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Introduction to the Special Issue on Visual Learning in Higher Education

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Higher education throughout the world is undergoing various processes of change, pressurised by demands to provide education for greater numbers of students and to do so using a variety of models of increasing number and diversity. Among these changes, the use of new technologies to support learning is attracting significant amounts of attention as university teachers and students seek to make the best use of the opportunities which they provide to both modernise learning methods and make learning and teaching more effective.

Right at the heart of this enterprise is the understanding that higher education involves attempts to allow students to gain new knowledge, understanding and skills. At the core of the disciplines of higher education are complex concepts, theories and ideas — as well as epistemological assumptions and traditions of disciplinary discourse. Effective university teachers and students are constantly searching for better ways to both engage in teaching and facilitate new models of learning within these disciplines, thus aiming to transform students from relative novices in an area to domain experts.

But a commonly argued point is that the informal learning which occurs outside the academy, for example in leisure settings or using mobile technologies while travelling, is both *exciting* for learners and takes into account a rapidly changing global environment. It is argued that universities, on the other hand, remain wedded to plodding mass lectures and arcane texts — ossified teaching mechanisms of dubious benefit and relevance to learners. Clearly, differences of context mean that Higher Education cannot adopt models from outside in a straightforward fashion, but if institutionalised learning at this level aims to become more stimulating for learners, then a focus on the visual is a plausible avenue for progress.

So the key pedagogical approach which is the main focus for this Special Issue involves the use of visual techniques and technologies to support effective student learning in higher education. Those of you who work your way through some or all of the papers assembled here will find that visual concerns take many different forms in relation to pedagogy. In the realm of higher education models, diagrams and pictures can play a crucial role in supporting learning of complex ideas. Visual learning is however much more than just good diagrams. Visual aids to support learning, even in otherwise conventional university lectures, are ubiquitous. Many university courses now involve elaborate simulations, digital images (both moving and still), and many other techniques to open up whole new areas of learning, which can occur off-campus, in work places, and when students are engaged in their own individual study activities.

When the Higher Education Funding Council for England commenced its largest ever teaching and learning programme back in 2005, it was making an attempt to reinforce some of the very best work which was going on to modernise and improve teaching methods in higher education. Teaching and learning in higher education in the UK had become somewhat neglected as differential funding for research across the HE sector was driving institutions to compete for better research ratings, often at the expense of their attention to educational development and teaching quality. The two aims of the Centre for Excellence in Teaching and Learning (CETL) programme were: "to reward excellent teaching practice, and to further invest in that practice so that CETLs funding delivers substantial benefits to students, teachers and institutions"[i].

Our team at the University of Nottingham were delighted to get our growing interest in visual learning recognised and resourced through this initiative. As one of the 74 centres accorded CETL status, the activities of the Visual Learning Lab[ii] (VLL) were informed by several agendas. We began from the realisation that research into Visual Learning within HE was underdeveloped, even though visual learning itself was acknowledged as an effective tool for accelerating thinking, understanding and learning. We understood that different people meant different things when they referred to visual learning, and that any general definition would have to take into account traditions as diverse and overlapping as information visualisation, teaching techniques, methods of communication between learners (and between teachers and learners), technological developments, and an understanding of the psychological processes underpinning the comprehension of visual stimuli. On top of all this, our remit was developmental. Tasked with improving the student experience and working with academic staff across the University to inform their materials and processes from a visual perspective, we could not retreat to the relative comfort zone of debating theory.

So the VLL was built by people operating from the conviction that visual learning could be a *practical* framework for improving learning within Higher Education. Looking back to that starting point it is clear that the initial collaborators — from Engineering, Education, Geography, Psychology, Nursing, Pharmacy and English teaching backgrounds — were aware of the importance of cross-disciplinary insight and that the initially proposed projects were varied: uses of videoconferencing, geo-visualisation, simulation environments, visual databases, Reusable Learning Objects, and methods for presenting digital work.

The intervening time has reinforced these early notions while also impressing upon us the moving nature of our target: HE learners, a product of society more widely, have changing expectations and identities (Oblinger & Oblinger, 2005); the emerging focus on Learning Spaces serves to contextualise and inform in new ways our work on visual learning (Bligh & Lorenz, this issue); and the pace of technological developments mean that some of the interesting work in which we are now engaged is based around settings we could not have envisaged at the start of our project. The recently published VLL Showcase Report[iii] documents a cross-section of our current projects, and in comparing that document with our initial project list it is interesting to note the evolution of focus.

Attempting to define visual learning is difficult, in part because of the different disciplinary perspectives of those who are interested. Early in the life of the VLL we spent a lot of time fielding queries and dispelling the notion that we were interested in visual *learners* in the sense of Learning Styles (Dunn et al., 1984). Over time these queries have declined in frequency, perhaps reflecting an attendant decline in focus on Learning Styles as a topic, though we note the inexorable reliance on this approach within the Wikipedia page on Visual Learning at the time of writing[iv].

Our own notion of visual learning consists of a multi-layered framework in which the environment (from natural medium through to deliberately designed Learning Space) serves as a foundation for both teaching and learning activities and technical tools, while this combination in turn forms the basis for a layer of interpretation and meaning-making, understood through both a cognitive and socio-semiotic lens.

The papers in this Special Issue include several written by those working in or with the VLL, plus a selection from those at other institutions working on aspects of visual learning whose approaches supplement well our own multifaceted and flexible work on the use of visuals within learning and teaching. In clustering the papers for this issue, which are suitably varied in both content and form, we use the above framework as a central organising principle, moving gradually from space through tools and curricula and on towards teaching itself and the meaning making which occurs as a result.

In the first paper, *The Rhetoric of Multi-Display Learning Spaces: exploratory experiences in visual art disciplines*, **Brett Bligh and Katharina Lorenz** argue that more serious attention needs to be paid to the role of spatial context within learning. Beginning from a three-tier structure of technology, space and methodology, the authors demonstrate how new kinds of technology enhanced spaces such as Multi-Display Learning Spaces, where facilities are provided for the large-scale display of information across wall-sized surfaces, can support styles of teaching which encourage students to engage better with processes of disciplinary argumentation. Drawing upon examples from postgraduate teaching in Classics, the paper focusses upon issues of spatiality in teaching and the ways in which people can relate to visual displays (for example, to direct attention using movement). Drawing upon a theoretical background taken from the Learning Spaces research agenda, the authors propose a structure for understanding this new learning scenario where technology (Multi-Display Systems), space (Multi-Display Learning Spaces) and pedagogical models (Multiple Perspective Learning) are seen as mutually supportive and interacting.

Next, in *Video Conferencing for Opening Classroom Doors in Initial Teacher Education: Sociocultural Processes of Mimicking and Improvisation*, **Rolf Wiesemes and Ruolan Wang** move the focus to scenarios in which two physical spaces, both sites of teaching and learning, are connected using videoconferencing technology. Videoconferencing technology itself is not new, and the focus of this paper is on the pedagogical implications, taking into account work on interactive Teaching and Learning Observatories (Coyle, 2004; Wiesemes et al, 2007) undertaken over many years by those at Nottingham associated with the VLL and engaged with pre-service teacher education. Building on the notions from this prior work and others that suitable videoconferencing teaching scenarios can be associated with the contextualisation of theory and decontextualisation of practice by students, Wiesemes and Wang argue here that such sessions can additionally be linked with mimicry and improvisation as students internalise shared experiences and relate them to potential for action in future practice. In doing so, the authors raise the important point that apparent improvisation by teachers in responding to unexpected or serendipitous events actually relies heavily on prior experience, and they examine how videoconferencing as a technical tool can provide access to suitably contextualised experiences for student teachers.

Continuing the segue into the tools-focussed section of the paper, in *Visual Considerations and Mathematical Proof* **Lara Alcock and Matthew Inglis** from the Mathematics Education Centre, Loughborough University categorise the considerations which must be made when presenting mathematical proofs to undergraduate students in lectures. Concentrating initially upon the syntactic issues of layout which can be used to make subject content within this potentially problematic area of teaching more comprehensible, the

authors describe considerations including the chunking of equations and the separation of these chunks, the use of layout to emphasise similar subarguments, and the overall layout of the proof on the available canvas. After considering the importance of gesture in live presentations of proofs, the authors move on to consider how such visual issues are manifest when proofs are instead presented online, as an *eProof*, and the design decisions which need to be made explicit when using the authoring tool *ExPOUND*.

Notions of context are increasingly seen as important when considering the use of visual technologies. In *Smart morning in an African village: Diversifying technologies within a Tanzanian context*, **Mikko Vesisenaho and Erkki Sutinen** from the University of Eastern Finland consider the difficulties of developing technologies in a context different from their eventual deployment. The authors document their CATI model (Contextualise, Apply, Transfer and Import) and describe how this is used within a contextualised IT curriculum in Finland which seeks to involve end users, in this case school students from Tanzania, in the design process for robotic visual educational devices known as I-Blocks. In doing so, Veisienaho and Sutinen relate HE visual learning to notions of ethnocomputing and the teaching of applied IT design principles whose relevance extends far beyond the academy.

Moving from physical tools to virtual environments, **Damien Schofield and Edward Lester**, from the State University of New York and the University of Nottingham respectively, consider the provision of simulation software and its use within an Engineering Education curriculum. In *Virtual Chemical Engineering: Guidelines for E-Learning in Engineering Education*, the authors detail the *ViRILE* tool (Virtual Reality Interactive Learning Environment), which simulates the configuration and operation of a polymerisation plant, is used by undergraduate chemical engineers for purposes including familiarisation with equipment and to emphasise the importance of safety within hazardous environments. Schofield and Lester document here a set of appropriate tasks to accompany such tools, and report student feedback in terms of perceived difficulty, enjoyment, graphical realism and disciplinary expertise.

Clearly, an examination of visual tools needs to be concerned with more than the tools and tasks themselves. Many visual tools within the literature have been proposed to support small group work. In *Self and Peer Assessment and Dominance during Group Work Using Online Visual Tools*, **Edward Lester and Damien Schofield**, together with **Peter Chapman** from the School of Psychology at the University of Nottingham, consider the *composition* of these small groups of learners in terms of temperament dominance. Having undertaken a virtual reality-based problem solving exercise, which was filmed, groups of three students were asked to score themselves and their peers. The results of student scoring show that *decisive* students receive higher marks from their peers, and analysis of the sessions themselves demonstrates that *dominant extroverts* tended to undertake more physical movements of shared devices such as the computer mouse and keyboard. While Lester, Schofield and Chapman are careful not to over-generalise the implications of their study, it is clear that studies which seek to further our understanding of student group dynamics are crucial if visual tools and attendant tasks are to be appropriately designed.

Roger Murphy and Namrata Sharma, in *What Don't We Know About Interactive Lectures?*, move us on from a focus on tools and curricula towards an examination of teaching and learning and the way in which visual tools are seen to underpin and enhance interaction within large group lectures. Murphy and Sharma's starting point is a critical examination of the apparently "straightforward didactic act" which constitutes lecturing, wherein an orator performs in front of an apparently passive audience. Having problematised

this view, the paper outlines a variety of models which have been proposed in the literature to promote 'interaction' within lectures of a more overt nature, some of which are predicated upon the facilities offered by innovative visual teaching technologies. The authors conclude by calling for a renewed research interest in the activity of lecturing, based around an agenda which takes into account the processes of interactive lecturing as well as, more conventionally, the associated outcomes.

Finally, *Creating and reading images: towards a communication framework for HE learning* by **Natasa Lackovic** focusses upon the processes of meaning-making which form a crucial part of our understanding of the visual aspects of learning. Outlining a framework for communication within Higher Education learning, based upon the creation and subsequent interpretation of images as representations of concepts, Lackovic uses a socio-semiotic lens to focus upon image-based communication and proposes a task structure involving students creating representations of the core concepts of a lesson which have been nominated by teachers. Lackovic proposes to make use of Web 2.0 technologies, such as blogs, as repositories for these images and narratives and to support discussion in pairs between learners engaged in the processes of deconstructing meaning.

In doing so, Lackovic links together two of the issues — visual communication between people for the purposes of learning, and the role of innovative technologies to support such activities — which have always represented the core interests of the Visual Learning Lab.

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Note from the general editor

This issue also contains an extra article in which visual learning is a topic, but not in a higher education context. In the article *Does MS Photo Story 3 Make a Difference? The Views and Experiences of a Group of Norwegian Secondary School Teachers,* **Gerd Wikan, Bjørn Faugli, Terje Mølster** and **Rafael Hope** of the Hedmark University College examine views and attitudes of secondary school teachers on the role of MS Photostory 3 as a learning-enhancing artifact. The examination is based on the analysis of empirical data, collected from an ongoing project involving teachers and pupils at a Norwegian secondary school. They propose that it was necessary to upgrade the teachers' computer skills on a very basic level in order to give the teachers confidence to use ICT in their teaching. It is a pleasure to present this piece of thorough empirical work in this issue.

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[i] http://www.hefce.ac.uk/Learning/TInits/cetl/ Accessed 24 March 2010.
[ii] http://www.visuallearninglab.ac.uk/ Accessed 24 March 2010.
[iii] http://www.visuallearninglab.ac.uk/contexttextual/VLL_Showcase.pdf accessed 24 March 2010
[iv] http://en.wikipedia.org/wiki/Visual_learning accessed 24 March 2010