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## User Centred Design of Learning Spaces

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### Abstract

Design of learning spaces has to correspond to users' needs and goals, how current and future practices evolve in them and users' appropriation of new technologies. Financial constraints, increased diversity among students, more and more students taking part-time and flexible learning options, etc. have created new challenges for the design of learning spaces in higher education. In this new context innovative technologies are also emerging and the ways people communicate, coordinate and collaborate are continuously transforming and changing, which affect learning space design.

Our empirical data consist of focus group interviews with students and directors of studies. Students preferred learning spaces that integrate formal learning activities with more informal and leisure activities. Directors favoured spaces that integrate their roles as teachers, researchers and administrators. Based on the results of the focus group interviews we designed three different learning spaces supporting classroom teaching as well as more informal learning, which allow students to perform both individual and group activities. The learning spaces described are not yet evaluated. We believe that the appropriation of a learning space is a complex process. Hence, when evaluating the use of learning spaces it is essential to understand users' practices, their needs and goals and their use of learning resources.

**Keywords:** Learning spaces, user centred design, information and communication technology (ICT), technology enhanced learning

## Introduction

During the past two decades technology-enhanced learning has been one of the most prominent innovations of the educational arena. The promise of e-learning to deliver a design-rich, place-independent and fully customizable educational setting can be said to emanate from the marriage of new technologies with new theories of learning. Of course, ICT and learning has much longer history, but in the 1990's a renewed interest in how the rapidly developing information technology affects how, when and why people learn arose. Many also believe that the so-called Twenty-First Century Learning Skills (21CLS), especially the skills in information, media and technology, are important skills to learn for students (Warshauer & Matuchniak, 2010). Currently, with the rise of new technological innovations such as smartphones and tablets the development and exploration of how these artefacts can be used to enhance learning have increased even further (Brand & Kinash, 2010; Hoover & Valencia, 2011; Mulholland, 2011). At the same time as technology and learning theories have developed societal changes have occurred that have implications for learning spaces at universities. Today many universities struggle with financial constraints that have impact on the amount of time a teacher actually spends in the classroom. In Sweden a consequence of this is that the amount of teacher time in classrooms are decreasing to levels that are less than 5-6 hours/week (Markowski, 2009). For students this means that they to a larger extent than before have to act, and learn, in environments outside the formal classroom.

Given the developments, and others, described above it seems obvious to conclude that the educational context has become more complex the last decade. Therefore it is important to recognise that designing today's learning spaces is a quite intricate task, including considerations regarding technology, financial matters, learning theory and students' preferences. In other words, designing learning spaces require a holistic perspective rather than a narrow focus on specific activities in the educational context (Jones et al., 2005). Hence, the purpose of this paper is to investigate whether a user centred approach can help us to design learning spaces in a more holistic way.

## Learning spaces

Many describe the current trends of higher education as involving a higher degree of enrolments, increased diversity between students, ubiquitous access to Internet, and an unbundling of faculty roles through employment of more non-tenure and part-time instructional staff. Because of these trends there are rising needs for more, and better, coordination between the various actors involved in the educational context (Levy & Murnane, 2004; Paulson, 2002; Schuster & Finkelstein, 2004; Greenhow & Belbas, 2007).

When students, technologies and learning settings are changing this will also have impacts on learning spaces in general. According to Temple (2007) the concept learning space has not attracted any greater attention from scholars or researchers. Within higher education space has mostly been related to space planning or architecture, rather than being perceived as a crucial resource in teaching and learning. In this paper we adopt Brown's (2005) definition of learning space: "Learning spaces encompass the full range of places in which learning occurs, from real to virtual, from classroom to chat room." Moreover, the developments in the blended learning area have led to a situation where more and more learning spaces comprise both virtual and physical elements.

However, the subject of learning space has received more attention during the recent years, see for instance (JISC, 2006; Oblinger, 2006; SMG, 2006; Scottish Funding Council, 2006). These authors present examples of how to design learning spaces that are more appropriate for students and teachers needs. Most of our current physical learning spaces are based on design models from the 1950s and 1960s, and contain lecture halls/rooms with rows of chairs/tables (Temple, 2007). In accordance with new pedagogical models there has been an increased interest to investigate whether space have impact on how we teach and learn, and Monahan (2002) have put forward the concept of built pedagogy in which the central idea is that spaces provide affordances and limitations that affect what is possible or not. Lomas and Oblinger (2006) stress the issue of student habits and practices and argues that they will have impact on future learning spaces. New student's practices that are adopted are for instance the extensive use of information and communication technologies. This creates new requirements for learning spaces. According to quite a few researchers characteristics such as digital, mobile, independent, social and participatory should be taken into account in the discussion of future learning spaces. In their investigation of space and pedagogy Jessop and Smith (2008) found that most of the layout and furniture at their

campus favoured a teacher-centred approach. Similar to JISC (2006) they also found that users were reluctant to change the current format of the learning space and hence adopted the learning signalled by the arrangement in the room.

The discussion above indicates that our learning spaces have become larger. Jones, Dirckinck-Holmfeld and Lindström (2008) emphasises this and argues that virtual learning spaces in higher education alone is complex settings that involve management, administration and ICT as well as teachers and learners. Organisational aspects as well as pedagogical aspects influence practices in these environments. However, we lack established methods for evaluating the interrelationships between all the different actors involved in the integration of technology, support, collaboration, teaching, learning, and administration of technology in learning spaces (Greenhow & Belbas, 2007).

To summarise, we argue that there exists no design method for learning spaces that cover the social and organisational habits developed in a larger context. Much has been done, i.e. organisational models and structures for designing virtual universities or solving interoperability problems with learning objects, but methods that analyse affordances of technologies and developmental processes of work practices that change the setting over time are very little explored. Also, the use and design of virtual learning spaces traditionally have had a product focus, that is, a focus on designing devices, artefacts, systems or services. Although there exists attempts to develop spaces that support “communities of practices”, there have been little investigations into how such learning spaces should be designed. In general practices are difficult to design – they tend to evolve and develop dynamically over time. Design should therefore consider the appropriation of technologies and their integration into practices, rather than trying to optimize the product or tool with multiple features.

### **The usefulness of a user centred approach**

From the discussion above we can conclude that learning spaces can be intrinsically complex. Regardless of whether the learning space is virtual, physical or blended we believe that it is important to take a student and teacher (as users of learning spaces) perspective into account. This must include users’ habits and the communication patterns they have developed through the appropriation of technological artefacts. In order to investigate the importance of the user perspective we conducted a pilot project at our university. Our purpose was to inquiry if a user centred approach can be useful in the design of future learning spaces.

The pilot study was conducted in fall 2008 and involved 33 students and 12 directors of studies. The students came from different educational programmes (engineering, social work, business administration, etc.) and were both bachelors and master students. They represented both campus students and students from two of the university annexes. Both are located more than 100 kilometres from the university campus.

The method we used was focus group interviews in which the participants conducted two brainstorming sessions. Our approach was influenced by Stuart (2008) who used a similar method when redesigning the library at the Georgia Institute of Technology. The first session considered the physical part of the learning space, and the second the virtual part. Each focus group interview contained 5-7 persons and took approximate 45-60 minutes. We began all interviews with the physical part. The first thing to do was an individual task where the participants were asked to imagine entering a physical building and make notes of what they would like to find. They wrote their findings on post-it notes and there were no limitations in what they could write; it could be a feeling, things, a reflection, a sentence, etc. Thereafter they individually clustered their notes on a whiteboard. Finally, they worked in groups and clustered their notes and negotiated a common header on each cluster. The same procedure was then made for the virtual part of the learning space. In this session we began by asking the participants to reflect on what they wanted to see when entering their own virtual space at the university.

The data from the focus groups show a clear need for integration of private and public spheres. Neither directors of studies nor students seem to make a clear distinction between their work (directors) and their studies (students) and what they do outside these contexts.

The students described their ideal physical space using concepts as:

- Water: waterfalls, brooks, streams, fountains.
- Colour: warm colours, interesting wallpapers, colour themes in each classroom.
- Sound/Audio: a combination of silence and sound (people talking, music, birds, etc).
- Plants: flowers, green plants, plastic flowers.
- Tempting furniture: sofas, round tables, round rooms.

- Accessibility: computers and printers, wireless, information and service centre in the middle of campus.

The directors of studies had similar reflections on the physical space. They organised their expressions around the following themes:

- Pale and open spaces.
- Flexible spaces that is easy to rearrange according to teaching and more informal learning.
- Mobility and wireless communication.

Both directors of studies and students describe the virtual learning space as more complex than the physical learning space. Their descriptions most often involve an integration of private and public spheres outside the educational context with the virtual learning space. The students describe an integration of private and formal technologies and behaviours and communication patterns that probably have evolved through appropriation of personal technologies, for instance mobile phones, instant messaging and web 2.0 technologies such as Facebook, flickr, YouTube, blogs, etc. The students' description of the virtual space were organised around the following themes:

- Features: calendar, forums, chat, reservation systems, links to everything connected to my educational programme, history of my performance (e-portfolio), future courses, personal communication, course material, search engines, news, SMS and connections to Facebook, YouTube, etc.
- Design: "clean", fresh, nice colours, easy search, programme oriented rather than course oriented, personal, practical, structured.
- Services: buy and sell, contacts with other students, dinner proposals, cultural events, maps over free wireless connections, collaborations with companies and public authorities, translations, pod-casts, TV-guide, job advertisements, student union, time tables for bus and trains, dissertations, links to associations and other non-profit organisations.

The ideal virtual learning space for the directors of studies seems to be more complex than the students' ideal virtual space. The directors describe their ideal space as a space that is able to integrate much of the support they need in their roles as teachers, administrators and researchers. They describe the virtual space using the following themes:

- Teaching and learning environment; integrating all the resources related to a course.

- Information space; contacts with colleagues at the department, the faculty, the university as a whole, the vice chancellor, news and regulations from the government.
- Project space; common information space for different kinds of projects, “memory spaces”, my own documents and resources.
- Research; links to my research field, networks, forums, library connections.

## **The concrete result of the focus group interviews – a new learning environment**

Based on the focus group interviews our department invested in furniture and technology for the students during 2010 and 2011. The traditional computer lab with rows of tables and computers has almost disappeared in favour of more collaborative settings. Figure 1 shows a computer lab with a large table in the middle. The character of the table is inspired from an architecture setting with standing wheelchairs and a table surface, which allows students to write on the table with whiteboard pens. Each computer workspace allows students to sit in pairs and collaborate.



Figure 1. Collaborative space for digital media production

Our department have been using videoconference equipment in decentralised education since the 1990's, but always in special studios or large lecture halls. Today, our new videoconference systems are integrated in regular classrooms and permit the teacher to perform classroom teaching with students on campus and off campus at the

same time. Figure 2 shows part of one such classroom. It also includes furniture for collaborative activities (d).

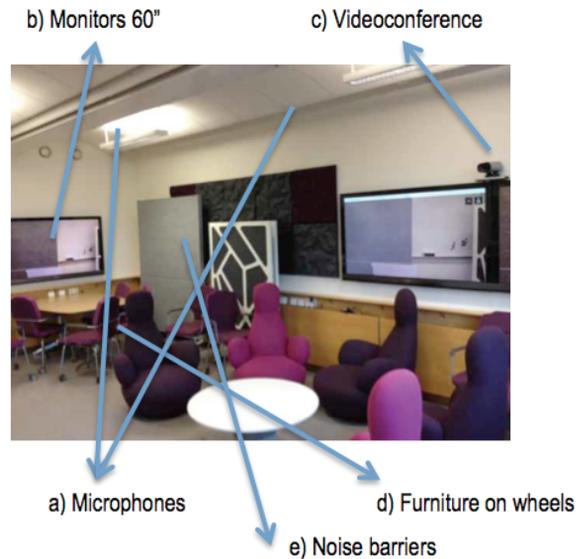


Figure 2. Configuration of a lecture room (former computer lab)

Each table and chair is on wheels and can easily be moved, and each workplace is connected to a wall mounted 60” monitor (b) (in total there are five monitors installed in the room). When the classroom is not used for teaching the students can use the room for individual or group activities by using the noise barriers to separate their workspace from the rest of the room. The teacher can use either all the monitors to perform classroom teaching showing e.g. slides on every screen, or allow students to collaboratively use each monitor for group tasks.<sup>1</sup> The room is also equipped with a videoconference system and microphones in the ceiling (a, c) to connect students from remote sites to the learning space. Currently, the department has two satellite groups approximate 140 km from campus, with a dozen students at each site. At those sites the rooms are equipped with only a 60” monitor, a web camera and a computer containing the client software to the videoconference system.

Outside the classroom the university have started to develop learning spaces according to the outcome from the focus group interviews. One example is the learning space in the University library (see Figure 3). This space is available for students 24-7. It is

<sup>1</sup> [http://www.youtube.com/watch?v=\\_W19KV7veUs](http://www.youtube.com/watch?v=_W19KV7veUs)

designed to be very flexible. All furniture is on wheels and can be rearranged according to individual preferences.<sup>2</sup>



Figure 3. Learning space at University library

## Concluding discussion

Our focus group interviews show that both students and directors have goals and interests that are not in accordance with current learning spaces. Students prefer spaces that integrate formal learning activities with more informal and leisure activities. Teachers, on the other hand, prefer spaces that provide flexible settings appropriated to their pedagogical approaches and their other roles as researchers and administrators. Similar results can be found in other investigations. At the University of Technology in Sydney, the students reported that the following activities was of importance in learning: i) Quiet spaces to study alone, ii) Spaces to socialise with other students and friends, iii) Spaces to study with others, and iv) On-campus shops. In the same study the participating teachers claimed that they had shortages of flexible spaces and breakout spaces (TLC, 2005). Chism, et al (2005) describes a similar picture in which the students valued comfort, colour and design.

The learning spaces described in the previous section are not yet evaluated. We believe that the appropriation of a learning space is a complex process. Therefore, we have to investigate what kind of interdependencies and dependencies that already exist or may

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<sup>2</sup> <http://www.youtube.com/watch?v=ZQ2dCwzSTvY>

be created when users appropriate a certain learning space. When teachers and students enter a learning space they rely on earlier experiences and practices. Transformations of practices seem to be related to individuals' actual needs, motives, goals, and problems in the specific space. The learning space can therefore be affected in two ways. Firstly, the learning space can inform current practice among the users in such a way that it transforms to a new practice. Secondly, the current experience among the users of the space can influence the choice and use of artefacts, which then will affect the learning space. If users want to solve a problem or see an opportunity within a learning space they are motivated to transform their practice. If the current learning resources are insufficient for this transformation they search for other resources to fulfil their objectives. If the learning space does not correspond to users' needs and goals they enter other spaces that are more appropriate. Hence, when evaluating the use of learning spaces it is essential to understand users' practices, their needs and goals and their use of learning resources.

## References

1. Brand, J. and Kinash, S. (2010). Pad-agogy: A quasi-experimental and ethnographic pilot test of the ipad in a blended mobile learning environment. In C. H. Steel, M. J. Keppel, P. Gerbic & S. Housego (eds.), *Curriculum, technology & transformation for an unknown future, Proceedings ascilite Sydney 2010*, (pp. 147-151).
2. Brown, M. (2005). Learning Spaces. In D.G. Oblinger & J.L. Oblinger (eds.), *Educating the Net Gen*, Boulder, Colorado, Educause, 2005, eBook, available at <http://www.educause.edu/research-and-publications/books/educating-net-generation/learning-spaces>
3. Chism, N.; Coles, L.; Pyle, E.; Bevers, L. and Worland, B. (2005). *ES Informal Learning Spaces: A Study of Use*. June 2, 2005, PowerPoint presentation. <http://www.docstoc.com/docs/19628580/ES-Informal-Learning-Spaces-A-St>
4. Greenhow, C. and Belbas, B. (2007). Using activity-oriented design methods to study collaborative knowledge building in e-learning courses within higher education. In *CSCL, 2007(2)*, (pp. 363-391).
5. Hoover, D. and Valencia, J. (2011). iPad: Effective Use in the Classroom. In *Proceedings of 2011 EDUCAUSE Annual Conference*.

6. Jessop, T. and Smith, A. (2008). Spaces, Pedagogy and Power: A case study. In *Proceedings of HEA Annual Conference*, July 2008.  
[http://www.heacademy.ac.uk/assets/documents/Events/annualconference/2008/Tansy\\_Jessop\\_learningteaching.doc](http://www.heacademy.ac.uk/assets/documents/Events/annualconference/2008/Tansy_Jessop_learningteaching.doc)
7. JISC (2006). *Designing Spaces for Effective Learning. A guide to 21<sup>st</sup> century learning space design*. [http://www.jisc.ac.uk/publications/publications/pub\\_spaces.aspx](http://www.jisc.ac.uk/publications/publications/pub_spaces.aspx)
8. Jones, C.; Dirckinck-Holmfeld, L. and Lindström, B. (2005). CSCL – The next ten years – A view from Europe. In *CSCL '05 Proceedings of the 2005 conference on Computer support for collaborative learning: learning 2005: the next 10 years!*, (pp. 237-246).
9. Jones, C.; Dirckinck-Holmfeld, L. and Lindström, B. (2008). *Analysing networked learning practices. In Analysing networked learning practices in higher education and continuing professional development*. Sense Publishing.
10. Levy, F. and Murnane R. J. (2004). *The new division of labour: How computers are creating the next job market*. Princeton NJ.
11. Lomas, C. and Oblinger, D. (2006). Student Practices and Their Impact on Learning Spaces. In D. Oblinger (ed.), *Learning Spaces*. Educause eBook.
12. Markowski, A. (2009). Studententer får allt mindre undervisning. In *Dagens Nyheter*, 2009.01.11
13. Monahan, T. (2002). Flexible Space & Built Pedagogy: Emerging IT Embodiments. In *Inventio*, 4(1), (pp. 1-19).
14. Mulholland, J.B. (2011). iPads Strengthen Education. In *Government Technology*, 24 (4), (pp. 20-24).
15. Oblinger, D. (ed.) (2006). *Learning Spaces*. Educause eBook.  
<http://www.educause.edu/learningspaces>
16. Paulson, K. (2002). Reconfiguring faculty roles for virtual settings. In *Journal of Higher Education*, 73(1), (pp. 123-140).
17. Schuster, J.H. and Finkelstein, M. (2004). *The American faculty: Restructuring academic work and careers*. Baltimore: Johns Hopkins University Press.

18. Scottish Funding Council (2006). *Spaces for learning. A review of learning spaces in further and higher education.*  
[http://www.webarchive.org.uk/wayback/archive/20080412040751/http://www.sfc.ac.uk/information/information\\_learning/Spaces\\_for\\_Learning\\_report.pdf](http://www.webarchive.org.uk/wayback/archive/20080412040751/http://www.sfc.ac.uk/information/information_learning/Spaces_for_Learning_report.pdf)
19. SMG (2006). *Space Management Project: Summary.* Space Management Group.  
<http://www.smg.ac.uk/documents/summary.pdf>
20. Stuart, C. (2008). *A Space of One's Own: Learning Environments Derived from User-Centered Discovery Techniques.* Educause Live! (11/21/2008).  
<http://connect.educause.edu/Library/Abstract/ASpaceofOnesOwnLearningEn/47802>
21. Temple, P. (2007). *Learning spaces for the 21<sup>st</sup> century. A review of the literature.* The higher education academy.
22. TLC (2005). *Learning and Teaching Space Design.* University of Technology, Sydney. <http://www.iml.uts.edu.au/scholarship-research/forum/forum07/laurence2007.pdf>
23. Warshauer, M. and Matuchniak, T. (2010). New Technology and Digital Worlds: Analyzing Evidence of Equity in Access, Use, and Outcomes. In *Review of Research in Education*, 34, (pp. 179-225).