies mediate human action both individually and collectively, there is currently great interest in learning arrangements that are collaborative, reflecting a perception of the world of work that emphasises communication and teamwork. The design of spaces for learning has been influenced by the field of computer-supported collaborative learning (including O'Malley 1994; Crook, 1994)

and interacts with the interest in social networking among learners in Higher Education, as shown, for example, by Facebook and other Web 2.0 applications.

There is evidence that the sector is starting to investigate the use of new tools and methods although not in any great numbers. Roberts and Weaver (2006) specifically looked at evaluating technology-rich spaces from a practitioner perspective, but the student perspective is less well documented, hence the JISC-funded Learner Experiences with e-Learning programme provides useful learner views. Tom, Voss and Scheetz (2008) in the US used blogs to capture students' opinion, and in 2007 the University of Nottingham commenced surveying students online in its Learning Hub to track their views.

Aims and Objectives

The aim of this study was to identify and review the methods and tools currently used to evaluate the *contributions technology supported physical learning spaces make to learning and teaching.* This is broader than post-occupancy evaluation of the design objectives and requires the development and knowledge of space related learning objectives, leading to the further development of new methods through consultation with a wide range of stakeholders.

The objectives were:

- to identify good practice in the evaluation of physical learning spaces,

- to identify the tools, models and data sources that can be used to monitor learning activities, generate quantitative data and qualitative data, inform the development of new spaces and help improve the layout and operation of existing learning spaces, thus enabling institutions to develop baseline information to inform the design of future new space projects, and

- to identify aspects (and examples) of space configuration, and of elements within a space, that contribute to effective learning by individuals and groups

Methodology

The project had several research strands including desk based research, workshops and telephone interviews; we also used a web based survey to collect this 'interview' data.

This project required extensive desk research in several topic areas with the existing JISC case studies[2] provided a good base for this process. Key criteria for 'good practice' was the extent to which the tools and methods used by institutions have provided answers to the questions posed in each evaluation/survey carried out, from the point of view of the institutions involved, from an external point of view, and how the evaluation findings have informed institutional decision-making and the wider community. The project also attempted to identify the nature and extent of useful 'baseline data'. The conceptual framework for the research was based on the

---

[2] JISC InfoNet - http://www.jiscinfonet.ac.uk/infokits/learning-space-design

interaction of four elements: learning/learners, teaching/teachers, space and technology.

Other than being technology supported, we placed no restriction on the type of space being evaluated and included internal and external spaces, formal (seminar room, lecture theatre etc) and informal (cafe, drop-in centre) spaces where possible.

The stakeholders consulted included Directors of Teaching & Learning, Estates, Information Services, students, designers and architects, academics and support staff who work in or enable others to use these spaces and technologies, and professional associations working in this area. These people have:

- responsibility for, or experience in, evaluating learning in formal or informal settings,

- responsibility for, or experience in, designing or procuring spaces for learning,

- experience in designing technologies for learning,

- experience in using spaces for learning (e.g. teachers, students, support staff),

- experience in using technologies for learning (e.g. teachers, students, support staff)

We conducted two stakeholder workshops. The first was on 13 November 2008 in the Learning Hub of the Hallward Library at Nottingham. This enabled participants to experience five new zones, each designed to support a different pedagogical or learning focus: (i) short stay individual information gathering, (ii) open-space flexible group work, (iii) individual quiet study, (iv) small-group intentional collaborative work, and (v) structured teaching-and-learning, thus mirroring developments in many other institutions.

The second took place at The Automatic,[3] Liverpool John Moores University, and made use of the 'Distiller' an innovative multi-screen, multi-user system for group brainstorming.

The purpose of these workshops, which built on the desk research, was to see tools and methods in action, evaluate data and brainstorm new methods, feeding back to the community for further development. Each workshop generated data for a written and visual report, captured through a range of high-end audio, video and graphic technologies.

Telephone interviews were conducted to allow us to produce evaluation case studies and to start constructing an annotated directory of methods and tools, with the intention of commenting on their suitability for various contexts and purposes. The key findings from these interviews are presented later in this document under Findings and Results.

---

[3] http://www.ljmu.ac.uk/automatic/

Implementation

The project ran from September 2008 to March 2009.

Initial desk based research was carried out to find existing and ongoing work in this area and to try to identify those institutions that could be targeted to provide interview and case data for the study. A spreadsheet was constructed that identified the entire list of UK HE and FE institutions. This was then divided by geographical area and team members were tasked with identifying those institutions with the 3 key points below:

1. Notable technology supported learning spaces
2. Evaluation of those spaces in any form
3. Evaluation of the learning taking place within those spaces

It should be noted that most if not all institutions would claim to have technology supported learning spaces and that the first criteria for selection was if the institution was advertising these as new or innovative. In these cases it was likely that information about the space, the people responsible for the space and any evaluations would be more accessible.

Once the institution was identified, the next task was to identify the person(s) responsible not only for the space in question but also specifically anyone who may have been responsible for, or involved in, evaluating this space. A targeted email was then sent inviting these individuals to take part in the project – either by way of a telephone interview, a web based questionnaire or as a participant in one of the planned workshops.

A web site was set up as the public face of the project[4] which gave details of the project and where workshop invitations, study invitations and newsletters were published.

A protocol was developed to capture the data from interviewees which was then turned into a script for team members to use on the telephone[5]. The interviews, each of which was 30-60 minutes long, were recorded and later transcribed for analysis. Unfortunately, two of twenty recordings were partially lost due to equipment failure. A further two sets of data were collected by a web based survey replicating the interview protocol.

One of the biggest challenges for the JELS research project is the presupposition that architecture can improve learning. There are too many variables involved in any assessment of a learning space to ever assure an intimate relationship between effective learning and any given environment. And yet we have an instinct that tells us that the quality of space we inhabit will affect our ability to concentrate, to solve problems and to be creative.

---

[4] http://www.lsri.nottingham.ac.uk/jels

[5] Appendix 3 - Interview Protocol

We inhabit spaces and we have learnt through our experience; we know that certain spatial arrangements, qualities, facilities and technologies will help our work processes. With these challenges in mind, how space can facilitate different learning behaviours and respond to the needs of individuals was the focus of investigations in the first workshop.

Workshop 1

The first of two workshops took place at The Hallward Learning Hub at The University of Nottingham. A total of 25 people were present, with representatives from a variety of institutions across various stakeholder groups, including Information Services, Estates, academic teaching and research staff, students, designers and architects, as well as team members and student facilitators.

The aim of the workshop was to use the Hallward's spaces to promote interdisciplinary discussion about evaluation approaches for those or similar spaces with particular emphasis on the learning taking place. More specifically, its main theme was to attempt to identify the different tools we could use to assess these needs.

In advance of the workshop a briefing document[6] was circulated to delegates introducing the project, its aims, methods and desired outputs. Importantly this also included a set of definitions, to clearly define the nature of the workshop's aims.

A full report can be found in Appendix 4 - Workshop 1

Workshop 2

The aims of the JELS Workshop 2, held at The Automatic, Liverpool John Moores University on 24 February 2009, were:

- to bring together a collection of delegates of appropriate background and expertise, from library and central university service leaders to those involved in groups responsible for the creation of new learning spaces, such as CETLs (Centre for Excellence in Teaching and Learning);

- to conduct primed discussions around existing learning space evaluations in order to establish their usefulness, to compare them and to place them into context against what might be possible;

- to envisage how future evaluations might better focus on, and even nurture, learning and teaching within learning spaces.

Within the context of the project, the purposes of Workshop 2 were to help review our findings from our literature survey and interviewing activities into a contextualised and synthesised whole through a process of discussion, and to suggest ways forward for learning space evaluations which might inform our eventual project conclusions and recommendations.

---

[6] Appendix 5 – Briefing Document for Workshop 1

A key enabler for the Workshop 2 process was *The Distiller*, a group collaboration system developed by Liverpool John Moores University to allow groups of people to collaborate quickly and anonymously by using personal keyboards as input to a large set of central screens. At several points during the Workshop, The Distiller allowed us to conduct a two-stage process of data gathering followed by validation, thereby allowing us to attempt to gain the maximum benefit from the time available to us with our assembled group of experts.

A full report can be found in Appendix 6 - Workshop 2

Findings and Results

Our literature review revealed a number of reports and findings, three of which have been selected for inclusion as an Appendix, as they either contained knowledge and comment about the current state of evaluations with suggestions for future development or demonstrated the use of new technologies used in evaluations. Key concerns in these reports were:

- that due attention should be paid to the relationship between the space and 'pedagogic performance';

- there is still insufficient qualitative and deep research into the relationship between pedagogy and design of learning environment;

- how to separate the influence of the learning space from other factors when assessing the impact upon learning;

- that limited access to the space creates haves and have-nots amongst students.

A summary of the three selected reports can be found in Appendix 8 - Selections from Literature Review*.*

All 20 interviewees each discussed one space that they were involved with, or responsible for, and the evaluation of that space. Four of our interviews were developed into case studies (Appendix 9 - Case Studies) as they either demonstrated the use of new and innovative technologies and methods to evaluate learning spaces or addressed the fundamental criteria of attempting to assess the learning, or change of learning, happening within the space.

Surprisingly, we did not find any current evaluations that looked at lecture theatres as technology supported spaces.

A key resource identified from the study was the 'Theory of Change' evaluation framework used by CILASS (Centre for Inquiry-based Learning in the Arts and Social Sciences) which is described later in this section.

Results from the Literature Review and Interviews

Data collected from the telephone interviews and web surveys was scrutinised using qualitative thematic coding and analysis. This approach highlighted four themes derived from current practice:

- Emphasis on standard evaluation techniques (tools used)

- Emphasis on enabling new learning and teaching scenarios
- Status of evaluation within the life-cycle of the design process
- Distribution of Outputs

Theme One: Emphasis on standard evaluation techniques

Of evaluators interviewed, only 20% reported using Web 2.0 or multimedia technologies to enable them to conduct their evaluation. Methods most frequently utilised were surveys [60%] focus groups [50%] and observation [45%].

The choice of more traditional evaluation techniques – surveys, focus groups, interviews, observation and automatically-generated occupancy data – appeared to be a pragmatic one for most evaluators, resulting in 'quick wins'. Many factors impact upon evaluators' decision making processes; those reported included the resources available to undertake an evaluation, time and budgetary constraints, and, in some cases, funding timescales. Equally important are related issues concerning the 'informal' nature of the evaluation and the research questions at hand. For example, one CETL (Centre for Excellence in Teaching and Learning) wished to evaluate "how people perceived the space and the impact it had on them as individuals, learners". To answer this research question interviews were conducted with staff and students, alongside an observational study and the completion of questionnaires via a piece of software. The evaluator indicated that these data collections answered the questions posed:

"I think we got very good feedback about issues around the use of the room and the use of space which were that it provides a very, very positive and different sort of learning environment, but it does support staff and students in being creative and problem-solving and all those sorts of things. On the other hand, it does require those working in that room…to teach in a very different way and encourage facilitation. So in that sense it did answer issues around how it impacted on their [participants and leaders] learning and their experience"

The self-reports of staff and students, collected through traditional interviews and questionnaires and verified through observation, answered questions about whether particular learning and teaching scenarios were enabled, and how the users of the space perceived this. For some evaluators these methods were a starting point in the evaluation process, but not sufficient in themselves.

To move beyond traditional methods one university used multimedia data collection – namely audio-visual recording and video diaries – as part of an observational study of student behaviour in a learning space. This strategy generated a large amount of rich, naturalistic data that gave insights into student and teacher practices:

"[For example] what we've got are ten booths and we've got cameras in each of the booths and we can actually simultaneously look at what's going on in each of the booths and the sound with it...we've got a piece of software that allows you to be able to watch through many different camera angles what is happening right the way through that room. So, for instance, if somebody comes in and starts making an announcement and gets the attention of all of the students, then you can see how

that's changing the nature of which way they're working… without this software, it would have been very individualistic in watching one group of students…"

The lead evaluator in this instance stated having rejected traditional surveys and focus groups as less useful beyond the planning stage of a learning space, referring to the concept of a life-cycle of evaluative activity. A hazard of this automated observational technique can be the overwhelming volume and complexity of data generated. The lead evaluator was interested in recruiting academic support from a social science discipline to assist in analysing the data. The evaluator also mentioned the need to obtain ethical approval for this type of innovative data collection.

In this instance, as with other more detailed projects recognising more holistic issues around student experience and the changing nature of the academic year, discussion of methodology frequently utilises academic research language and processes rather than evaluative positions which are broadly conceptualised less formally. Notably, very few evaluations utilised control groups or strategic sampling; where formal approaches were taken, this was under the auspices of a research team, with budget and resources available.

Theme Two: Emphasis on enabling new learning and teaching scenarios

The arrangement of teaching and learning space was a central concern for the majority of evaluators. 70% of evaluations sought to assess whether the redesigned learning space had enabled new learning and teaching scenarios. 10% of evaluations reported seeking to assess the learning that was occurring in the space against predetermined pedagogic criteria. 55% of evaluations focused in part on assessing users' use of the space. These figures indicate emphasis in evaluation has generally been given to ensuring that spaces are being utilised, and utilised in an exploratory and innovative manner, in line with design ambitions.

The focus of research questions and the criteria by which an evaluation was judged by informants frequently centred on users' use of the (usually physical, rather than networked) space. This highlighted a distinction between the learning and teaching scenarios enabled by a space, and the efficacy of the learning processes within it. For example, one informant framed the success of the learning space in terms of how the space is being used, relating this closely to the original research questions:

"I would say that the methods we have applied have answered the question in terms of telling us whether the place is being used and how it's being used. And the feedback from the feedback forms and the focus groups led us to believe that the centre's being used appropriately and it's had its benefits in ways that we hadn't necessarily anticipated [namely, students' feelings of ownership over the space]. So I suppose yes, we have had our questions answered."

Currently, evaluators do not appear to focus strongly on the relationship between the learning activities occurring within a space, and the learning processes or measurable outcomes associated with these activities. At first this appears surprising, particularly since more than half of evaluations involved staff or management from posts within the Learning and Teaching sphere. There were notable exceptions to this rule, however, and over the course of the interviews this

apparent disconnect highlighted several key factors relating to how evaluation is undertaken and conceptualised at the institutional level.

Those more thorough evaluative processes sought to explore how a specific learning space enables or inhibits specific processes relevant to learning, to ensure that the objectives of the space are met over time. For some undertaking the first wave of an evaluation, this quickly became evident. For example, an evaluator in one university noted that they "were looking for very flexible, open learning". The main method of the evaluation was an online survey. The informant explained:

"What we didn't do, I don't think, in any detail, because it was very soon after we'd opened the building, was to ask the teachers if it had changed their teaching…From the look of the responses I've got, I think we asked them, ' What do you think of it?' And I don't think we went back and actually said to [staff], 'Have you changed your teaching?' which is really the question I'd like to know…their comments are very much on the 'physicalness' of it rather than on the teaching."

In this instance the emphasis on physicality of space is articulated in participants' responses to their tangible environment. However, another spatial emphasis is seen at the institutional level, as this evaluator observed:

"…every university has to look at its space usage; [the centre] now has a space usage in the main teaching hours…of something of the order of 67-75% that is bums on seats, which is an incredibly high percentage of open learning space. We're not telling the students to be there, they're choosing to be there… [whereas for conventional lecture theatres] I suspect that our figures are less than 25% overall…so the kind of learning we imagine took place is taking place."

Both these factors, institutional and individual, could help explain the ways in which space and usage are privileged as data. From these examples, the enabling of new learning and teaching scenarios is implicitly associated with new, 'better' ways of learning, acting as a shorthand for improved pedagogic action. This association of new uses with improved learning is paradoxically often reliant upon indicators of occupancy, usage and scenarios rather than data concerning the socio-cognitive processes of learning, or general assessments of learning. Many evaluators were aware of this tension, and identified learning processes as important, however, only 50% were able to recognise these factors within their evaluations, and in these cases evaluators relied upon self-reported learning.

Several institutions are already engaging in data collection strategies which could allow a more detailed investigation of how activity in a learning space relates to learning processes. For example, one respondent university captures audio-visual observational streaming data of learners in the learning space, generating a high yield of rich data which could be analysed as regards to learning processes. Another university embeds its evaluative activity within research activity, using an action research model and ethnographic methodologies such as observation studies and interviews to "identify how they [students] react as a group as well as individuals to the different spaces" with the aim of tying together "space, pedagogy and curriculum".

Although many of the learning spaces featured were networked in interesting ways, the evaluators focused upon the physicality of the space, and usage was often conceptualised by both evaluators and users in physical ways. For example, one evaluation did cover a range of features of the learning space:

"seven areas I think. Décor, noise, heating, learning environment, learning software, accessibility, IT support, IT help".

The main findings discussed by the informant related to what purpose people used the space for; access hours; food provision; and noise. Likewise, another informant stated:

"I wouldn't say it was the IT that has been predominant. The IT has been facilitating. But it's the flexibility of the discussion space and the fact that it's social learning."

Indeed, all of the evaluations we analysed had a component that related to the physical space; by contrast, 85% of evaluations also included networked spaces and 75% IT surfaces. There were few detailed evaluations of learners' patterns of accessing online resources or a virtual learning environment within a learning space, though most of the learning spaces discussed were enabled with network access. This may be partly due to the difficulties in measuring certain aspects of online use. For example, one evaluator explained that their institution

"...does collect data in terms of, for example, log-ins to the [virtual learning environment]. But because you don't have to be in the learning resource centre to log into the [virtual learning environment] that doesn't tell you necessarily how much people are using things here."

Theme Three: Status of evaluation within the life-cycle of the design process

Seven evaluations of the twenty analysed were one-off evaluations, rather than ongoing or recurrent. Interestingly, when evaluation results were obtained that confirmed evaluators' expectations of the learning space, this was sometimes seen as reaffirming that evaluative activity could cease, rather than been portrayed as the basis from which to conduct ongoing or increasingly more sophisticated work. For example, one interviewee reflected on this perspective, stating:

"We're not planning to [do more evaluation] at the moment…mainly because we've got other priorities and, as I said, because it confirmed what we felt about the [learning space] then there wasn't really any point in going back and finding out again."

By contrast, twelve cases were found wherein evaluation was viewed as integral to the lifecycle of the design process and evaluations were ongoing or recurrent. One such case was a university whose lead evaluators came from both a social science background and learning and teaching. Here, the approach was to seek to connect research and evaluation, leading to more robust evaluation techniques which explicitly address the learning processes affected by the space:

"It's kind of a sociological experiment if you like. It's about changing sort of power structures in classes, so there's no fixed space for teachers, no fixed space for students, completely flexible furniture, there are no desks."

The invocation of 'power structures' resonates with discussions at another university of 'student ownership' of space, though this type of discourse, with its emphasis on non-physical aspects of use of space, occurred only infrequently. Related to the attention paid to both research and evaluation of a learning space at this university, increasing the sophistication of the evaluative process itself was a declared goal of the evaluators:

"Probably the most important reason for doing some of the stuff we do is that we recognise that there aren't really good methods, general methods for evaluating, so we're really interested in coming up with better methods."

Likewise, another university recognised time and changing behaviours as central to learning processes and the evaluation approach. In this conception, evaluation was applied in terms of evolving curricula, new courses and the different demands of each season of the academic year.

"I was interested in patterns of learning. Did it change over the year; was it different at different times of year? What did they [students] need at different times of the year? So, for example, we found that at exams … we took space in the buildings to accommodate greater need for individual work, whereas at the start of the session more and more people were being given group work. The emphasis was less on individual space; it was more on group space. So we found these things, we needed to build, to flex the building to allow for this."

In this sense, evaluation occurs within the life-cycle of the academic institution alongside that of a design process.

Funding structures may reflect or influence how the evaluation is integrated into the design process. 65% of institutions indicated there was no specified budget for the evaluation, but one institution quoted a budget of approximately £60,000, mostly covering the cost of two dedicated research assistants.

A critical discussion of the role of evaluation in the development of a learning space occurred in only one interview:

"We're…discussing at the moment about the degree at which the evaluation should be kind of involved in the developmental process as the evaluation continues, the extent to which the evaluation process should be completely divorced from the process of developing the project. And we've got kind of mixed feelings about that really. So I think what we're trying to head for is some kind of interim feedback report from the evaluators that will help in terms of the instances of this initiative, but won't compromise the perceived object of the evaluators."

This interviewee also clearly considers the institutional dynamics in which evaluation and development are embedded, and the effect that these may have on the quality of the evaluation – a discourse occurring in other interviews.

Theme Four: Distribution of Outputs

Of the institutions surveyed, 45% reported that the findings of their evaluation are, or will be, publicly available. Of these, the most common types of outputs were reports to funders [40%] and conference papers [35%]. Nearly all institutions produced an institutional report, and most reported that the evaluation fed into the design of new

learning spaces. It was unclear whether the generally low publication levels, particularly for published papers produced by evaluations, was due to resource considerations, or to the informal or ad-hoc nature of some of these evaluations as expressed by informants. As one interviewee stated:

"I don't think [making the findings publicly available is] appropriate, really, it's not written in that format. Like I said, I've published a copy of what we were trying to do, but not the evaluation of whether we think we did it."

Alternatively, data itself may be published without being brought together as an evaluation of a learning space, for example, within the annual report of an institution. Many interviewees noted an informal exchange of information through visits from other institutions to the learning space.

Evaluation Frameworks

We found two frameworks related to the evaluation of learning spaces, the first, based on the 'Theories of Change' is summarised below by Professor Philippa Levy. The second, the Social Infrastructure Framework, also summarised below, was found via our literature survey

'Theory of Change' for impact evaluation: learning spaces evaluation methodology as used by CILASS (Centre for Inquiry-based Learning in the Arts and Social Sciences)

The CILASS Centre of Excellence in Teaching and Learning is using an evaluation framework that is consistent with the inquiry-based ethos of the CETL to explore the ways in which new learning spaces impact on the student experience and the development of pedagogy. Its focus is developmental in that it is concerned with generating understanding of why and how educational impact occurs rather than simply monitoring or auditing educational outcomes.

It is an adaptation of *Theories of Change*[7] programme evaluation combined with the use of *EPO (Enabling, Process and Outcome) Performance Indicators*[8] and it is used as the evaluation methodology for all educational development initiatives at the University of Sheffield. The approach is based on the assumption that all change initiatives have an underlying 'informal theory' of how desired outcomes will be achieved; that is, how change will happen. This informal theory is introduced at the outset of the change initiative in order to identify indicators for an evaluation that will focus not only on whether or not outcomes have been achieved, but also on how they have been achieved – thereby leading to a greater understanding of the processes and factors that are important in fostering change. The approach allows for identification of outcomes that might initially be unanticipated at the outset of an initiative and the factors that led to them.

---

[7] http://www.shef.ac.uk/cilass/resandeval/internaleval.html

[8] http://www.shef.ac.uk/content/1/c6/05/00/22/CILASS%20Perf%20Indicators%20Apr%202006.doc

The University of Sheffield Theory of Change (ToC) evaluation process involves the creation of a document that summarises a change initiative (e.g. design of a new learning space; introduction of new technology into a space, etc) across five distinct areas through a narrative framework: the *current situation* that precedes the intervention, e*nabling* (E) factors that define the structures and support which need to be set up or provided to produce the desired outcomes; *process* (P) indicators that define what needs to happen in order to achieve the desired outcomes; *outcome* (O) indicators that define the intermediate or longer-term outcomes and the overall *impact* desired for the project or programme. Through backward mapping a causal narrative or 'theory' is established, e.g. "to achieve the desired impact, the outcomes need to be x, y and z. To achieve these outcomes processes a, b and c need to happen, to carry out a, b and c resources and enabling factors d, e and f are required". Once the Theory of Change and the EPO indicators have been established, evaluation questions are drawn from them and data collection methods are designed.

At CILASS programme level, the ToC framework offers a means of exploring and assessing the impact of the CETL as a change initiative. The CILASS programme-level ToC defines EPO indicators relating to the provision and promotion of new learning spaces and use of technology for inquiry-based learning. The curriculum development projects that CILASS funds also establish ToCs that, where relevant, include indicators relating to the planned use of CILASS spaces for teaching. Project level ToCs offer a standardized format for meta-analysis and synthesis of multiple evaluation datasets.

Data collection methods for both programme-level and project-level evaluation of the impact of the CETL's spaces have included questionnaires, focus groups and interviews with academic staff who teach in the CILASS spaces, conducted both by CILASS research associates and by students from the Department of Information Studies as part of Masters level dissertation study. Thus far, students have contributed feedback to the evaluation of learning spaces primarily through project level evaluations although more programme-level data collection from students using the spaces is planned.

Evaluation so far suggests that features including the flexibility and informality of the CILASS spaces impacts positively on the student experience of inquiry-based learning and on the development of educational practice. For example, the spaces are perceived to have acted as a stimulus for pedagogical reflection and experimentation, changing learning-teaching relationships between staff and students, and raising staff awareness of information literacy development aspects of students' experiences of inquiry-based learning.

A more detailed exploration of the evaluation of the CILASS spaces has been included in the interim evaluation report prepared for HEFCE in the summer of 2007[9] and this report also includes the CILASS programme level Theory of Change document.

---

[9] http://www.shef.ac.uk/content/1/c6/04/89/91/CILASS Interim Evaluation Report July 2007.pdf

The CILASS website also offers guidelines for curriculum development project leaders on using the ToC approach[10].

Social Infrastructure Framework (Bielaczyc, 2006)

The importance of the Social Infrastructure Framework (SIF) lies in its recognition that an understanding of the interplay between learning theory, activities, participants and the configurations of space is crucial if technology-supported learning spaces are to be effective. Though grounded within design research rather than evaluation, and focussing on designing the tools within a space rather than the space itself, the SIF aims to develop a deep understanding of the elements required for successful educational practice through a combination of analysis and theory related to learning activities, participant structures and configurations of space. The SIF is based upon the notion that developers and teachers are constantly engaged in creating configurations of these elements (Bielaczyc, 2006, p.302), and that this process might be improved by making the design choices explicit and carried out in a structured way.

The SIF framework is based, at its highest level, around four dimensions:

- The **cultural beliefs dimension**: the mindset that shapes the way of life of the classroom;

- The **practices dimension**: the way in which teachers and students engage in online and offline learning activities relating to the tool;

- The **socio-techno-spatial relations dimension**: the organisation of physical space and cyberspace as they relate to teacher and student interactions with the tool;

- The **interaction with the "outside world" dimension**: the ways in which students interact with people outside their immediate classroom context.

Each of these dimensions is further sub-divided into *Design Considerations*, each of which is intended to lead to a set of questions (Bielaczyc, 2006, pp.314-315) which aim to inform a design document as part of an iterative process of improvement.

Several examples are deployed through citation to demonstrate that the author has used the approach with some success in real design projects. Difficulties with formulating contextually relevant questions in response to the Design Considerations are mentioned briefly, and the importance of the implementation path in the success of design research projects with SIF is discussed in more detail. Bielaczyc concludes that: "As a design tool, it [SIF] can be used to extend the scope of the developer's design beyond the technology-based tool itself to include the specification of critical elements of the classroom social structures… As both a design and an analytic tool, the Social Infrastructure Framework helps to specify which variables the researchers should be paying attention to as they create measures to assess the effectiveness of a design in classroom settings" (Bielaczyc, 2006, p325).

---

[10] http://www.shef.ac.uk/cilass/resandeval/internaleval.html

FELS: a conceptual Framework for the Evaluation of Learning Spaces

Bringing together all the data from the desk based research, interviews and workshops it is apparent that there is both a need and an opportunity to propose an initial framework to assist thinking about the structure and operation of evaluation studies.

Our FELS framework is intended to provide the following benefits:

- A common vocabulary to standardise evaluations
- A checklist of issues to be considered by individual practitioners and evaluators
- A structure to describe the nature and character of evaluations completed to date

Introduction

Proposing a framework for the evaluation of physical learning spaces might be mistaken for a bureaucratic and stultifying exercise, rather than an attempt to bolster creativity and communication. Conceptual frameworks are often shrouded with a veil of mystery surrounding their conception and can be overwrought and complex to use. However, Shields (1998, p.202) contends that this mystery "can be partially lifted by classifying conceptual frameworks using research purpose and clustering them with particular research questions, methods/techniques and statistics".

For work with evaluating learning spaces we might wish to be able to *describe* spaces in a meaningful way, later leading to questions such as What? Where? When? Why? Who? or How? Such work spans two categories in Shields' classification: Exploratory Research and Descriptive Research. These categories are implicitly linked with methods such as field research, case studies, focus groups, structured interviews, document analysis, content analysis and surveys. From this, it can be seen that the most appropriate type of framework (Shields, 1998, p.203) is one of descriptive categories, in some cases loosely defined so that they can be later extended by practitioners as our understanding of the field deepens. Such categories can lead to the construction of working hypotheses and of an evaluation which tests those hypotheses appropriately.

Within the remainder of this section we consider FELS, a conceptual Framework for the Evaluation of Learning Spaces, and consider how this might be used by practitioners. Development of FELS has been influenced by the Social Infrastructure Framework (Bielaczyc, 2006). While our current focus on the evaluation of physical learning spaces means that the FELS framework is constructed quite differently from SIF, we share the belief that a descriptive framework which provides scaffolding for consideration by practitioners can assist in identifying those elements of a learning space evaluation which are the most relevant to context, particularly as part of an iterative process within which the discovery of more information about variables occurs progressively and subsequently influences the design of the evaluation itself.

In keeping with the concerns identified above, FELS aims to develop a common vocabulary which can be used to describe existing situations in which such

evaluations have been conducted, in order to enable the identification of recurrent patterns within these existing evaluations. Proposals for new evaluations can be constructed, based upon our project finding that the scope of most evaluations is confined to a small subset of possible evaluation options. Rather than propose further specific types of evaluation, we aim to outline a methodology for describing and thinking about the relationships between what is to be evaluated and the process of evaluation itself. We suggest that a process of structured thinking about learning spaces and evaluations is qualitatively different to the standard, more pragmatic approaches, in that the resultant evaluations are more likely to be of relevance to their objectives.

FELS presents as its high-level categories a series of *dimensions* (intentions, context, practice, designs and procedures) which are each further sub-divided into *aspects*. Beginning from the questions Why? What? and How?, the dimensions indicate a combination of information that must be understood about a learning space if a meaningful evaluation is to be constructed, plus a series of questions which indicate alternative options that might be explored within the construction process. We contend that every evaluation needs to take into account all of the dimensions of the FELS framework if its construction is to relate appropriately to the space and evaluation questions. Having considered all the aspects, the evaluator can then choose or prioritise some, depending on the context.

Using the framework

The framework, summarised in Table 1 , is presented as a set of categories with associated descriptions. As a first step, it offers a vocabulary for examining and discussing evaluation ideas and practices.

In order to work through the framework, a plausible approach might be to traverse each dimension systematically, gradually constructing an evaluation design document to which further detail can be added with repeat iterations through the framework. On the first iteration, it is important to consider each of the dimensions, and to identify those aspects which are relevant to the intended evaluation. A further process of prioritisation might be required after this stage. Subsequent iterations through the framework would concentrate upon those aspects which have been identified as relevant, and would seek to add further detail based upon a deeper reflection which considers the information already unearthed for the surrounding aspects.

Why?

Intentions
Purpose
Users
Policymakers
Policy

What?

Context
Interactions
Design gestures
Curriculum
Maths
ICT
…
Non-specific
Process
Scripted
Open

Practice
Occupancy
Interactions
Academic Contract
Effectiveness
Participation
Processes
Products
Physicality
Users
Culture
Learning styles
Affective conditions
Effective conditions
Ecology

Designs
Taxonomic
Entrances
Teaching spaces
Learner Centres
Use
Open
Closed
Technology
Mobile
Connected
Visual
Supportive
Specialist
Surfaces
Reconfigurable
Fixed
Learner Created
Infrastructural

How?

Procedures
Timescale
Longitudinal
Quick gain
Initiated
Internal
External
Conducted
Internal
External
Feedback
Summative
Formative
Measurement Methods
Quantitative
Qualitative
Research Methods
Practitioner research
Academic research
Service level evaluation
Operation
Technical
Human
Top-down
Bottom-up
Tracking
Use of space
Journey of learner
Tools
Framework
Stages
Consultation
Pre-commission
Post-commission
Ongoing
Baseline
Pre-commission
Comparison
Reporting

Table 1

A conceptual framework for the evaluation of learning spaces

The **Intentions** dimension is structurally the most simple, yet it invites deep thinking about why the evaluation is to happen and what its impact should be. Concretely identifying a purpose for the evaluation, and relating this to the appropriate users, policymakers, and policies upon which the evaluation should have an impact, will enable the further process of working through the other dimensions to be approached with a sense of context.

For the **Context, Practice** and **Designs** dimensions, the process is more directly iterative. For the first pass through the framework, it may be sufficient to identify the content of the aspects using the suggested alternatives as a starting point. Subsequent passes through the framework would seek to more fully describe the relationships between the learning spaces and the framework aspects. Such a process of iteration would not be problematic as long as the initial, surface-level assumptions were genuinely subject to revision as deeper investigations offer new insight. Similarly, the **Procedures** dimension invites an iterative, probing approach based upon practitioner self-questioning, but here the questions and options have become more constrained by the earlier dimensions. In this way, the aims and context define the evaluation, rather than the other way around.

A further issue to be tackled relates to the fact that most current evaluations are conducted ad hoc and at the post-commission stage only. This constrains both the types of evaluations that are possible, and their potential for effectiveness in terms of influencing design.

Conceivably, a useful first exercise for practitioners familiarising themselves with the framework might be to attempt to write a short internal document which seeks to express the ideas which were present within an already completed evaluation. Such an exercise might have the following benefits:

- Familiarisation with the vocabulary of the framework, increasing the potential for further communication;

- A chance to reflect upon previous work in a structured, but ultimately non-judgemental, way and to identify those elements of the work which performed well, and those that could be improved;

- The opportunity to begin to re-construct previous evaluations, even if only as a thought experiment, and to reflect upon how the objectives of the evaluations might have been accomplished better with a different design;

- An invitation to begin to think critically about those evaluations which are on the horizon, or for which a need may arise in the future.

In this way, it is possible for practitioners to prepare themselves for the construction of new evaluations in advance. At its most effective, the framework might serve not merely as a guide to constructing good evaluations in response to identified need, but also to identifying that need in the first place through increased experience, transferability, and ambition.

The structure of the framework

This section provides an overview of the five dimensions within the framework, while the subsequent, shorter, sections provide a brief description of the aspects within each dimension.

The **Intentions dimension** covers the core of an evaluation, and describes the reasons why the evaluation is necessary together with its intended impact upon learning and its users and upon subsequent research, design or policy. As such, the Intentions form the "Why?" of the framework.

The **Context dimension** of an evaluation refers to the anticipated affordances of the space in terms of learning and teaching objectives. Learning spaces are designed with a purpose, however loosely such definitions may have been stated in practice. The Context seeks to identify that purpose by making explicit the ambitions associated with the designing of a new space, and to enable new indicators of success to be extrapolated and underlying assumptions about the space to be highlighted and, perhaps, challenged by the evaluation.

The **Practice dimension** of an evaluation seeks to identify how the space has been used, conceptualised and re-purposed in practice. At the core of the Practice dimension is the need to identify the learning interactions which take place and the way in which the construction of the learning space enables and inhibits those learning interactions and educational practices. The Practice dimension also recognises the need to consider the interaction between a learning space and the "outside world", both in terms of other learning spaces and the wider lifecycle of the users of the space.

The **Designs dimension** of the framework enables the development of rich and context-aware vocabulary for the description of the space itself. Technology-supported learning spaces can be characterised in terms of the type of space, how and if the design is enforced to impact upon use, and the technology and surfaces within the space itself.

The Context, Practice and Designs dimensions of the framework are intricately interrelated to form the "What?" of the framework. In essence, an evaluation of a learning space aims to identify the gap between ideal and realised teaching and learning practice within the space. These three dimensions aim to support these elements of evaluative practice by allowing for the description of the intended processes and outcomes (Context), the achieved process and outcomes (Practice) and the facets of the space which are responsible for the links, both successful and otherwise, between the two (Designs).

The **Procedures dimension** considers the construction of the evaluation itself, and therefore forms the "How?" of the framework. The construction of the evaluation depends heavily upon the "Why?" and "What?" elements of the framework, and will feed back into these other elements as part of an iterative process of evaluation-based improvement. The Procedures dimension considers the formulation of the evaluation in terms of elements including timescale, how and by whom it is to be conducted and conceptualised, the evaluative tools and what they will be uses to investigate within the space, the stages at which the evaluation is to be conducted

and the identification of suitable baselines for control comparison, and how the evaluation is to be reported to maximise effectiveness in relation to the Intentions dimension.

Aspects of the Dimensions

The following sections describe each of these dimensions by referring to the aspects of the dimensions which are considered within the framework.

The **Intentions dimension** (Table 2) describes the reasons why the evaluation is necessary together with its intended impact.

The **purpose** aspect considers the reasons why the evaluation process is necessary, such as examining student satisfaction, assessing the impact upon learning, influencing the design of subsequent spaces, the justification of funding to stakeholders, and so forth. The purpose of an evaluation may be a combination of several such factors, and it is important to identify this from the beginning if the evaluation is to be appropriately targeted.

Why?		
Intentions		
Purpose		
Users		
Policymakers		
Policy		

Table 2

The **users** aspect identifies at a high level of granularity the users of the space, such as learners, researchers, teaching and support staff. These users may be appropriate stakeholders or participants in the evaluation process, and it is important to consider all those who may influence or be affected by the space.

The **policymakers** aspect suggests the identification of relevant policymakers who might need to be identified as targets or even sponsors of the evaluation, if the process is to achieve its purpose. In this regard, we refer to the outcomes of our project's Workshop 2, where a key driver for evaluation was that of mediating between users and policymakers to enable greater communication around practice.

The **policy** aspect considers the identification of policies, procedures, and institutional or even national planning documents which might be influenced by the evaluation. Such a process may involve immersion within the vocabulary and communication preferences of those around the policy, enabled through the identification of policymakers. Research itself, as represented by research publications such as journal papers or conference proceedings, constitutes a valid policy in terms of institution-relevant research output.

The **Context dimension** (Table 3) refers to the anticipated affordances of the space in terms of learning and teaching objectives.

The **interactions** aspect is related to the concept of learning interactions. This should capture the described elements or distinctive varieties of learning practice that inspire or shape the design brief of 'collaborative' learning, 'exploratory' learning, 'case-based' learning etc. A taxonomy of possible learning practices has been described in a recent BECTA funded project (CAPITAL - Curriculum & Pedagogy in Technology Assisted Learning:[11] part of the Research & Development Programme for the next phase of the UK's Harnessing Technology Strategy). These are: Exposition, Reflective, Performative, Networked, Community, Collaborative, Tutorial, Assessing, Browsing, Cross-contextual, cross-conceptual, case-based, problem-solving, inquiry-driven, ludic, construction.

The **design gestures** aspect originates from our expert interview with Peter Jamieson, and derives further pedigree from the notions of 'signs and codes' developed by Savin-Baden (Savin-Baden, 2008, p10). Basically, design gestures are the links between Built Environment practitioners and pedagogy. An architect may react to a design brief which includes a specification of desired learning scenarios by building into their design specific features which aim to enable those scenarios. These 'pointers' or design gestures may take many forms: the layout and type of furniture, the lack of furniture, the distribution of light, types of technology deployed, the shapes of rooms or walls or the presence of specific alcoves, etc. If the space is subsequently used for teaching in ways that ignore these efforts, then it is conceivable that practice within the room could still be achieved. Conversely, the gestures may be inhibiting pedagogy through poor design. Either way, an acknowledgement

What?		
Context		
Interactions		
Design gestures		
Curriculum		
Maths		
ICT		
…		
Non-specific		
Process		
Scripted		
Open		

Practice		
Occupancy		
Interactions		
Academic Contract		
Effectiveness		
Participation		
Processes		
Products		
Physicality		
Users		
Culture		
Learning styles		
Affective conditions		
Effective conditions		
Ecology		

Designs		
Taxonomic		
Entrances		
Teaching spaces		
Learner Centres		
Use		
Open		
Closed		
Technology		
Mobile		
Connected		
Visual		
Supportive		
Specialist		
Surfaces		
Reconfigurable		
Fixed		
Learner Created		
Infrastructural		

Table 3

---

[11] http://www.htcapital.info/

of this connection is useful for practitioners. This aspect, therefore, focuses attention on the specific design aspects of the space which accommodate or encourage learning and teaching interactions.

The **curriculum** aspect captures the domain-based design of the space. Even non-specified spaces such as open access library centres might have been defined to serve one or a number of definable faculties due to their location or other factors. The curriculum aspect is also clearly linked to notions of discipline-based pedagogy.

The **process** aspect serves as an indicator of the formality of the processes which are intended to occur within the space, along a spectrum from prescribed and structured (scripted) to completely open in format.

*The **Practice dimension** (Table 3) seeks to identify how the space has been used, conceptualised and re-purposed in practice.*

The **occupancy** aspect relates to demonstrable use of the space for appropriate activities. It is related to existing notions of quantitative evaluation, which still may form a useful sub-set of an evaluative process which aims to demonstrate reproducible success.

The **interactions** aspect relates to the identically titled aspect from the context dimension. The purpose here is to identify and describe the interactions that are *actually* happening within the space, in order to derive and enable a process of comparison between desired and actual practice in terms of learning interactions.

The **academic contract** aspect is centred upon notions of cultural acceptability within a space. It is particularly related to disciplinary rules, pedagogical signatures, discipline-based pedagogy, safety and accessibility regulations, and notions of acceptable behaviour within society more widely, as mediated through societal perceptions of roles and interactions within an academic context.

The **effectiveness** aspect is concerned with the participatory nature of the use of the space (with reference to student involvement and engagement), as well as the processes which support that participation and the learning and teaching interactions. The aspect also takes into account the physicality of the learning space, in terms of what participation within the space physically involves for the users, and the products which result from the participation and processes.

The **users** aspect considers the characteristics of the space users. In an increasingly globalised Higher Education sector, issues of differing cultural norms within an academic context must be considered. Users may be sensitive to affective conditions (broadly, how 'likeable' the space is) and effective conditions (a perception of effective practice being achieved within the space).

The **ecology** aspect recognises that spaces operate within a wider ecosystem of other spaces, and within a context of the wider work and life balance of the users. Relevant sub-aspects might include the physical location of the space within an institutional context, and factors both locational and cultural which might cause the space to be unpopular despite the provision of good facilities, or conversely popular due to factors other than the presence of a good environment for learning.

*The **Designs dimension** (Table 3) enables the development of a rich and context-aware vocabulary for description of the space itself.*

The **taxonomic** aspect considers the fundamental type of space which is being evaluated. We are influenced by existing work which has sought to construct taxonomies of learning spaces (JISC, 2006). Entrance spaces include examples such as receptions, services areas, throughput spaces re-purposed for public events, and information displays. Teaching spaces include vocational or domain-based areas such as laboratories, large lecture spaces, lecture spaces, spaces for seminars or discussions in small classes, and instructional computer labs. Learner centres include cafés, open access computer labs, student configurable spaces, breakout rooms and corridor enclaves, museums and art installations, outdoor spaces, and performative spaces.

The **use** aspect considers whether the activity within the space is enforced through policy or mediated more informally through changing teaching and learning practices.

The **technology** aspect considers the technology deployed within the space to support the learning and teaching interactions. Mobile technologies include tablet PCs, laptops, mobile phones, wireless keyboards and mice, PDAs and digital cameras. Connected technologies include wired computing systems, wireless networks, wireless-enabled laptops, and internet enabled PDAs and mobile phones. Visual and interactive technologies include video conferencing, video and web streaming, image projection, interactive whiteboards and voting systems. Supported learning systems include assistive technologies, accessible USB ports, audio-visual prompts, video recording facilities and plasma screens for the display of information. Specialist equipment relates to domain-specific educational needs, and might include scientific, medical, robotic, archaeological equipment, etc.

The **surfaces** aspect takes into account those other physical components located within a space, such as tables, chairs, walls, floors, ceilings, windows, doors, and so forth. The configuration of these surfaces may be entirely fixed within the space, scaffolded but open to re-configuration by users, or potentially entirely configured by the users within the learning and teaching scenario.

The **infrastructural** aspect considers the facilities provided by the built environment of the room which are necessary if the affordances of the technology, surfaces and learning scenarios within the room are to be realised. Infrastructural elements include lighting, air conditioning, mains power provision and networking points. Walls are also infrastructure because their construction defines the space itself; this should not be confused with the role of walls within the surfaces aspect, which is concerned with their configuration to support learning.

The **Procedures dimension** (Table 4) considers the construction and implementation of the evaluation itself.

The **timescale** aspect considers notions such as the required length of time for the evaluation in terms of prioritising longitude or quick gains, together with the rhythm of the evaluation as it relates to the ebb and flow of academic life or the necessity for repetition or iteration of the evaluation at defined intervals.

The **initiated** and **conducted** aspects consider whether the evaluation is deemed necessary due to internal or external requirements, and whether the evaluation will be carried out by staff related to the project or specifically imported evaluation staff.

The **feedback** aspect considers whether the outputs of the project are intended to provide summative data considered against success thresholds and designed to provide "feed out" from a project, or whether the central aim is to provide evidence to feed back into the project to influence subsequent practice.

The **measurement** aspect is intended to capture the position of the evaluation within a mixed ecology of quantitative and qualitative methods. Although evaluations which fall entirely into one of these categories are conceivable, it is likely that most appropriate evaluations may need, in practice, to consider a careful balance between the two types in order to meet their intentions. This aspect is heavily related to the tools aspect described below.

The **research** aspect considers the balance between evaluation and research. Potential nodes within the research aspect include service level evaluations, designed to improve the practical management and use of the space, academic research within disciplines such as the learning sciences, and practitioner based research focussing on the roles of academics as teachers, or support staff.

The **operation** aspect denotes whether the evaluation is to be carried out manually, by staff identified within the conducted aspect, or to be carried out technically, for example by the use of automated systems which will need to be identified within the tools aspect.

The **tracking** aspect denotes the threads of occupancy, interactions, users and ecology which are to be tracked within the spaces. Items here might include the

How?
Procedures
Timescale
Longitudinal
Quick gain
Initiated
Internal
External
Conducted
Internal
External
Feedback
Summative
Formative
Measurement Methods
Quantitative
Qualitative
Research Methods
Practitioner research
Academic research
Service level evaluation
Operation
Technical
Human
Top-down
Bottom-up
Tracking
Use of space
Journey of learner
Tools
Framework
Stages
Consultation
Pre-commission
Post-commission
Ongoing
Baseline
Pre-commission
Comparison
Reporting

Table 4

change in usage of the space over time (over the course of an academic year, perhaps, or by the time of day), or the journey of an individual user (learner, tutor, support staff) through the space as they carry out their roles.

The **tools** aspect encapsulates the tools which are used to carry out the evaluation itself. Tools may range from the traditional, such as surveys and focus groups, to the use of newer technologies such as Web 2.0 spaces for the formation of online communities to discuss issues.

The **framework** aspect considers any institutional or theoretical frameworks within which an evaluation is obligated or desired to operate. For example, several CETLs (Centre for Excellence in Teaching and Learning), including CILASS, who presented their framework at Workshop 2 and as part of our presentation at the JISC conference), have created their own evaluative framework.

The **stages** aspect refers to the developmental stage of the space to be evaluated. The space may not yet have been fully designed (still at the consultation stage), may be at a pre-commission stage of development, may be newly opened to users (post-commission) or established. Established spaces might also be subject to ongoing evaluation, especially within the context of an evaluation providing formative feedback.

The **baseline** aspect refers to the process of identifying comparators for success in terms of the space. Plausible examples include comparing the space against evaluative data from the same location pre-commission, especially if such an evaluation was performed within that stage, or comparing the space against another space which purports to similar context, practice and designs.

Conclusions

Here, we report the results of the JELS study in terms of the original objectives. These were to identify:

- good practice in the evaluation of physical learning space;

- tools, methods and data sources to monitor learning activities and inform the development of new learning spaces

- aspects of space configuration that contribute to effective learning.

Good practice

The project found that while most institutions recognised a need to evaluate teaching and learning within a space, the main drivers for evaluation were to satisfy management that the spaces were being used and they were well-liked by students. Thus, the main evaluation methods were measurement of occupancy and assessment of student satisfaction. Our study has revealed an inherent tension between a wish by management to justify new learning spaces in terms of enhancing student experience, and a need to support innovative teaching and learning activities. In general, teaching innovation is considered to be an activity of individual staff and so did not either attract the resources needed to design and build new

learning spaces, nor the opportunity to undertake an evaluation of teaching and learning effectiveness.

We have, however, found and reported some evidence of good practice that considers the relations between design and use of space, that assesses the changing practices of teaching and learning, and that takes a life-cycle approach to evaluation.

Tools, methods and data sources

The tools and methods can be split into two broad categories: those intended for structuring and analysing the evaluation process, and those designed for guiding and assessing the substance of the learning space innovation.

The ToC (p16) method from the University of Sheffield is a general approach to proposing, justifying and guiding educational innovation, which can be applied to learning spaces. The structured narratives can be developed and interpreted by a range of stakeholders, including senior management, teaching innovators and students. It is one example from a range of methods for assessing educational innovation and appropriation, with the advantage that it has been specifically applied to the development of learning spaces.

The Social Infrastructure Framework (p18) demonstrates the usefulness of considering aspects of learning design, an understanding of the identities of learners and teachers, and physical learning spaces.

In this report we have proposed a conceptual framework, FELS (p19) to guide the substance of learning space innovation, in the form of a shared vocabulary, a design checklist and a method of reporting outcomes in relation to similar evaluations. We have also elaborated how this framework can be used to construct evaluations by practitioners in response to identified need and, further, how the framework might be of use in identifying the need for learning space evaluation in future.

Aspects of design for effective learning

Through our workshops and case studies we have uncovered some aspects of learning space design that appear to contribute to effective learning. These must be treated with caution, since they have not been subjected to comparative evaluation, or to rigorous analysis.

These aspects include:

- building flexibility into the design, so that the space can be easily and quickly reconfigured for different teaching and learning scenarios;

- relating the design to intended use, particularly in terms of the learning and teaching scenarios to be deployed and the identities of the learners and teachers;

- considering infrastructural provision, such as lighting, air conditioning, mains provision and networking points and building in either sufficient, or preferably *spare*, capacity;

- making use of existing professional guidelines, especially with regard to acoustics and audio delivery which are often neglected within learning spaces;

- considering the context of the design, especially how the space is connected, and related to, other learning spaces within an ecology;

- considering the 'legibility' of the design (the clarity of through flows for learners and the use of appropriate signage) so that the space supports and guides learners rather than acting as a barrier to progress.

Our findings suggest that the evaluation of physical learning spaces needs to extend the classic post-occupancy model. The concept that evaluation should be iterative and built into the whole pre-design, design, build and post-occupancy process is one that needs to be taken up at an institutional level with the issue of funding also being considered. A key to this move to evaluating learning could be the CETLs, all of whom are tasked with evaluating their processes and where a number of these have responsibility for, or are situated in, technology supported physical learning spaces which they are already actively evaluating.

A cautionary warning came from a number of sources that institutions should be aware of 'evaluation burnout' within the student body, with so many requirements to garner student input one more evaluation may be a step too far. There may also be a need for some spaces to be designed with experimentation in mind, since rigorous evaluation is opposed in some quarters due to a perception that it hinders innovation.

Much interest has been generated in this project, indicating that this is an area of concern to many institutions. We propose that further work should be undertaken to refine and test the proposed framework and to look at the benefits of new and emerging technologies and methods for evaluation.

Building on previous and current evaluations and work in this area we hope that this study report and the framework proposed will aid institutions in moving towards a fully integrated model for evaluation of physical learning spaces. We suggest that it is important to monitor UK activities in relation to international benchmarks where there is currently much activity, particularly in Australia[12] [13].

This report is accompanied by a spreadsheet[14] listing the collated data from our investigations. It is hoped that this will be extended over time, building towards a comprehensive, annotated, searchable directory or compendium of evaluation methods and tools for learning spaces.

---

[12] Australian Learning and Teaching Council. A comprehensive learning space evaluation model

[13] Carrick Institute (2008). Places & Spaces for Learning

[14] http://www.lsri.nottingham.ac.uk/jels/downloads/JELS compendium.xls

The project team would like to acknowledge and thank all those who took part and gave of their time in the workshops, surveys and interviews.

References

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel* 25: 297-308

Australian Learning and Teaching Council – A comprehensive learning space evaluation model. http://www.swinburne.edu.au/spl/projects/elsp.html

Bielaczyc, K. (2006) Designing Social Infrastructure: Critical Issues in Creating Learning Environments With Technology. The Journal of the Learning Sciences 15(3): 301-329.

Bransford, J. Brown, A. and Cocking, R. (2000): How people learn: brain mind, experience and school. Washington DC: National Academy Press

Carrick Institute. (2008). Places & Spaces For Learning Seminars Draft Report. Canberra: ALTC.

Comber, C. and Wall, D. (2001). The classroom environment: a framework for learning. In C. Paechter, R. Edwards, R. Harrison & T. Twining (Eds.), Learning, space and identity. London: Paul Chapman Publishing

Csíkszentmihályi, M. (1990). Flow: The Psychology of Optimal Experience. New York: Harper & Row,1990.

Crook, C. K. (1994). Computers and the collaborative experience of learning. London: Routledge.

Fisher, K (2005). Research into Identifying Effective Learning Environments. http://www.oecd.org/dataoecd/26/7/37905387.pdf

Huba, M.E. and Freed, J.E. (2000) Learner-centered assessment on college campuses: Shifting the focus from teaching to learning, Needham Heights, MA: Allyn &Bacon

Hunley, S., and Schaller, M. (2006). Assessing Learning Spaces. In Oblinger, D. (Ed.) Learning Spaces. Boulder,CO: Educause.

JISC (2006). Designing Spaces for Effective Learning. http://www.jisc.ac.uk/uploaded_documents/JISClearningspaces.pdf

Maslow, A. (1943). A Theory of Human Motivation. Psychological Review, 50 370-96.

Oblinger, D. (2006). (Ed.) Learning Spaces. Boulder, CO: Educause.

O'Malley, C. (1994), Computer-supported cooperative learning. Berlin: Springer-Verlag

Roberts, S. and Weaver, M. (2006). Spaces for Learners and Learning: Evaluating the Impact of Technology-rich learning spaces. In New Review of Academic Librarianship 12,1. pp 95-107.

Savin-Baden M. (2008) Learning Spaces: Creating Opportunities for Knowledge Creation in Academic Life. Maidenhead: The Society for Research into Higher Education / Open University Press.

Sanoff, H. (2001), "School Buildings Assessment Methods", North Carolina State University and National Clearinghouse for Educational Facilities, Washington, D.C.

Scottish Funding Council. (2006). Spaces for Learning. http://www.jiscinfonet.ac.uk/Resources/externalresources/sfc-spaces-for-learning

Sharples, M., Graber, R., Harrison, C., and Logan, K. (2009) E-safety and Web 2.0 for children aged 11-16. Journal of Computer Assisted Learning 25(1), 70-84

Shields, P.M. (1998) Pragmatism as Philosophy of Science: A tool for public administration. Research in Public Administration 4: 195-225.

Smith, R. (2008). Technology-Rich Physical Space Design: An overview of JISC Activities. http://www.jisc.ac.uk/publications/publications/bpelearnspacesv1.aspx

Soja, E. (1989). Postmodern Geographies: The Reassertion of Space in Critical Social Theory. New York: Routledge, Chapman and Hall.

Solomon, Y. Croft, T. and Lawson, D. (not yet published). Safety in numbers: mathematics support centres and their derivatives as social learning spaces. Studies in Higher Education.

Strange, C. C., and Banning, J. H. (2001). Educating by design: Creating campus learning environments that work. San Francisco: Jossey-Bass.

Temple, P. (2007). Learning Spaces for the 21st Century. Higher Education Academy.

Tom, J., Voss, K. and Scheetz, C. (2008). The Space is the Message: first assessment of a learning studio. Educause Quarterly, 31 (2). pp 42-52.

Watson, L., Anderson, H. and Strachan-Davis, K. (2007). Design and Management of Open Plan Technology Rich Learning and Teaching Spaces Study

Wenger, E. (1998). Communities of practice: Learning, meaning and identity. Cambridge: Cambridge University Press.

Appendixes

Appendix 1 - Individuals and organisations that provided input and support to the project.

- Heather Williamson, JISC
- Les Watson, LesWatson.net
- Caroline Windrum, Mike Sharples and Charles Crook, LSRI,
- Philippa Levy and Pam McKinney of CILASS, The University of Sheffield
- Liz Burd, University of Durham
- Tony Croft, Loughborough University
- Gary Priestnall, SPLINT, The University of Nottingham
- Paul Taylor and Cath Lambert, The Reinvention Centre, The University of Warwick
- John Tuck, Royal Holloway University, London
- Hugh Anderson, HAA Design
- Peter Jamieson, The University of Melbourne
- Students of The University of Nottingham
- Staff of The Automatic, Liverpool John Moores University
- Students of Liverpool John Moores University
- University of the Arts
- University of Bedfordshire
- University of Birmingham
- University of Cumbria
- Glasgow Caledonian University
- Centre for Active Learning, University of Gloucestershire
- University of Nottingham
- University of Surrey
- University of the West of Scotland - Paisley campus
- University of Wolverhampton

The JELS Project team:

Ian Pearshouse, Elizabeth Hartnell-Young, Brett Bligh, Rebecca Graber, Elizabeth Brown, Sarah Lewthwaite, Rhonda Riachi, Andy Gibson, Andrea Wheeler, Andrew Manches, Madeline Hallewell, Bronya Norton, Florence Drouvin and Eleanor Palfreman

Appendix 2 - Extracts from an international expert interview

What is the scope and direction of the work that you've done in evaluating spaces during the design/build process and post-occupancy?

In all the projects I do one of the critical things for me is to spend as much time in the space as I can observing what users are doing... I feel like I have a relationship with the space ... I guess I do that for a number of reasons: one, the spaces that I design are based on suppositions of what people will do and what will work and, as a consequence, I want to see whether my imaginings are correct and whether they're on target or not. I like to see how students change and adapt in changing spaces and how they live in and occupy those spaces so I pay a lot of attention to that... I really don't think that many of the people who I see as key stakeholders..., particularly the external consultants and architects, I don't believe they have much awareness of the way people move in and use space at all.

Do you have any ideas for new or different tools or methods and, if so, how can technology play any part in that evaluation?

I'm really interested in how we can plot student movement through these spaces and I'm particularly interested in the informal spaces that I'm designing because I'm designing quite a lot of these and some are public areas and some are external and some of these are transitional spaces which are semi indoor/outdoor spaces...I'm really interested in how we map student movement through these spaces and how they occupy them. I would like to think that we should be able to use some sort of mapping technology ... but I'm also interested in using it artistically. I'd like to think, for instance, that people moving through one of my public spaces could be plotted electronically and that creates a changing landscape – a digital display if you like ...So that, in a sense, we'd have an expression of what we were doing moving through this space....

...what we're interested in is identifying what the designers saw to be the critical features that they deliberately placed in the spaces to improve the students learning experience or what the teachers are able to do in a teaching sense and it's really critical that this is articulated at the beginning of these projects... We need to know what someone like me, for instance, intended to be the critical features of the new engineering classrooms...so if you're doing the evaluation ... then you would need me to articulate what it was that I was trying to do, educationally, for the students and the teachers who were going to be using those rooms.

Obviously we're evaluating evaluations so do you know of any current or previous studies that are doing that same thing?

I have to say that I have very little awareness of that. What I will say is I haven't seen anything that has been remotely of use to me. What I have seen has been rather disappointing and it's generally not focused on the educational concerns that I have. But what is also absent – and I want to emphasise that point I made a moment ago about the design features – it's one thing to have an educational focus and to bring that point of view to the evaluation process but there are different kinds of educational focuses and it's a contested field. A lot of people that I've designed spaces with or for might have very conservative or different points of view about teaching and learning than I have...

Appendix 3 - Interview Protocol

This template is for the RAs conducting telephone interviews. This document consists of a list of questions that interviewees will be asked and prompts for the interviewer.

NB - If interviewees have experience of more than one learning space evaluation, please ask them to choose that which was the most interesting and/or novel. Information about further projects can be collected via another telephone interview or via a web questionnaire.

Question:	*Prompt:*	*Tick when done:*
1. What is the name of the institution that these evaluation methods were used in?	Name of CETL, HEI or FE college. For HEIs/FE, if a particular department/unit was the lead on this, e.g. School of Education.	
2. What is the name of the learning space that was evaluated?		
3. What are the names of the interviewee(s) and what was their role in the evaluation?	Name and role (in the evaluation) of the person(s) being interviewed	
4. Was this an internal or external evaluation? (or both?)		
5. Who instigated the evaluation? (In particular, the roles of these people)	Names of people is fine, we really need their **roles** though, e.g. Director of Estates; PVC for Research etc.	
6. Were there any other institutional sub-units/departments involved in the evaluation?	e.g. Estates, IS, various academic schools e.g. Education; Geography; Computer Science etc.	
7. What were the evaluation questions posed in the study?		
8. What were the reasons for carrying out the evaluation?	Can be a combination of reasons, e.g. evaluation of student satisfaction; measuring learning; justifying funding; assessing whether new learning and teaching scenarios were enabled.	
9. What were the outputs from the evaluation?	Can be a combination, e.g. institutional reports, technical reports, conference papers, journal papers, designs for new learning spaces, iterated design for new learning space, reports to funders etc.	
10. Who formulated the actual research methods?	If anyone in particular came up with the methodology or questions etc.	
11. What kind of learning did you imagine would take place in the space?	Can be do with epistemological position or based on learning theory. Examples include constructivism; tutor-led etc.	

12. What were the design gestures within the space which were intended to enable this innovative teaching and learning? (N.B. A "design gesture" is the way in which the technology or the space was set up, to make that learning happen.)	e.g. by an architect or design consultant. Will probably be a lot of "don't know" answers for this – this is fine and will be an interesting finding in itself.	
13. Are any professional guidelines referenced in the evaluation?		
14. Do you consider any aspect of your evaluation to be different from traditional evaluation techniques or innovative in any way? If so, how?	e.g. any use of Web 2.0 tools (blogs, wikis, social networking platforms etc) or multimedia (video diaries etc).	
15. Did the space that you evaluated include any of the following components, for learners/learning? - Formal physical spaces - Informal physical spaces - Networked spaces - Surfaces (IT) - Surfaces (non-IT) - Other – please specify	Formal physical spaces = spaces where learning is driven by a lecturer etc Informal physical spaces = spaces where learning is driven by students e.g. libraries, hallways etc Networked spaces = e.g. supporting a VLE presence Surfaces (IT) Surfaces (non-IT) = e.g. tables Other – please specify	
16. Did the space that you evaluated include any of the following components, for teachers/teaching? - Formal physical spaces - Informal physical spaces - Networked spaces - Surfaces (IT) - Surfaces (non-IT) - Other – please specify	(see prompts for Q14)	
17. Were there issues with time for any of these components? If so, please give details of what these are. - Formal physical spaces - Informal physical spaces - Networked spaces - Surfaces (IT) - Surfaces (non-IT) - Other – please specify	(see prompts for Q14) Some components might be restricted by time e.g. if used for teaching during the day, or evening courses, or other bookings.	

Page 38 of 60

18. What were your data collection methods?	Broadly, were they quantitative, qualitative, mixed methods.	
	Were automated methods used? (e.g. swipecards)	
	Also more specific details needed, e.g. surveys, video data, focus groups, 1-to-1 interviews, observations etc.	
19. Do your data collection methods include baseline data?	Yes / No.	
	If yes, what baseline data?	
20. How was recruitment of participants carried out?		
21. What budget was allocated to the evaluation project? (This information can be kept confidential if required.)	Only if interviewee is comfortable sharing this. Can suggest a range, e.g. between £0-500, £500-1000, £1000-5000, over £5000.	
22. What amount of time did you have to carry out the evaluation?	Might be different to what was originally planned or funded.	
23. a) How have the tools and methods answered your research questions? b) Was this what you expected?	They might have found the complete opposite to what they expected – this is absolutely fine.	
24. a) Have the findings impacted on institutional decision-making and the wider community? b) Has there been further take-up of these spaces by others in the community, as a result of your work?	Again, only if interviewees are happy to share this data. Decisions made at institutional level might be confidential but again, we are happy to record the data but not make it widely available.	
25. Will you be carrying out any further evaluative work?	Yes / No.	
	If yes, please give details.	
26. Is the evaluative work available to the public?	Report or document – hard copy, on the web etc?	
27. Would it be possible to obtain a copy of any surveys/questionnaires etc used in the evaluation?		
28. Would it be alright to contact you should we have any follow-up questions?		
29. Would you like me add your name to our mailing list, enabling you to receive information about the outputs of our project?	If yes, get details of email address.	
30. Do you have any further information you'd like to pass to us, or recommendations about who else to speak to?		

Thank you for participating!

Appendix 4 - Workshop 1

The workshop began with delegates being given introductions to the tasks set for the day, exploring the Hallward, identifying specific spaces for 'case-study' consideration, followed by evaluation design activities. They were then divided into three groups. Each group was allocated to recognise a multitude of stakeholder perspectives and achieve a similar mix of experiences and backgrounds. Project members acted as facilitators for each group.

Following introductions, the morning session was dedicated to recognising the implicit pedagogies of the Hallwards' various learning spaces. The Hallward location enabled delegates to tour and scrutinise new learning zones designed to support a different pedagogical or learning focus. These included:

(i)   short stay individual information gathering

(ii)   open-space flexible group work

(iii)   individual quiet study

(iv)   small-group intentional collaborative work, and

(v)   structured teaching-and-learning

These spaces were specifically highlighted for participants' attention as they effectively mirror developments in many other institutions.

Further innovative spaces for participants' consideration included the Hallwards' Assistive Technology Suite (a room dedicated to computers enabled with a variety of assistive technologies for use by disabled students), the Thunder wall area (a multi-screen computer display facility) and more informal spaces such as the library café, and multifunctional, flexible student spaces. At the start of the day, each group was issued with several handheld *Creative Vado* 'point and shoot' digital camcorders. These were used by delegates moving through the Hallward as a form visual notation to highlight areas of interest, record impromptu conversations with students working within Hallward spaces, and, later on, to capture group discussion and ideas. This informal data capture demonstrated delegate perspectives that could be revisited by the research team and utilised with a view to the organisation of the subsequent workshop and issues arising at interview.

From this exploratory starting point, groups reconvened to collate their initial reflections of potential evaluations strategies. Facilitators recorded key points and reviewed agreed findings; the feedback from each respective group was then presented using the electronic whiteboards in the conference room.

In the afternoon participants were placed in new groups to explore the potential for constructing new toolkits for evaluating learning spaces. During this design activity, delegates discussed their own spaces and evaluations, and the tools and methods that had proven appropriate for various stakeholders. Once again these discussions were annotated by facilitators on whiteboards, whilst delegates could visually notate with digital camcorders.

The day ended with feedback from these groups and a collective discussion of the work carried out during the day.

During discussions it was important to stress that the focus was not on actually evaluating learning spaces, but on assessing the suitability of various methods used in evaluating learning spaces. Nevertheless, the context had to be established and moreover, assessing tools also meant assessing the implicit assumption that there is a direct relationship between design and learning.

The outcomes of this workshop were designed not only to provide useful data for the study in general but also to inform the content and structure of the second workshop held later in the study.

Appendix 5 – Briefing Document for Workshop 1

Examining methods for the evaluation of learning spaces: briefing for the workshop

Introduction

The JISC Evaluating Learning Spaces (JELS) project aims to identify and review methods to evaluate how technology-supported physical learning spaces affect learning and teaching. We are interested in interactions between learning/learners, teaching/teachers, space and technology. The aim is to produce a catalogue of such evaluation methods, covering conceptualisation, design, implementation, post-occupancy studies and, most importantly, the interaction of space with learning and teaching.

Innovative, technology-supported physical learning spaces may support new forms of learning, increase student satisfaction and enhance the prestige of the institution within the sector. However, evaluation of such spaces is often limited to post-occupancy studies. Little reference is made to pedagogic principles, nor to serious attempts to understand the ways in which such spaces support new forms of interaction by learners.

This workshop will make use of the innovative Hallward Library, which encloses a variety of technology-supported learning spaces, to bridge the gap between theory and practice. Firstly, we will explore how methods of evaluation could be applied within the Hallward Library as an exemplar set of learning spaces. Then we will use this experience to attempt to define new methods for evaluating learning spaces in learning and teaching.

Evaluation methods

Methods need to be defined in such a way that practitioners can apply them to their needs, and also so that they can be operationalised directly in order to evaluate a learning space. To enable evaluation methods to be compared by practitioners, it is proposed to formulate a consistent structure for representation which might form fields within the catalogue.

Epistemological assumptions

An evaluation must confront the issue of what it means to learn within the space. For example, the space might be constructed to prompt certain kinds of student behaviour, to facilitate social interaction between participants in learning and teaching scenarios, or to present information in innovative ways for teaching.

Reason for evaluation

Evaluations of learning spaces can be motivated by various factors. Examples include the evaluation of student satisfaction, the assessment of impact upon learning, assessing the facilitation of new or augmented teaching scenarios, or to justify the funding which has been allocated and spent.

Desired outputs for stakeholders

Evaluations will result in outputs to stakeholders, which may take various forms, including reports to senior management, scholarly publications, dissemination through technical reports, or reflection upon feedback through an iterative design document.

Context and suitability

It is necessary to consider the kinds of technology-supported physical learning spaces which can be evaluated by the method. Types of space can be differentiated according to how the learning is initiated, managed and oriented.

Types of learning space with informal initiation and management include drop in centres and cafes. Libraries usually have an informal initiation but require formal management, while resource centres, particularly those connected to a course, require a more informal management style and institutional initiation. Formal seminar and lecture spaces require both formal management and initiation. Learning space orientation could be around research-based learning (for example, the Learning Sciences Research Institute), problem-based or work-based learning, or learning within a traditional academic context, such as lectures.

Tools

Evaluations require instruments of research to be selected which are appropriate to the space, users and the learning scenario. They must also be suitable for producing data which can be analysed in a manner appropriate to the desired outputs. Tools might include user satisfaction surveys, surveys of potential users or feedback forms from existing users, each of which may utilise open or closed questions, or a combination of the two. Interviews with users or potential users might be conducted in either individuals or groups, and captured as audio or video data for transcription or visual analysis. Manual or automated user data could be captured, including head counts, equipment usage monitoring and the density of bookings for the space.

Budgetary implications

An evaluation must be clearly budgeted, with appropriate tools and outputs chosen according to the feasibility of cost. The available budget will influence the choice of evaluation method.

Time implications

Clear timescales need to be set for the evaluation, taking into account output deadlines and the time taken for the tools to generate meaningful data.

Definitions

In attempting to evaluate the evaluation methods, we are essentially engaged in a meta-analysis. In such a process, the use of a common vocabulary is essential if debate around how evaluation methods can be defined, compared and utilised is to be meaningful.

Within the project, tools are defined as concrete devices for data gathering. For practical evaluation purposes, a variety of tools may be required, including questionnaires, video or audio interview data, computer system logs (for example, of swipe card access systems), researcher field notes, and others. The choice of tools is dependent upon the evaluation method.

We define frameworks as position statements relating to how technology-supported physical learning spaces augment teaching and learning. Frameworks may be defined in policy documents or scholarly articles; they may be abstract approaches that have been used little in practice. Frameworks may advocate a research methodology, such as design research, qualitative research, quantitative analysis, or ethnomethodological approaches.

Evaluation methods, the central focus of the project, are practical and concise expressions of techniques which allow a learning space to be evaluated successfully.

The catalogue is the primary output from the project. It is an annotated guide to those research methods that have been uncovered, either those that have been developed within the project, for example at the workshops, or those which can be extrapolated or even reverse engineered from the work of others. Ideally, the catalogue would be able to guide practitioners towards suitable methods based upon their aims and needs.

 It must be stressed that the definitions of terms used for this workshop are made solely to aid consistency and avoid confusion.

Appendix 6 - Workshop 2

Introduction

The aims of the JELS Workshop 2, held at The Automatic, Liverpool John Moores University on 24 February 2009, were:

- To bring together a collection of delegates of appropriate backgrounds and expertise, from library and central university service leaders to those involved in groups responsible for the creation of new learning spaces, such as CETLs (Centre for Excellence in Teaching and Learning).

- To conduct primed discussions around existing learning space evaluations in order to establish their usefulness, to compare them and to place them into context against what might be possible.

- To envisage how future evaluations might better focus on, and even nurture, learning and teaching within learning spaces, by considering three interrelated research questions.

Within the context of the project, the purposes of Workshop 2 were to help review our findings from our literature survey and interviewing activities into a contextualised

and synthesised whole through a process of discussion, and to suggest ways forward for learning space evaluations which might inform our eventual project conclusions and recommendations.

A key enabler for the Workshop 2 process was *The Distiller*, a group collaboration system developed by Liverpool John Moores University to allow groups of people to collaborate quickly and anonymously by using personal keyboards as input to a large set of central screens. At several points during the Workshop, The Distiller allowed us to conduct a two-stage process of data gathering followed by validation, thereby allowing us to attempt to gain the maximum benefit from the time available to us with our assembled group of experts.

Knowledge of participants

We utilised several mechanisms to ensure that our participants were familiar with our conceptions of the issues around learning space evaluations and spoke a compatible vocabulary.

First, the selection process used to choose delegates was intended to target those with an established interest or expertise in the field. Two of our participants were students at Liverpool John Moores University, who were there to provide a "learner's-eye view".

Second, we sent a two-page briefing document to delegates shortly before the event (see Appendix 7 - A briefing document for Workshop 2

 The document considered definitions for working spaces and established our points of interest within the project and provided an overview of what we hoped to accomplish during the day.

Third, we planned two keynote presentations to set a context for the workshop discussions. The first presentation, from Hugh Anderson of HAA Design, concerned the evaluation of technology enriched learning spaces in terms of both technology and behaviour, based upon an earlier JISC-funded project. This first presentation argued that existing evaluations were often building-related rather than activity-related, used traditional evaluation mechanisms and were not irrelevant but were certainly insufficient. The second presentation, from Pamela McKinney of the CILAS CETL, demonstrated how they had developed a framework of evaluations based upon the Theory of Change and had begun the process of using this framework to evaluate all of their projects. It should be noted that, on the day, these presentations had to be reversed in order due to logistical pressures.

Activity 1:

The group breakout session was an attempt to come to terms with current evaluation methods and frameworks, to consider concrete examples of evaluations with which the workshop participants had been involved, and to begin a process of mapping the limitations of current evaluation methods. This latter aim was to be achieved through the construction of "axes" representing dimensions of difference along which a learning space evaluation might vary. The aim of these axes was to frame the afternoon discussion by seeking to illustrate that evaluations might vary, and yet were currently clustered across the axes, and to identify positions with a structured

debate rather than coming to an early, possibly premature, consensus (Sharples et al, 2009 p80).

Discussion

The plenary discussion based upon the first task established a number of common concerns, which can be broadly clustered into three themes: Aspects of Evaluation, Aspects of Spaces, and Tools.

Aspects of Evaluation

Concerns about Aspects of Evaluation commenced with the fact that many evaluations were seen to be summative and closed. It was suggested that the negation of this situation, i.e. a formative and iterative process of evaluation which would feed back and subsequently influence the space, would be substantially preferable. A brief discussion ensued about the mutual exclusivity of formative and summative evaluation, with "dual usage" evaluations seen, if practical, as the most suitable scenario in terms of both attracting funding and influencing subsequent work within the space.

A time component was seen as crucial to the design of evaluations. A schema could be constructed of evaluations, taking into account temporal, spatial and durational issues and thereby making it possible to plan for an evaluation programme with awareness of the rhythms of academic life. An open feedback process might take into account not only the types of users submitting the feedback but also time factors associated with the response; this process could be scaffolded where possible by learning facilitators within the spaces. The usage of different kinds of participants within an evaluation was discussed: existing users might provide an authentic picture for an evaluation with a specific purpose; the use of pre- and post-testing evaluation regimes might initially involve interacting with participants before they had encountered the space; while the involvement of learners from other institutions might provide novel insight into an existing space. Within this context, evaluations deploying staged experiments, such as conducting the same learning activity across different spaces, were seen as interesting if ethical considerations could be ameliorated. The gathering of case studies was seen as useful in a strategically limited way, and as an "inevitable" mode of working in some cases.

The precise target of an evaluation was identified as an obvious, but often overlooked, element of evaluative design. Evaluations of spaces were often targeted in practice at an innovative piece of equipment within that space, which needed to be stated more explicitly within outputs. Targets of evaluations were also identified as crucial, with examples including undergraduate and postgraduate students, academics and non-academics for teaching and research, support staff, facilities staff, estates and potential proxy users. The outputs of such evaluations might also be written to be targeted, for example at the different target groups for evaluations already identified, plus parents and prospective students, business users, and external users such as students from different universities.

Aspects of Spaces

These were seen as most likely to impact upon evaluation, straddling a divide between "harder" measures such as the impact of spaces upon assignments and

examination results, and "softer" measures such as popularity with students. Perhaps surprisingly, student voices within the Workshop favoured assessments of the impact of space upon summative student properties, such as coursework and exam results as well as wider employability indicators; one student summed this up as "the quantity of work you get from a space".

At the opposite end of the spectrum, a discussion occurred around soft, social, psychological effects such as how "likeable" the space was to its various users.

Tools

Within the Tools theme, discussion centred around the dominance of methods such as surveys within the evaluative sphere. Vox pops and other student interviews were also seen as relatively easy to deploy, and therefore perhaps over-utilised. More innovative tools might involve those learning facilitators who are often a permanent ground presence, especially within more open access spaces, to log qualitative usage data over time. Other proposed ideas included the collection of IT network activity statistics, the use of stop frame photography, freeze frame video and other automated visualisations of usage within a space, and the student logging of their own activity.

Axes

A series of axes for the differentiation of learning space evaluations were produced as a result of the morning discussions. After the axes had been input into The Distiller, they were voted on by delegates in terms of preference.

Votes	Axes		
9	Traditional Practice	-	Innovative Practice
7	Individual Study	-	Mass Provision
6	Quantitative	-	Qualitative
6	Operational / Technical	-	Human
5	Existing	-	Innovative
5	Purpose (learning)	-	Institutional objectives
4	Closed	-	Journey
4	Top Down	-	Bottom Up
4	Practitioner Research	-	Service Based Evaluation
4	Use	-	Non Use
1	Timing	-	? (non-decided/proposed)
1	Theory	-	Measurable
1	Consumers	-	Investigators
0	Summative	-	Formative
0	Internal Evaluation	-	External Evaluation
0	Internal Initiation	-	External Initiation

Table 5 - Axes of differentiation for learning space evaluations

shows the opposing ends of the axes, along with their relative voting by delegates.

Activity 2:

Here we focussed upon how evaluations for learning might be re-conceptualised in future. Specifically, break-out sessions considered the following three research questions:

- What tools and methods could be established to critically, and potentially qualitatively, evaluate learning and teaching activities within technology-supported learning spaces?

- How might the commonalities and differences, across learning objectives, of different learning space users such as teachers, students and support staff, be effectively examined and mediated within a learning space evaluation?

- How might institutional policy and learning space evaluation be constructed and related such that the former becomes informed by the latter?

Across these themes, our intention was to formulate a discussion about what is desirable, viable, and feasible.

Question 1

Group 1 focussed on the question: "*What tools and methods could be established to critically, and potentially qualitatively, evaluate learning and teaching activities within technology-supported learning spaces?*"

The group proposed that tools be hierarchically related to the levels of the Maslow hierarchy presented within the JISC document *The Design and Management of Open-Plan Technology-Rich Learning and Teaching Spaces* (Watson et al, 2007); the notion here is that learners' needs can be related to each other in a hierarchy which ranges from fundamental basics to more subjective needs, and that each successive need within the hierarchy grows in importance after the lower order needs below it have been fulfilled. Nonetheless, any such hierarchy targeted to enable the evaluation of learning spaces would be more complex than that simply for design, and must be viewed as a complex "moving target" linked to a set of iteratively evolving tools.

The group considered that evaluation tools should be developed as part of the design phase of a learning space, perhaps linked to explicit theories of learning, which in turn form the basis of the associated indicators of success. Nonetheless, as above, tools need to iteratively change over time to take into account new developments and conditions.

The process of tools development was seen to be programmatic rather than atomised. Since learning spaces encompass complex, interrelated variables it was seen as necessary to reflect on the variables to identify closely related clusters, to choose tools appropriate for those clusters, and then develop a programme that deals with all the clusters over time, and which itself can be reiterated.

The group closed their discussions by emphasising the relationships between these tools and other factors. For example, communication with space users in ways that recognise diversity and appropriately target communication styles, and the creation

of a culture of "technological openness" between users and IS/IT service centres which allows criticism to be seen as constructive feedback rather than a territorial issue was seen as being desirable.

Question 2

Group 2 focussed on the question: "*How might the commonalities and differences, across learning objectives, of different learning space users such as teachers, students and support staff, be effectively examined and mediated within a learning space evaluation?*"

The group began by contemplating the necessity of integrating academic research on teaching and learning into the evaluation process. Considerable attention was seen to be needed on topics such as the "how" of evaluation, the emergent research process around evaluation, and suitable ways of aggregating outcomes within a project into targeted, evidence-based proposals. A management of expectations was required to avoid a situation wherein too much was expected of an evaluation project, since this might place unnecessary pressure on the staff carrying out the project to produce inflated results. Existing evaluation methods were seen as too intuitive and anecdotal for purpose; a suggested improvement was to tag large amounts of data for strategic overview and analysis as the project progressed or even as an institutional policy at meta-project level. An increased focus on practitioner research regarding their own usage of space was viewed favourably by the group.

An associated problem of representation was seen to be the disciplinary differences in which spaces are used, linked to notions of discipline-based pedagogy. A more reflective process might allow such differences to be discussed and take into account by evaluation processes, and might also reduce territorialism. Issues of choice and complexity were seen to be important, and not just for open plan spaces. The anticipation of flexibility within all spaces and the subsequent evaluation of "adaptability" to different contexts was seen as a crucial part of this process.

The group considered the *identities* of the different groups of users, and suggested that a better understanding of the commonalities and differences of these groups, in terms of their interactions with learning spaces, might make evaluations of the needs of different users more practical through appropriate clustering around specific design issues. Such clustering might allow for a process of factor analysis to occur.

Question 3

Group 3 focussed on the question: "*How might institutional policy and learning space evaluation be constructed and related such that the former becomes informed by the latter?*"

The group began by clarifying that, if the desired outcome was a situation where evaluation influenced policy (and, perhaps, vice versa), then evaluation needed to act as a process of *mediation* between learners and those people who influenced or wrote institutional policy (hereafter, "policymakers"). The task, therefore, was to design evaluation as a mediation mechanism by which student *influence* (rather than merely satisfaction) over a space might be increased.

The group continued by identifying those policies which might be impacted, even indirectly, by learning space evaluations: budgets; learning, teaching and assessment strategies; institutional research profile policies; timetabling; School or Department strategic plans; IS strategies; Estates strategies; the institutional response to National Student Survey; associated student experience strategies; programme development and quality; Staff Development Units, including those for academics; responses to professional bodies, including to accreditation requirements; accessibility, equality and diversity policies. All of these policies were seen to be open to influence by learning space evaluations in an ideal situation, although when group members were asked to prioritise the policies through voting, the three most immediate levers of influence were identified as: the learning, teaching and assessment strategy, the Estates strategy and the student experience response strategy.

The group next moved on to consider how policymakers might be convinced to implement policy change based upon the evidence gained through learning space evaluations. Such mechanisms included:

- Financial arguments, both institutional (evaluations might save money through warning against inappropriate developments and practices) and personal (policymakers from successful institutions might gain work as external consultants on this issue);
- Compliance with legislation, and the desire to move beyond compliance to best practice;
- The impact of University league tables, based upon measures which include the student experience;
- Institutional reputation in terms of the quality of facilities;
- Arguments that policymakers might retain power over institutional decision making by becoming involved, rather than risking increasing irrelevance or being forced into intransigent and isolated positions;
- Argument in favour through case studies or exemplars of good practice which might be followed, emulated or built upon;
- Arguments for efficiency and risk management;
- Being seen as an innovator within the institution.

On the topic of student influence, the following factors were seen to be important:

- Allowing students to demonstrate their design ideas, potentially by giving them access to simple tools within which they could construct visually arresting virtual models of learning spaces;
- Allowing students from other institutions, who might have broader horizons or experience of different types of learning innovation, to be involved in the evaluation process;
- Constructing formal programmes of evaluation built around nominated student representatives (volunteers used longitudinally, student union representatives, online communities, etc).

In an associated discussion with the student representatives at the Workshop, it was established that students were more likely to become involved in learning space evaluations if they were initially contacted using established lines of trust (for example, via a trusted course tutor rather than by blanket emails from unknown functionaries). Similarly, ongoing contact with students was more likely to be established by those with "student rapport". It was considered that refreshments may be sufficient to attract substantial numbers of students to feedback events on the grounds that they might feel a sense of privilege at being asked to contribute, but it was suggested that monetary incentives might be required to achieve repeat attendance over a more longitudinal period. Finally, the notion of online communities using Web 2.0 technologies was welcomed in principle, but only if delivered using dedicated systems within a walled garden, rather than infringing on students' established online social spaces such as Facebook.

Appendix 7 - A briefing document for Workshop 2

Our aim within this study is to identify and review those methods and tools currently used to evaluate the contribution that technology-supported physical learning spaces make to learning and teaching. We seek to understand the impact of these spaces upon learning and teaching, rather than viewing success in terms of design objectives or post-occupancy evaluation. We, therefore, are required to consider the interaction of four distinct elements: learning and learners, teaching and teachers, space and technology.

What are Learning Spaces?

In the broadest possible terms, learning spaces have been defined as places of transition, or possibly transformation, where the learner experiences a shift or re-orientation in their life world. An immediate consequence of this definition is the need to consider the identity of the learner, the identity of those responsible for orchestrating the learning process such as the teacher, the nature of the shift or re-orientation which the learner undergoes, and the way in which the learning process is intended to interact with, or engage, the learner.

Learning Spaces are considered to relate to a large number of existing theoretical concepts. Among others, they may be seen as architectural spaces within which the learner assumes the role of user, as formal or informal spaces based upon the structure of the learning experience which is intended to take place within them, as smooth or striated spaces depending upon whether authority is to be invoked by the construction of the space, as special examples of social spaces, as a process of psychological removal from the real world by associating space with new habits, or as spaces that mediate processes of education or even construct them.

Importantly, within our project we regard the unit of granularity as the physical learning space and associated technology, and the interaction with teachers and learners. For our current purposes, we do not regard the learning space as a psychological or social construct of the individual learner, nor do we examine the impact of virtual spaces, worthwhile as such endeavours might be in future. Instead, we contend that a useful starting point for study is to consider how the same space influences the conditions for learning and teaching, changing dynamically across

time and configuration, and how the identity of the space relates to a variety of factors:

- discipline-based pedagogy,

- modes of learning and interaction,

- the "design gestures" and original intentions of designers and architects, and how they may be translated into learning and teaching activities,

- the impact of the presence of ICT and physical surfaces, and

- the longitudinal impact of the space upon learning and teaching.

Crucially, our most fundamental concern is how such a physical space might be critically evaluated in terms of these objectives.

How are Learning Spaces evaluated?

The evaluation of learning is fraught with difficulty, if nothing else because there are many conceptions of what constitutes learning and how the process occurs. There is widespread agreement that current assessment methods do not fully evaluate learning, but little consensus as to how they might be augmented or replaced to do so. Thus, Learning Space evaluations often owe more to Space evaluation more generally, with processes of learning and teaching often being evaluated only in a modest sense, if at all.

Once this is understood, it is easy to predict the reality of Learning Space evaluations, which are often quantitative and aim to justify capital expenditure by demonstrating post-occupancy measures. Students may be given questionnaires to fill in as "users" of the space, while teaching and support staff are often, curiously, overlooked altogether. Furthermore, there is often little sense of pre/post evaluation, or of appropriate comparators or baseline data. These were our findings during the initial stages of the project, as we undertook a literature survey, but they have been reinforced by our subsequent interviews with evaluation practitioners, which are still underway at the time of this workshop.

What are our emergent findings?

While it is important to understand that our project's data gathering interview processes are still underway, that our formal data analysis is far from complete and that we do not claim that our current selection of interviewees will eventually prove to have been statistically representative, it is nonetheless possible to draw themes from our current data collection processes at an informal level.

It would appear thus far that nearly all Learning Space evaluations are initiated, conducted and reported internally to the institution. Directors or managers of IS Teams, Schools, or CETLs are often the initiators of such evaluations, as well as those pro-Vice Chancellors with appropriate responsibilities. Evaluation is rarely seen as a research activity, and may be relatively informal in structure, especially when compared to the well-defined research questions that theoretically drive research. Support staff are often used as foot soldiers, either to hand out questionnaires to students or to provide feedback in the form of their informal observations. Other common evaluation tools include student interviews and

anonymised feedback forms, which may either be placed in paper form around the space in question, or be made accessible through student terminals. Importantly, what is often measured is student satisfaction, who relationship to learning and teaching could be questioned.

The most common forms of output from evaluation projects are institutional reports, which seek to justify at committee level the investment that has been spent; we found evidence of a few conference papers but no refereed journal articles. Furthermore, the reports are often seen as the end in themselves, with few respondents conveying the notion of an iterative design process. Instead, successful evaluations are used as the basis to justify further, similar development in the future and, in the case of prestigious spaces, to springboard advertising campaigns. Perhaps most interestingly of all, we found no evidence of "unsuccessful" evaluations, leading us to suspect that reports which contradict initial expectations were unlikely to be publicly acknowledged.

What do we hope to discuss during the day?

The primary goal of our project is to produce an annotated compendium of research methods based upon our framework of variables, by which we attempt to capture the nature of Learning Space evaluations as they currently exist. However, beyond this we seek to stimulate discussion around current evaluations, what is captured by existing methods, and what is missed, and how we could seek, as a community, to more critically evaluate Learning Spaces in terms of the learning and teaching activity that goes on within them in future.

Within the first part of the day we hope to hold a discussion about current evaluations, triggered both by our findings, as expressed within this document, and by a presentation by Hugh Anderson, an expert in post-occupancy evaluations. The second half of the day will focus on how evaluations for learning might be re-conceptualised in future.

Specifically, teams will focus on parameters such as:

- What tools and methods could be established to critically, and potentially qualitatively, evaluate learning and teaching activities within technology-supported learning spaces?

- How might the commonalities and differences, across learning objectives, of different learning space users such as teachers, students and support staff, be effectively examined and mediated within a learning space evaluation?

- How might institutional policy and learning space evaluation be constructed and related such that the former becomes informed by the latter?

Across these themes, we wish to formulate a discussion about what is desirable, feasible and viable.

Appendix 8 - Selections from Literature Review

Research into Identifying Effective Learning Environments (Fisher, 2005)

Key concern is that post-occupancy evaluation pays due attention to relationship between learning environment and 'pedagogic performance'. Fisher argues this can be addressed by incorporating 'key performance measures' into the evaluation – e.g. H. Sanoff (2001) 'classroom rating scale'. Sanoff's accompanying criteria look into such aspects as flexibility, collaborative work, variety of learning strategies facilitated, student belonging.

Fisher concludes that there is still insufficient qualitative and 'deep' research into the relationship between pedagogy and design of learning environments and that further research must develop through a close working relationship with classroom teachers to 'ensure its relevance to learning'. Furthermore, we should consider using 'students as researchers'.

Assessing Learning Spaces (Hunley and Schaller, 2006)

Authors were particularly concerned with the problem of how to separate the learning space from other variables when assessing the impact upon learning. They therefore stressed 'multifactor, multimethod' analyses and singled out 3 issues to be addressed in the assessment design:

1. Does the assessment focus upon teaching or learning?

2. Who is the audience for the assessment (information needs to blend with existing requirements e.g. accreditation)

3. Assessment needs to acknowledge that teaching and learning is no longer confined to the classroom (and therefore new learning space).

Authors stress difference between assessing teaching and learning, that institutions should determine assessment targets based upon their own missions and that assessment needs to account for the complex interaction of learning spaces, pedagogic practices and student outcomes. They also state that data should be gathered over time from multiple factors, methods & sources.

Methods proposed were academic engagement and surveying teaching methods; studying the use of learning spaces by means of focus groups & interviews (usual caution for researchers re reliability of memory and authentic communication of feelings), surveys and photographic/video studies (minimal intrusion; relatively cheap)

Examples of models and theories suggesting targets for assessment were; Person-environment interaction (positive & negative) [Strange and Banning, 2001]; Learning Outcomes (observable & measurable) [Huba and Freed, 2000]; Engagement [Astin's theory of involvement – Astin, 1984].

Limitations of the assessments were recognised as including; Students experience different learning environments within a given course/learning activity; Courses taught by many tutors using variety of methods; Learning goals measured at discrete points of course cannot account for impact of various experiences; Measures of

specific learning be sensitive enough to detect differences due to teaching or setting of variables; The attitude of the teacher is critical: is this factored into assessment of the learning space?

The Space is the Message [Tom et al, 2008]

This is a case study of a 'Learning Studio', University of Missouri-St Louis [UMSL]

Motivation to create this space, in part, was pressure/inspiration provided by positive responses to new learning spaces in 'other institutions'. Also, competition and need to keep up or even forge ahead of other institutions. UMSL were convinced that new learning spaces were closely linked to improved student outcomes and enrolments. They conducted an 'in-house' assessment of Learning Studio. Methods included in-house observation (tutors); surveys (small sample); blogs (tutors & students); video observations and faculty debriefings.

UMSL make 5 broad claims for pedagogic success, namely enhanced learning outcomes; engagement; attitude; collaboration and absorption of the curriculum (authors do not seem to develop this).

Further they observe that students want to use learning studio, that it enables 'changes in pedagogy'; 'teacher learning' is enabled, users were encouraged to 'give up the podium' and that students take greater ownership of their learning (by being challenged, inspired, empowered).

Assumptions/limitations noted by the authors were that positive assessments too often reveal assertion rather than quantifiable evidence; that if comparing 2 classes in an attempt to gauge effectiveness of a new learning space, given differences such as different students, time of day, teacher etc. is it really like for like?

They were also concerned that limited access to the space creates haves and have-nots amongst students and that collaborative work is uncritically viewed as a learning virtue (quality of work? Genuine collaboration? Do some students dominate the group? etc.)

They ask how to factor in such things as higher student expectations; costs - new learning spaces take up more room; institution has to balance effective v efficient use of facilities; support issues - do some teachers need high IT support and is this sustainable? Is increasing student comfort necessarily a wholly good thing?

Appendix 9 - Case Studies

Here we present four case studies, selected from the database of interviewees and desk based research, These were chosen as they either demonstrated the use of new and innovative technologies and methods to evaluate learning spaces i.e. going beyond the traditional post-occupancy survey or they addressed the fundamental criteria of attempting to assess the learning, or change of learning, happening within the space.

Case Study 1

This ongoing internal evaluation is based at The University of Durham, Active Learning in Computing (ALiC) CETL[15] (Centre for Excellence in Teaching and Learning) and focused upon a technology-rich learning resource centre, The Techno-Cafe[16]. The space incorporated both formal elements (classroom/seminar room) and informal elements (general learning resource space) reflecting different methods of use. Students were the main target of the evaluation, and it was hoped that the evaluation would indicate whether new scenarios of learning and teaching were enabled, whether students reported a shift in their learning, and how resources and space were being used by learners. The main evaluator, Dr. Liz Burd, is the director of the CETL and a member of the Computer Sciences department. The evaluation was part of an ongoing research project to see how the space was used at different times in the year.

The design of this learning space aimed to encourage collaborative learning through several design elements. Ten booths containing screens encouraged sharing of materials, whilst provision of computers was at a level to maintain sufficient service whilst encouraging group working but also allowing learners to bring their own laptops. The traditional format of a lecture was loosened by allowing audiovisual materials to be displayed in many booths, enabling group working. Learner flexibility was further encouraged through the creative use of non-IT surfaces such as mobile whiteboards. Therefore flexibility of physical space, innovative presentation space and the provision of private study space were the main features of the design. Since completion to date the space has received approximately 100 visitors from other institutions looking at redesigning their learning spaces.

Ultimately the evaluation yielded institutional and funding reports, and furthermore influenced the design of new learning spaces. Compliance with ethical standards for research was obtained via the institutional ethics committee, and as all data was for internal use this was a similar processs as used for recording in many public places. The evaluation was a mixed-methods study utilising multimedia modes of data collection; audiovisual recording in its observational arm and electronic data collection such as online resource access through a continuous data stream. The audiovisual recording was captured by a series of cameras (ten in total, one per booth) providing a detailed multimedia description of learning activities. An external company provided and set up the cameras with advice from the manufacturers, two members of the CETL team were also involved in this process. A rich volume of data was generated examining varying facets of the learning and teaching experience, from physical spaces to temporal issues and usage patterns of surfaces, with both learners and teachers a focus of the evaluation; although no numbers are available, any person entering the space became part of the study and this probably now represents the largest study of a learning space, in terms of data collected, in the UK. The cost of the evaluation was estimated at £6,000 (for equipment/software).

---

[15] http://www.dur.ac.uk/alic/

[16] http://www.durham.ac.uk/alic/technocafe/

Most of the evaluation appears to have thus far examined usage patterns over time, providing answers for questions surrounding the enablement of new scenarios, and how resources and space are being used. Issues of learning may be addressed more fully in time as the lead evaluator hopes to collaborate with colleagues in social science disciplines.

Case Study 2

The Mathematics Learning Support Centre (MLSC)[17] at Loughborough University was designated a Centre for Excellence in Teaching and Learning (Sigma CETL[18]) in 2005, in a collaborative venture with Coventry University's Mathematics Support Centre. This centre seeks to support any students in their learning of mathematics or statistics by providing welcoming and trained support staff, flexible areas of reconfigurable furniture, a number of computers, and access to academics who can provide formal tuition on a face to face one-to-one basis. Despite being a drop-in centre, the space was envisaged as a formal space within which to conduct this tuition.

After receiving the CETL funding, the space at Loughborough was developed as a further iteration of an existing support centre, designed by the CETL Director, Prof. Tony Croft and colleagues in collaboration with the institutional Estates department. The design of the space was constrained by existing building infrastructure, such as walls, which could not be modified.

The drop-in centre space was designed so that students could use it to work on coursework, either on their own or in peer groups, to request help from academics on a one-to-one basis, and to obtain computer access to search for resources. Adjoining space dedicated solely to second and third year mathematics undergraduates, was used to facilitate peer support, provided a small reference library with computers and equipment so that students were able to practise their presentations using a data projector. The evaluation of the space was internally instigated and formulated by the CETL director; the central purpose was to establish usage data which could be reported back to HEFCE through the CETL Interim Report. The evaluation was focussed on providing practical results, with no particular emphasis on evaluative innovation.

Evaluative research around the space was subject to a perceptual divide between evaluation and research. The "formal evaluation", which consisted of collecting mainly quantitative usage data, was viewed as separate from, although "parallel" to, the "pedagogic research", which involved focus groups with students.

The formal evaluation was carried out by a CETL evaluation officer (0.2 FTE) and CETL Assistant Director, who had been assigned the activity of evaluating the space as a small part of their work.

---

[17] http://mec.lboro.ac.uk/

[18] http://www.sigma-cetl.ac.uk

Throughout the CETL funding period, several pedagogic research studies have been conducted by academic staff in association with research students. These have focussed both on the space itself and the ways in which students are encouraged or discouraged from using it. One example of this research focuses on the space dedicated to the specialist mathematicians (both at Loughborough and Coventry Universities). A total of 21 maths students from the two universities took part in the focus groups, typically 3-5 students per group with a total of 6 groups. Volunteers were invited to put themselves forward. There was no payment made, but they were encouraged to come along and tempted by cakes and soft drinks.

The format of the sessions were open and conversational, but around certain themes guided by questions predetermined by the facilitator. i.e. What was different about year 2? What forms of support did the students call upon? What were the key transitional issues? etc.

Researchers were primarily interested in how undergraduate maths students' "mathematical identities" changed with exposure to university teaching.

- Why do many students become alienated from mathematics even though they have chosen to study it at university?

- How space facilitates interaction between tutors and students, and facilitates student-student peer support.

- Can the provision of such space reduce alienation, improve engagement?

Researchers' findings suggest that this latter is the case. For further details of the study, readers are directed towards a research paper accepted for publication in "Studies in Higher Education"[19].

The purpose of the evaluation was to be formative, to feed into the Interim Report and then to subsequently be used to change practice in the remaining years before the CETL final report in 2010. Both the evaluation and the pedagogic research are ongoing processes, still underway at the time of writing. The evaluation of the drop-in centre uses feedback forms which have a low response rate. Swipe card data is also collected providing information about the identity of those using the space.

Baseline data for the usage statistics was available for comparison, primarily because a proto-centre had existed prior to the award of CETL funding, for which the swipe card data had been archived.

The evaluation and research instruments provide a mixed set of quantitative and qualitative data, both of which feed into CETL reports. Swipe card data is analysed to produce results about the identity of student visitors, their repeat visit patterns, and their associated departments. Annual quantitative reports are produced which summarise these usage statistics, indicating how usage from different departments has varied compared to previous years and also focussing on the increased use of the space by students.

---

[19] Safety in numbers: mathematics support centres and their derivatives as social learning spaces, Solomon, Croft and Lawson – not yet published

The focus groups are analysed more qualitatively to ascertain the student experience of using the space and to attempt to understand which aspects of the space are most useful. Broadly, students value their perceived ownership of the space:

"they liked this learning space … because it was their learning space, not a lecturer's office and they can take their things out in it and they can make it their home for the time that they're in there and it becomes 'theirs' not a member of staff's space"

The ongoing evaluation is seen to have been successful in answering the research questions, in terms of ascertaining the fact that the space has been used, and used appropriately. The evaluation has also been successful in identifying unanticipated benefits, such as the students' appreciation of the space as their own territory and an increased "colonisation" of the space by students who value the facilities even if they do not require access to a member of staff. This former conclusion has helped the CETL to defend its design decisions against those who argued that an academic "open door" tutorial policy might negate the need for such a space.

The CETL subsequently intends to use the evaluation in two ways. Firstly, there is the notion that the evaluation, which has demonstrated success, will be instrumental in securing further funding from within the institution to continue the work of the space once the tranche of CETL funding ceases in 2010. Secondly, the CETL hopes to use the evaluation to gain more input into the construction of such learning spaces at a wider, institutional level, although the fact that many voices will be competing for such influence has been acknowledged.

Case Study 3

This example focuses on the work carried out by colleagues operating across two institutions, the Reinvention Centre at the University of Warwick and Oxford Brookes working in this case at Warwick. It was a series of internal evaluation activities that followed a particular class of students (in the social sciences) to see how they reacted to the different spaces as a group, as well as individuals. The academic researchers who carried out this work considered it to be continuous "action research" rather than a single evaluation *per se*. Staff involved in the research were mostly academics but there was additional input from library resource/learning facility management and staff from Estates and Timetabling divisions.

The main space under investigation was $120m^2$ of floor space with flexible, moveable furniture, making it easy for users to transform the shape and purpose of the room. The open design and layout is intended to facilitate active learning and interaction between students and teachers. The room makes good use of natural light from windows in the walls and roof; there are also spotlights embedded in the floor and lights shining up into the ceiling. The floor is made of rubber and is heated so that teachers and students can sit and work on it if desired. There is wireless internet access throughout the room and some laptops are available for use. In addition there are two data projectors and the room is also audio-enabled.

The study was heavily observational, using an ethnographical approach. A single class of 30 students and one teacher were observed in a number of different

environments over a period of two terms by a team of three researchers, two researchers were present in each session.

The researchers, recognising the need for better evaluation methods than those currently being used, wanted to pilot new evaluation methods. They also wanted to look at the interaction between space, pedagogy and curriculum. Specifically they looked at how the social dynamics of the group, including the teacher, were affected by space and how the orientation to learning and teaching was adopted in that space. It was hoped that these areas of research would influence the future design of other learning spaces, in line with key university strategies at both institutions.

Whilst the Reinvention Centre at Westwood is very much focussed on the practice of teaching, the use of the space was described by the researchers to be "flexible, student-centred, collaborative", where traditional hierarchies or power structures between teaching staff and students were broken down, since there was no fixed place for either group. It was felt very strongly to be a social learning space, with no formal layout, whilst being fully technologically-enabled. The large amount of qualitative data gathered from these evaluation activities is still being processed although a number of academic publications have resulted to date[20]. Approximately £13,000 has been spent on evaluative tasks so far and research into these learning spaces is ongoing. Findings from the research are expected to inform the wider community into the design of learning spaces and also help in the development of appropriate evaluation tools.

Case Study 4

This was an internal evaluation of a technology-enabled space within SPLINT (SPatial Literacy in Teaching)[21] at The University of Nottingham as part of a teaching and learning project into spatial visualisation, itself part of a wider consortium with two other institutions (The University of Leicester and University College London). The evaluators, Associate Professor Gary Priestnall, and Dr. Nick Mount are members of the Geography department and the focus of the evaluation was upon the students and their reflections of the learning space and the usability of the visualisation equipment therein. This project is also linked with the JISC funded DELVE (DEsign of Learning spaces in 3D Virtual Environments) Project[22].

The evaluation was purely qualitative and consisted of small informal focus groups with open discussion around aspects of the learning space and in particular, the benefits and disadvantages of various technologies used in the space to support specific teaching activities. The students were asked to reflect upon their use of the space – were they working individually? In small pre-allocated groups? Or in ad-hoc groupings? Further questions centred around their use of the technology within the space and any problems or issues they experienced.

---

[20] http://www2.warwick.ac.uk/services/ldc/resource/interactions/current/ablambert/lambert

[21] http://www.le.ac.uk/geography/splint//index.html

[22] http://www.jisc.ac.uk/whatwedo/programmes/elearningltig/delve.aspx

The learning space itself was created according to specific criteria (flexible learning space in terms of room layout/furniture) and ideas for where some of the visualisation equipment should be (e.g. dual data projectors to provide a stereo, 3D, interactive display). In particular, there was a trade-off between having as large a screen as possible at one end of the room, in combination with only having a flat floor – to overcome this, the room was designed to have a pitched roof at one end to accommodate the screen. The space was designed to provide both formal and informal physical spaces: it is has a fixed console in one corner for either the lecturer or the student to present, but the same area has loose chairs and desks that can be arranged into various configurations. Wireless internet access is also available although this is not robust and there is ongoing work to improve this. Laptops and a variety of other hardware devices are available for use, such as GPS-enabled PDAs.

The evaluation to date has been on a small scale, with focus group activities contained within usual teaching activities. The evaluation strategy was set by Jane Wellens of the University of Leicester who has been overseeing evaluation across the whole SPLINT CETL. As a CETL, the budget for the evaluation was embedded within the overall project so there was no exact figure for this. The findings of the evaluation has led to a couple of conference papers, details of which can be found on the SPLINT website, and has aided in some re-designing of the learning space to integrate additional visualisation technologies. Ongoing analysis of all the focus groups will be presented in a working paper from their project in due course, which will be publicly available from either the SPLINT or the DELVE project website.