Interim Evaluation Report

2007

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND
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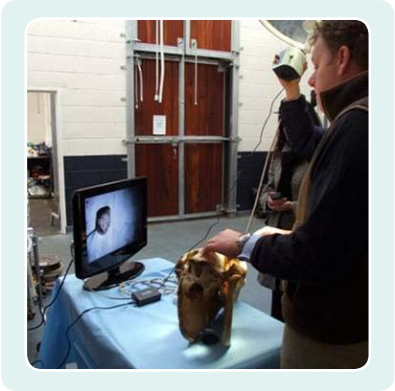
Contents



Foreword

Professor Gill Nicholls

Pro-Vice Chancellor for Student Experience
University of Durham

This review of the Visual Learning Lab's impact on teaching and learning (strategy and practice) at the end of its first phase is impressive. With sixteen projects up and running, three new learning zones developed, and a range of exciting research questions being addressed, the VLL CETL has already established itself as a significant learning and teaching resource at the University of Nottingham.

The first phase of the VLL focussed on recognising existing excellence in visual learning practice and rewarding this through the provision of project funding. This was followed in January 2007 with a second round of investment to establish new projects as pockets of innovative visual learning research and practice. The qualitative feedback collated from these projects shows the positive effect they are having at a variety of levels within the University.

The comprehensive range of visual learning practice and development that the VLL has been able to support – from veterinary visualisers to an archaeological showing and seeing centre, from a virtual reality submarine to a cultural exchange - makes the VLL particularly valuable to the University of Nottingham. The VLL team is enthusiastic about the development of productive new research and teaching synergies within and between departments, schools and faculties and there are clear signs even at this early stage that VLL activity is having an impact across all five faculties.

From a student perspective, the VLL provides an opportunity to access pioneering and high quality visual learning technologies. The preliminary data outlined here shows that students have benefited from VLL activities. The students appear to enjoy the interaction, and from a teaching perspective, the VLL appears to have given staff the opportunity to develop their interests and skills in visual learning and this in turn has proved to be motivational and a mechanism to help further innovation. From a University-wide perspective, the fact that all University of Nottingham students currently based on the UK campuses (and an increasing number on the satellite campuses in Ningbo and Malaysia) have access to these cutting edge facilities gives the University an opportunity to lead the way in teaching innovation within the virtual and real environment and as a result enhance the student learning experience.

In addition to the impact that the VLL is having on teaching and learning, it has created a strong research agenda in the field of visual learning pedagogy, which shows every sign of gaining momentum and strength. I have every confidence that in the next development phase the research output will make a significant contribution to the debates within the field of VLL pedagogy. The skills (both subject specific and transferable) acquired both by students and staff during their interaction with, or research into, visual learning technologies will undoubtedly contribute to enhancing employability and career prospects.

From the perspective of PVC for student experience, I am perhaps most enthused by the sense of excitement about teaching and learning in Higher Education that this CETL seems to be stimulating. Students think it builds confidence. They 'enjoy the opportunity to be creative'. I am full of expectation and excitement about the next phase of the Visual Learning Lab and look forward to continuing my advisory role in the next years of VLL CETL activity.

1.0 Executive Summary

The Visual Learning Lab (VLL) was created as one of 74 national HEFCE funded Centres of Excellence in Teaching and Learning (CETLS) in 2005 at the University of Nottingham.

The interim report charts the structures, developments and major achievements of the VLL over the first two and a half years of its work.

The VLL is visionary and builds on three key goals: to raise awareness of effective visual learning internally and externally; to develop and disseminate excellent practices involving visual learning; to incubate and evaluate new initiatives and to research visual learning including its impact on student learning. The VLL is built on a dynamic conceptual framework for visual learning developed and shared by VLL partners which foregrounds pedagogy, research and evidence-based innovation in practice.

The report highlights the further development of innovative learning and teaching activities in a set of core schools across the university upon which the VLL was founded. It also documents the establishment of four Visual Learning Zones across four different campuses of the university offering a range of visual learning experiences and specialisms. VLL developments are presented through reporting on core work and activities in Phase One. There is a focus on capacity-building by sharing and exploiting teaching enhancement opportunities in an expanding range of schools. This is being achieved through different strategies including funded projects across all faculties in the university which in turn have facilitated new collaborations between schools from very different traditions. VLL activities are carefully monitored and the work across the schools is rigorously evaluated and researched.

Visual Learning Lab activities described in the report include fora, briefings, open days, conferences, workshops and training events as well as collaboration with other University of Nottingham CETLS and the active East Midlands CETL group. The VLL has been involved in the university's new Teaching and Learning Strategy and contributes to university-wide initiatives especially in e-learning and technology-enhanced learning.

Although in early stages, the findings of the interim report suggest that visual learning approaches have the potential for significant impact on students' motivation, learning enhancement and on the development of a wider range of generic skills. Lecturer involvement suggests that the VLL is encouraging pedagogic discourse and experimentation in teaching through reconceptualising existing modules as well as piloting new approaches to student learning.

The success achieved during the first period of operation has formed the foundation for a programme of further development and research activities from 2007-2010 and beyond. In the second phase the VLL will focus on impact both internally and externally by building a profile which promotes its reputation as an established centre of excellence for visual learning, teaching and research beyond the HEFCE funded period.

Dr Do Coyle &
Professor Roger Murphy

> "I thoroughly enjoyed the opportunity to be creative"

2.0 Introduction

The purpose of this report is to present an overview of Visual Learning Lab (VLL) CETL activity in its first two years from 2005-7.

It is the synthesis of ongoing monitoring and evaluation written for the Higher Education Funding Council for England (HEFCE).

The data used in this report have informed our planning for phase two and act as the basis for the development of VLL activities up to and beyond March 2010. There is an additional VLL report for core team members and its management board which includes more project data and evaluation. Both of these reports will feed into the summative report at the end of the funding period.

The VLL CETL initially consisted of 7 schools (Education, Computer Science, Psychology, Chemical Engineering, Nursing, Geography, Medical School). The network of schools has evolved and expanded into four visual learning zones distributed across four of the University of Nottingham's campuses: Jubilee, Hallward, Sutton Bonington and King's Meadow campus. The VLL has used the 7 initial core schools as starting points for developing its activities based on outstanding visual learning practices in the areas of visualisation techniques, ways of conducting research into visual learning technologies, gaming and virtual reality applications, video conferencing uses, as well as use and development reusable learning objects and related visual learning applications.

In this interim report we will be presenting both quantitative and qualitative data about the VLL and its partners at the University of Nottingham. The data consist of:

- Interviews with VLL project leaders and participants
- Overview of impact of VLL activities and projects on staff and students

> "Really, really enjoyable - it was wicked fun and it's always good to do something new"

> Student involvement has been greater than I ever envisaged

3.0 The Aims and Scope of the CETL

3.1 Aims

The 3 key aims of the VLL CETL are:

- To raise awareness of effective visual learning internally and externally
- To develop and disseminate excellent practices involving visual learning
- To incubate and evaluate new initiatives and research visual learning impact on student learning

The overall purpose of the VLL CETL therefore is to build on existing excellence in visual learning practices within the University of Nottingham and beyond and to expand these practices to schools and faculties across the University of Nottingham and in other HEIs.

3.2 Objectives – Phase 1 (2005-2007) and Phase 2 (2007-2010)

The key aims described in 3.1 informed the following objectives for 2005-2007:

- To develop Visual Learning work across the University into a coherent, dynamic whole with a network of visual learning 'activists' through VLL projects and overall VLL initiatives across all University of Nottingham campuses,
- To enhance and develop the visual learning community through cross-school and cross-faculty partnerships between outstanding Visual Learning practitioners and the University of Nottingham's CETL network,
- To start building upon external networks, such as the HEA Subject Centres, the East Midlands CETL network and with external partners such as other visual CETLs and Visual Learning equipment suppliers in order to expand visual learning further in Higher Education and beyond.

In the second phase the VLL will build on achievements in phase one by focussing on impact both internally and externally and by building a profile to enhance its reputation as an established centre of excellence for visual learning, teaching and research beyond the HEFCE funded period.

This work will be based on the following three key objectives:

- to promote strategic knowledge transfer and dissemination of VLL work locally, nationally and internationally through effective networks and capacity building activities to further build a dynamic research portfolio, incorporating a range of research areas and projects, which will establish the VLL as a leading-edge visual learning research and development centre of excellence.

- to continue to build on the VLL's reputation as an innovative and pioneering CETL in adopting, adapting and researching new and existing technologies in relation to the enhancement of student learning

3.3 Planned Activities

These objectives will be put into practice through the following activities in collaboration with key partners at the University of Nottingham:

- Developing funding and dissemination strategies for innovation
- Rewarding excellent teaching
- Contributing to staff development and staff development policy
- Supporting pedagogic research

Further details on how these activities are being operationalised can be found in Section 5.

3.4 Roles and participants

The VLL core team is currently made up as follows:

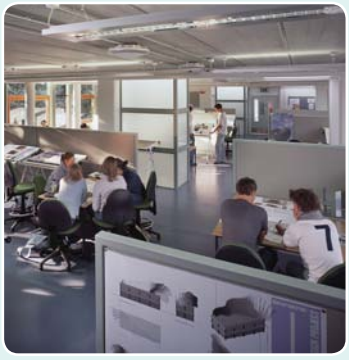
The two Co-Directors, Associate Professor Dr Do Coyle and Professor Roger Murphy, share overall responsibility for directing all VLL activities. They are supported in the daily running, management and operational planning for the VLL by a core team consisting of the Manager, Sarah Kerr, the Co-ordinator and Senior Research Fellow, Dr Rolf Wiesemes, and the Learning Research Systems Manager, Dr Brett Bligh.

The Manager supports the day to day running of the VLL, management and maintenance of all financial records, administrative links between the core team and VLL partners as well as putting dissemination strategies into practice with the support of the core and management teams.

The Co-ordinator and Senior Research Fellow works closely with the Co-Directors and the Manager. He contributes to the day to day running of the VLL through maintaining and developing academic and research contacts with all projects and other partners. He is also responsible for co-developing, overseeing and putting into practice VLL related research and related dissemination strategies.

The VLL Learning Research Systems Manager supports the VLL Co-Directors, the Manager and the Co-ordinator, individual VLL projects and overarching VLL initiatives through his technical expertise, leads on the development of the VLL website and related uses of technology in the VLL and serves as a link with Information Services, the Learning Sciences Research Institute (LSRI) and external technical partners.

> "I've never seen an assignment where students put so much effort in and get so much out of it"



> The project enhances both the visual abilities of students, i.e. their technical skills, as well as the skills of students i.e. their academic subject-specific skills

The Co-Directors and the core team work closely with a VLL management group, which consists of representatives from the core and advisory team. The management group supports the core team in an advisory role and contributes to the dissemination of VLL activities and related research to relevant networks both within and outside the University of Nottingham. The management group consists both of senior academics as well as academic related staff with a wide range of expertise in visual learning.

In addition to these internal University partners, the VLL collaborates with some external partners through its external advisors, as well as both non-commercial (the National College for School Leadership/NCSL) and commercial partners (Questmark).

The VLL is also part of the local University of Nottingham CETLs group and the East Midlands CETL network. The VLL CETL is starting to develop strong links with visual arts CETLs as well as related HEA Subject centres. It is envisaged that these links will be developed systematically as part of external dissemination activities from July 2007 until April 2010.

One physical VLL space (Jubilee Visual Learning Zone) is located in the School of Education on Jubilee Campus. There is a second Visual Learning Zone in the Hallward Library on the main University Park campus, a third one on the Sutton Bonington Campus based in the new School of Veterinary Medicine and Science, and a fourth one on the Kings Meadow Campus. These Visual Learning Zones – spread strategically over the 4 UK campuses - have increased the scope and capacity of the VLL. They support further a range of VLL zones of activity across the University and across all University campuses which will be described in more detail in Section 5. Section 4 gives a background to the conceptual and evaluation frameworks that underpin this activity.

4.0 Evaluation Framework and Approach

All VLL activity is subject to rigorous evaluation both internally, by the VLL team and partners, and by an external evaluator. The shared conceptual framework for Visual Learning developed by the VLL partners foregrounds pedagogy, research and evidence-based innovation in practice. This framework is reflected in the case study approach to evaluation. The case study approach is able to accommodate the wide range of activities and projects supported by the VLL. Practice data and information gathered from case studies is fed into an overarching conceptual visual learning framework. This framework in turn informs, on an ongoing basis, VLL research methodologies and data collection methods as also outlined in Section 5.1.

Common features of all VLL case studies can be summarised as follows:

- All VLL case studies have been conducted in their natural setting or in ways that give information about the natural setting.
- All VLL case studies observe the characteristics of an individual VLL project as a means to bring to the fore, describe and analyse the implementation and impact of visual learning in specific contexts.
- All VLL case studies have been conducted keeping in mind the bigger picture, i.e. examining common features of VLL projects.
- All VLL case studies have been conducted using a variety of methods of inquiry. Whilst one key feature of most of our individual case studies are interviews with VLL project leaders and users as appropriate and possible, we have also collected additional data based on individual projects where appropriate.

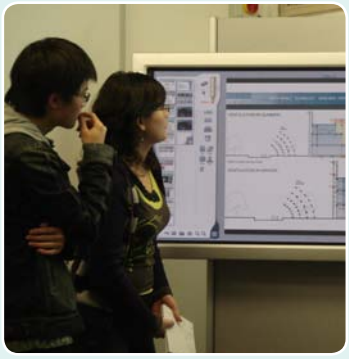
The list of projects outlined in Appendix 1 illustrates the diversity of activity being undertaken and evaluated by the VLL. The evaluation of such a range of activity is informed by a broad range of theories: cognitive sciences; visual arts; psychology; philosophy; education. Building on the shared methods outlined above, these theories can be combined to develop meaningful subject-specific evaluations for diverse visual learning cultures.

Whilst this approach to evaluation is efficient it also potentially raises questions about evaluating new and innovative visual learning practices, which can prove to be complex. We have attempted to overcome this by asking ourselves the following key set of questions for all our evaluation work:

- What is evaluated?
- Who evaluates? – For example, is the evaluator a subject specialist, a psychologist, an educational researcher or possibly a combination of all these people and others.

We consider it to be vital to ask these fundamental questions about evaluative research in order to develop shared research questions that reflect the conceptual framework developed at the outset of

> “The CETL initiatives have contributed to me getting a readership in the school”



> The visualisation techniques that we use are at the cutting edge of learning and teaching

the VLL. It is essential to develop research questions and methods jointly in order to address validity, reliability and transferability of research findings.

Although at this stage of VLL activity, with projects in a variety of stages (completion, near completion, set-up, in the stages of being set-up), it is impossible to make conclusive observations on the impact of the VLL CETL on teaching and learning, our findings to date indicate some overarching trends and unintended VLL side effects. Section 5 gives an overview of VLL activities and projects. Section 6 will look at the impact they have been having through qualitative feedback from staff and students involved.

> This form of assessment is more interactive than just sitting at a computer

5.0 Activities and Projects 2005-2007

All VLL activities are related to the aims and objectives outlined in Section 3. These have been operationalised in a variety of ways described in more details in this section; core team research activity; core school development; additional school development; recognising and rewarding excellence; VLL Zones; the Learning Hub; Video-editing suites; the Website; dissemination (including fora, surgeries, project days and conferences) and marketing. Findings and Impacts will be addressed in Section 6.

5.1 Research

Educational research underpins all VLL activities. The VLL considers educational research to form the critical backbone of its wide range of activities. Our key research is concerned with exploring one key question:

How can visualisation and related/other visual learning methods support and enhance student learning?

Whilst the overarching research theme is broad and inclusive, there is a focus on investigating how visualisation and visual learning can support and enhance student understanding of complex and challenging concepts.

Within this area, our research is focussed around four technology-enhanced areas:

- The use of interactive whiteboards to support and enhance student learning
- The use of interactive electronic flipcharts ('Thunder') to support and enhance student learning
- The use of video conferencing to support and enhance student learning
- The use of video editing to support and enhance student learning

Whilst the research is not led by the technology, data will be used to enable us to explore different aspects of student learning rather than different technologies.

The VLL also conducts research into all VLL projects and considers overarching process questions related to successful implementation, maintenance and development of teaching and learning initiatives such as the VLL. Ultimately, all these research areas are focusing on examining and identifying the pedagogical gains of the VLL.

In 2007, the VLL has made three full-time studentship competitiveawards to 3 individuals, who will during 2007-2008

engage in research training to prepare them to undertake pedagogical research related to visual learning in HE. This will add a further element to our overall research portfolio.

5.2 Strengthen VLL work in the core schools

Through making a series of competitive awards to staff in the seven core schools, the VLL has been able to help build on existing good practices in innovative visual learning and teaching and allow staff to invest both capital funds and staff costs in developing VL projects. There is now a substantial evidence base demonstrating the extent of effective visual learning work in each of these schools. See Appendix 1 for a full list of awards made, covering items 5.2 and 5.3.

5.3 Expand VL practices in other schools

In January 2007 a series of capital awards were made to schools who had previously not had a strong tradition in visual learning methods. (See Appendix 2 for a 'map' of faculties and departments covered by VLL awards and projects). Whilst these grants have been given to individual schools, a variety of links between projects are being forged around the type and/or use of technologies for visual learning. These projects and other activities are at an early stage of development and will be evaluated in the next academic year.

5.4 Recognise and Reward excellent practice among participants

> "The status of teaching and learning has been raised at the University because of the CETLs"

The VLL has been able to reward staff through various mechanisms:

- Supporting individual staff in the purchase of small items of equipment (up to a value of £2,000)
- Supporting joint development of projects and links between schools and faculties
- Providing opportunities for VLL members to present their work to a wider audience
- Supporting staff promotion through VLL membership
- Supporting winning the prestigious 'Lord Dearing for Learning and Teaching' through VLL membership and related activities
- Supporting the use and development of innovative learning and teaching methods in the newly created School of Veterinary Science through VLL awards and related research.

5.5 Establish VLL Zones

The Jubilee Visual Learning Zone

Recognising that a strong, active and visible physical base for the VLL is an important part of strengthening its core work, the VLL has established a visual learning zone in the School of Education. The VLL has established one physical space in a medium sized teaching

room in Dearing Education Building in the School of Education on the University of Nottingham's Jubilee Campus with satellite centres of activity or 'hubs' based around the original seven partner schools. This VLL Visual Learning Zone is equipped with high definition video-conferencing facilities and a groundbreaking virtual flipchart system (Thunder), the first of its kind installed in an educational context in Europe. The Visual Learning Zone on Jubilee Campus also provides professional video editing facilities for all staff and students and is the base for the VLL learning research systems manager. Additionally, the Visual Learning Zone has examples of current VLL applications available for demonstration to staff and visitors.

The Hallward Visual Learning Zone

The VLL also has a learning zone on University Park Campus in new open access student facilities with a VLL designed media wall consisting of a Thunder™ system, an interactive electronic flipchart tool, which will be used both for independent student group work as well as in more structured learning situations.

The period from June 2007 to December 2007 will involve VLL staff piloting this new technology with small groups. The Thunder wall provides a state of the art visual learning space for all students. It will make a major contribution to enhancing small group learning. Using part of its additional capital award, the VLL purchased equipment (after consulting closely with IS and Academic Support) to help students with visual impairments make full use of the Hallward Library Learning Hub and Thunder™ Wall. The equipment will be fully installed and ready by the time the Thunder™ Wall converts to full open access mode in January 2008. This particular Visual Learning zone has grown out of VLL collaboration with the Centre for Integrative Learning CETL at the University of Nottingham.

> "It's not just the money, but more the support saying "Yes, you can do this. We've done this in our school, you can do this in your school."

The Sutton Bonington Zone

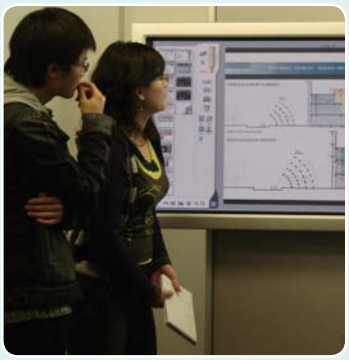
The VLL has a third learning zone at Sutton Bonington Campus in the newly established School of Veterinary Medicine and Science, which serves both the Veterinary School and the School of Biosciences. This visual learning zone replicates on a smaller scale facilities available in the Jubilee Learning Zone and contributes to the development of visual learning and teaching on Sutton Bonington campus.

The King's Meadow Zone

The VLL is also developing a presence at King's Meadow campus, where the VLL has supported in particular the expansion of video editing facilities for all staff and students. This visual learning zone focuses especially in developing collaboration with the University of Nottingham's Central Services departments such as Information Services and the Estates Office.

5.6 Develop a wide portfolio of visual learning research projects

As outlined in 5.1, we consider research into visual learning to be critical for the success of the VLL since March 2005. Some of the current research findings will be presented in more detail in Section 6 of this report



> “I enjoyed the opportunity to work in a team and be creative in a challenging way”

5.7 Open Access Facilities

Video-Editing Suites

The VLL through close partnership working with Information Services and a number of Schools has established a suite of open-access video-editing suites on the King’s Meadow Campus, with a further suite available in the Jubilee Visual Learning Zone. These facilities are increasingly used by students (and staff) from a range of schools and departments for a wide range of teaching and learning purposes, e.g. producing video diaries as alternative visual forms of assessment, editing and annotating classroom video data.

Thunder™Suites

The VLL has installed two Thunder suites, one in its Visual Learning Zone on Jubilee Campus and one in the Hallward Visual Learning Zone. Both Thunder facilities are accessible for all university teachers and students. In the Jubilee zone, the Thunder wall is used in for a range of teaching and learning purposes, e.g. in MA teaching, in course development meetings, for recording strategic discussions. In the Hallward zone, the Thunder wall will be used for a wide range of purposes as described in Section 5.5.

5.8 Website Creation, Maintenance and Development

A VLL website has been established and regularly updated over the last 2 years. This has helped to establish the VLL’s presence at University of Nottingham and to publicise its work with the core schools and partners. Recently, with a focus on taking the VLL into Phase 2 of its development, the VLL team has worked with the University of Nottingham Learning Team and a focus group of external web users to reconceptualise the VLL website, its logo and identity. This new visual identity has fed into a redevelopment of the VLL website in a format designed to reflect its new remit of dissemination, networking, and sharing of best practice in visual learning and teaching. While it is envisaged that the VLL website will continue to be a crucial factor in disseminating information about the CETL, both within the University and externally, subsequent developments will augment the functionality of the current website to promote networking and communication.

The development of the VLL website will allow the site to be used for collaboration and discussion. A communications list is being established of individuals who wish to be contacted each time the website is updated. From the news pages, users will be able to comment on the news items, leading to moderated online discussions around pertinent VLL developments.

Furthermore, a series of blogs will be established, based both around and between VLL projects. Individuals associated with VLL projects have indicated a desire to find out about how other projects are developing across the University. Through the use of blogs, online discussions can be facilitated with the joint aims of raising the profile of projects in other departments and promoting information-sharing and collaboration across projects.

These website developments will offer students and teaching staff the opportunity to enhance their learning experience through access to high quality information about visual learning opportunities, the opportunity to enter into web discussions with VL project leaders, and the opportunity to explore uses of cutting edge visual learning technologies. The website will be updated throughout Phase 2

of the VLL as projects feed back with research outcomes and evaluation. This will provide an invaluable resource for staff wishing to find out how best to use VL in their particular subject area.

5.8 Promote and disseminate visual learning through active involvement in a range of networks

In addition to having a presence at, and presenting papers at conferences, the VLL has been active in arranging its own series of dissemination and networking events:

Fora

The VLL has initiated a series of fora – an opportunity for all university staff to find out about the work of current visual learning projects and network with colleagues with an interest in developing visual learning. Now that the VLL projects are well underway or nearing completion, the academic Year 2007-2008 will see the first full-year programme of fora (see appendix 3 for details of the two fora held to date and a list of proposed fora for academic year 2007-08).

VLL Briefing Events

The VLL has invited members of University Staff to lunchtime briefing sessions at which the work of the VLL has been outlined, examples of projects discussed and the technology available in the room and further afield across the university showcased. The programme has currently covered Arts and Humanities, and Social Sciences, Law and Education. In the forthcoming academic year it will be rolled out across the other faculties.

Visual Learning Open Day

The VLL is planning a Visual Learning Conference Open Day in December 2007 to include all VLL project staff and will be open for other University of Nottingham staff with an interest in Visual Learning. The event will be a major dissemination and networking opportunity for staff, and will feed into planning of an international VL Conference in 2009.

Collaboration with other University of Nottingham CETLs

The VLL works closely with the other University of Nottingham CETLs. These collaborations range from informal information sharing via joint support of individual small-scale projects to strategic planning meetings as means to contribute to the University of Nottingham's policy decisions with regards to Learning and Teaching policies. Examples of these collaborations are the joint CETLs response to the new Learning and Teaching policy document and the shared development of Open Access facilities in Hallward Library in University Park.

These collaborations are having an increasingly positive impact for enhancing communication across the University and between the CETLs.

> "Developing students' visual literacy is a crucial skill"

> The University of Nottingham recognises CETLs' role in creating learning environments that enrich students' learning opportunities and their acquisition of transferrable skills

VLL involvement in East Midlands CETL network

The VLL is part of the East Midlands CETL network, a consortium of all CETLs based in HE institutions in the East Midlands. These nine Centres for Excellence in Teaching and Learning have joined together to form a proactive and productive East Midlands CETL Network. These are based at the Universities of Leicester, Loughborough, Nottingham and Nottingham Trent.

The Network has a common goal of enhancing the student experience, and its primary aims are to promote sharing of best practice, innovation, reward and recognition of practitioners in teaching, learning and pedagogic research. The investment into the region of over £31 million through the funding of these CETLs provides a unique opportunity for collaboration in order to maximise the impact of the work of the CETLs, not only within the participating Universities but also regionally and nationally.

The East Midlands CETL network has allowed the VLL to contribute to a wide range of events such as pedagogic research workshop, joint showcasing events, evaluation days and joint conference attendance.

Conferences, workshops and training events

VLL staff have attended a series of conferences, workshops and training events as delegates and speakers, in particular HEFCE events and HEA conferences.

5.9 Extend the reputation of the University in relation to the quality of student learning

The VLL is beginning to collate extensive project evaluation from its projects, and from September 2007 will be adding additional functionality to the Multi Media Thunder Wall in the Hallward VLL Learning Zone to showcase staff and student work in visual learning. This will include the promotion of a range of student work. A collaborative team has been set up to organise the content of the displays which links the CETLS, the VLL zones, Information Services and the Hallward staff. The VLL team has also held meetings with the University of Nottingham Media and External Relations Department in order to discuss how best to showcase its activities at the University of Nottingham for staff, students and beyond. The VLL team has also met with HEA reps to discuss how the subject centres can help disseminate the work of the VLL.

> I improved my confidence

6.0 Impacts and Findings

To date the VLL activities and projects outlined above have had a wide range of impacts on visual learning and teaching practices and learning and teaching in general at the University of Nottingham. These impacts are presented in this section divided into student experiences, lecturers' experiences and university wide impact of the VLL.

6.1 Student Experiences

Preliminary data clearly indicates the highly positive impact that the VLL activities and projects are having on student learning. We present some case study data below to illustrate the beneficial effects of VLL activities on student learning.

Case study example: **Video Editing Projects**

The student feedback in this section focuses on a video diary editing project in the School of Geography, which has already been transferred to another module in the School of Nursing (Geography: F82161 Desert Geomorphology, BA/BSc Geography, 50 students; Nursing: Module 12 Social Justice and Health, Master of Nursing Science, 60 students).

Both projects focus on developing students' video editing and production skills in tandem with subject specific skills, e.g. presenting laboratory data on erosion processes, for examining critically how visual presentation of laboratory and practice data enhance student learning. The video diary projects also develop team working skills and examine how data can be presented and communicated to a wide range of audiences.

This data has been extracted from written module feedback forms. Open-ended comments were elicited from 4 questions requesting views on the technical and personal challenges associated with the assignment, the value of learning new skills, advantages of video in comparison with more traditional assignment formats and enjoyment of the project.

Overall, the majority of students valued the use of visual learning and identified that use of video taught them new practical, personal and generic skills.

'Teamwork required in a more involved way – had to work together on all sections rather than splitting jobs up and put it together at the end.'

'We learned lots of communication and people skills as we had to learn to work together as a group.'

'I improved my confidence.'

'I met the people in my group and got to know them much better. I also learned to compromise more.'

The opportunity to work in a team, be creative in a challenging way, and do something enjoyable was valued by many.

‘It was nice to do something different, to find new personal strengths and to feel a sense of achievement at learning something new.’

‘Good opportunity for people who struggle writing essays, holds my interest more.’

‘This form of assessment is obviously more interactive than just sitting at a computer and so was more fun.’

‘Enjoyable – a valuable experience and I feel challenged. A good addition to the course.’

‘Thoroughly enjoyed the opportunity to be creative.’

‘Really, really enjoyable – don’t scrap this assessment in the future as it was wicked fun and it’s always good to do something new.’

‘Much more interesting than other forms of assessment and it allows more opportunity to express ourselves.’

‘A lot of satisfaction when it was finished.’

The students that identified problems with this form of learning focused on the time consuming nature of the exercise, a preference for working alone and being unable to identify the assignment’s relevance to nursing practice.

‘Time consuming – at times difficult to coordinate different members of the group.’

‘Very challenging to fit in filming around University and work commitments and found we had to spend the majority of a couple of weekends filming, then countless hours editing and planning.’

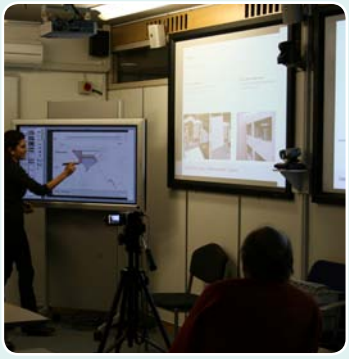
‘Although it provided an opportunity to learn new skills I didn’t feel that these skills were relevant to the course and although they were enjoyable I thought it took emphasis away from the nursing content.’

In following years, this aspect will be addressed by clearly stating the benefits of teamwork and communication for health professionals at the outset.

Whilst the above student comments relate to the student experience in one particular VLL project, some of their more generic insights and messages apply potentially to all VLL projects in the following ways:

- VLL projects provide opportunities for upskilling and developing new and/or different skill sets.
- VLL projects offer less academically inclined learners opportunities to ‘shine’ and develop their creativity in their individual professional and learning contexts.

> “Really, really enjoyable - don’t scrap this assessment in the future.”



> “Through working with other students, they learn about each other and about the use of equipment”

- VLL projects tend to address both subject specific skills and/or knowledge as well as generic skills such as communication skills, group work etc.
- Overall, VLL projects contribute to raising student motivation for learning. However, some aims and objectives of VLL projects need to be articulated more clearly for students.

In addition to the primary student data, there is a range of qualitative evidence from lecturers involved in VLL projects commenting on the student experience. One lecturer who initiated a video production assignment made the following comments on the benefits for students. Whilst some of these comments are project specific, they remain valid as overall comments on impacts of VLL activities:

> ‘I’ve never seen an assignment where students put so much effort in and get so much out of it.’

> ‘Through working with other students, they learn about each other and about the use of equipment.’

Other lecturers have highlighted the additional benefits of involvement in VLL projects for students:

> ‘It’s very important to raise our students’ digital literacy. […] By making the students part of the digitization process we’re making them aware of the time and effort that goes into producing and then using these pictures. […] It’s also about developing students’ visual literacy. It’s a crucial skill nowadays’.

> ‘I think the student involvement has been greater than I ever envisaged.’

Overall, our data indicate that VLL activities and projects contribute to enhancing the student learning experiences in a range of ways:

- Develop generic skills such as team working and communication,
- Develop familiar non-educational applications in educational contexts in order to enhance the student experience,
- Develop criticality both in relation to the use of digital visual media in general as well as in the related visual subject specific areas and skills.

Within the next 2 years, we will track student experiences in further detail and will be able to include more detailed information of the impact of the VLL on student experience in the final VLL report and through the ongoing development of our case study research.

6.2 Lecturers’ Experience

The effects of the VLL CETL on university teachers through its activities and its project-based work is the most easily identifiable impact of the VLL CETL. Our evidence base suggests that the VLL CETL (in conjunction with other University of Nottingham CETLs)

is starting to have considerable effects on teachers. Overall, the CETL initiative has contributed to a rise in the status of teaching and learning and an increase of opportunities to bring together innovative teachers from a range of schools and departments. Creating these opportunities and raising the profile of teaching is particularly important in a Higher Education institution such as the University of Nottingham which prides itself on its Russell Group status and its related focus on maintaining and developing world leading research.

This particular impact is reviewed in more detail in the following subsections based on interview data from project participants.

Opportunities for experimentation

The VLL activities are able to support experimentation in teaching and learning across the University of Nottingham by offering support for previously established initiatives and widening their impact as well as by supporting new teaching and learning initiatives through initial project grants.

University teachers who have been able to gain from VLL support have commented as follows:

> 'The VLL gives you the opportunity to move onwards and to get other people interested [in our activities].'

> 'At the staff level, becoming aware of all this technology available, which can support learning and teaching - that was something we became more aware of when we got the VLL grant and many of my colleagues realised that this could be interesting.'

> 'Over the next few years, our VLL project will be integrated further into learning and teaching. […] The project enhances both the visual abilities of students, i.e. their technical skills, as well as the skills of students, i.e. their academic subject-specific skills.'

> 'Due to the VLL project, we now have wonderful potential regarding where we can go next with our teaching.'

> 'It's the same with any new technology we've introduced. You start off with the enthusiasts … they're willing to take a bit of a risk … once they get enthused and confident […] this has a wider impact – you get a snowballing effect.'

"Due to the VLL project, we now have wonderful potential regarding where we can go with our teaching."

This interview data raises a number of key points:

- VLL support raises the status of new learning and teaching initiatives and enthuses the 'pioneers', whilst it contributes to win over the sceptics.
- VLL support (whether it be project-based or through overarching support and advice) offers a starting point for developing teaching and learning further and upskilling university teachers. This ultimately contributes to the creation of highly dynamic environments for learning and teaching and has a 'snowballing effect.'

> “I’m very impressed with the excitement the VLL generates”

- VLL support is about enhancing teaching and about offering opportunities for enhancing student learning both at a generic skills level and at a subject specific level.

Opportunities for research

One of the aims of the VLL is to offer opportunities for and avenues into educational research for non-education specialists supported by the core VLL team. VLL project leaders have commented on the effects of their particular projects as means to reflect on visual learning practices. This in turn can lead to an increased awareness of the use of visual learning methods in their schools and offers ways into educational research summarised as follows by one of the VLL project participants:

> ‘I think there is now recognition of “softer” evaluation research outside the School of Education.’

This acknowledgement of the role and opportunities for educational research in collaboration with education specialists in non-education departments contributes in turn to further raising the status of learning and teaching. It also contributes to widening individual schools’ research agendas and allowing teaching staff to explore and develop their own and colleagues’ practices further through the support of the VLL. These opportunities for research also contribute to addressing the overarching research questions raised in Section 5.

Opportunities for development

As already raised in Section 5, the VLL CETL (and other CETLs) at the University of Nottingham has contributed to offer a range of opportunities for development. ‘Development’ needs to be understood here in a range of ways as the following data from interviews with lecturers who are VLL project participants indicate:

> ‘The CETLs provide an opportunity to focus on new developments in teaching and sharing best practice with colleagues in a way that otherwise wouldn’t happen. It’s almost like being able to take time out to think about how to improve things and have the resources with which to develop new ideas and not all of these new ideas will be as successful as you’d hope they be, but other ideas will be so successful that they make the whole thing worthwhile.’

> ‘The enhancement of teaching and learning is the reward. It’s not about other, perhaps individually more tangible rewards.’

> ‘The VLL provides opportunities to work together and to have that supported […] enabling everybody to blow their own trumpet and have what they’re doing recognised.’

> ‘I’m very impressed with the excitement the VLL generates.’

> ‘The VLL creates a buzz of activity that makes people curious, draws them in and people want to find out what’s on offer and what they can get out of it for their own purposes.’

'The CETL initiatives have contributed to me getting a readership in the school … there are also other lecturers in the school who got promotion as a result of the CETL.'

'The status of teaching and learning has been raised at the University of Nottingham because of the CETLs … and as a result of that, people will get recognition as part of the role they're playing within CETLs and they will get promoted as a result.'

Based on the above interview quotes, 'development' as part of the VLL CETL activities can be understood as follows:

- In some individual cases, being part of a CETL has contributed to getting a promotion. In this sense, the CETL initiative can be a means for career enhancement and institutional recognition of new teaching and learning initiatives.
- CETLs contribute to enhancing the status of teaching and learning in a primarily research driven institution such as the University of Nottingham.
- CETLs create opportunities for collaboration between schools that might not have been obvious or as easily accessible before the CETL initiative.
- CETLs contribute to university teachers looking critically at their own teaching, examining others' teaching and getting ideas from CETL projects and overarching activities that can be transferred into specific teaching and learning environments.
- CETL rewards are both financial in relation to career development, but also non-financial in the sense that CETLs contribute to making innovative teaching and learning initiatives more visible across the University and raise the status of these individual initiatives as well as teaching and learning as a whole.

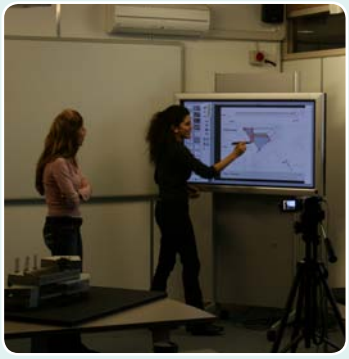
"The opportunities the VLL has given us are great regarding cross-fertilisation of projects and so on. The VLL has generated an awful lot of momentum"

Creating communities of practice

All VLL project participants have commented on the wide range of opportunities for participation and collaboration that the VLL CETL and other CETLs at the University of Nottingham have created. This section considers the overarching effects on teachers that the CETL initiative is having. For example:

'The VLL CETL has led to cross-fertilisation regarding the generation of research data and has led to collaboration with psychology as well as to additional interactions with staff in the School of Geography.'

'The VLL CETL has contributed to demarginalising Geographical Information Sciences (GIS) because the VLL allows us to produce tangible examples of technology use for learning and teaching. In this sense, we are not about technology, but about learning and teaching.'



> The VLL has led to cross-fertilisation regarding the generation of research data

'The opportunities the VLL CETL has given us are great regarding cross-fertilisation of projects and so on. The VLL CETL has generated an awful lot of momentum.'

'The non-financial support is also important, i.e. being told "You can do this, we've done this in our School'.

'I don't think at the beginning of this project I would ever have imagined myself talking to a philosopher about implementing reusable learning objects. …we're now doing this and that's really an unintended consequence of the initiative.'

Key areas emerging out of these data can be summarised as follows:

- The VLL CETL (and other CETLs) have contributed to demarginalising some ongoing visualisation work.
- The VLL CETL has contributed to creating more opportunities for talking to colleagues in their own schools and departments about teaching, learning and research as well as links with other schools and departments, which might not necessarily have subject links, but might share approaches to developing visual learning. It is vital to strengthen and develop these links, as they contribute to a dynamic learning and teaching environment which enhances the overall student experience at the University of Nottingham.
- Whilst it is important to acknowledge the contribution that the CETLs make to raising the status of teaching and learning in general – as reflected in staff promotion based also on innovative approaches to teaching – it is equally important to allow CETL participants to develop their thinking and practices about visual learning and teaching and related innovative practices. In this sense, it is crucial to create time and space for developing innovative teaching across the university.

Learning Designs

In this section we consider the effect of the VLL on learning designs by looking in particular at the effects of the VLL CETL on: developing new curricula; related learning activities; the use of technologies; learning spaces. We consider these various aspects jointly as they are closely interconnected. Our VLL project participants have commented on these as follows:

'One of the challenges to our project is the technical aspect of working across departments.'

'The visualization techniques that we use are at the cutting edge of the hydrograph and at the cutting edge of learning and teaching.'

'Though visual learning and e-learning have an area of overlap, they're not co-terms and therefore to get access to areas of visual learning which don't have anything to do with new technologies is vital.'

'As long as people can see how the technology can be used for them, they'll overcome any kind of fears that they might have specifically about technology.'

'Some of the activities will carry on post-CETL funding anyway – so, in a sense, the CETL funding has pump primed that activity.'

'Getting the new equipment is just fantastic and having the luxury of having a project worker seeing that it's implemented in the correct ways in teaching and learning – in many ways that couldn't have been done without the VLL, not just the money, but more the support saying "Yes, you can do this. We've done this in our school, you can do this in your school."'

As becomes clear from the data as well as from the overall descriptions of VLL activities and projects, the VLL has a highly positive effect on learning designs. These positive effects need to be monitored further, in particular when examining student learning experiences:

- Evidence to date suggests strongly that VLL activities and projects have overall a motivating effects on students and contribute both to their generic skills development and to their subject specific knowledge and skills development.
- At the same time, it is clear from our data and ongoing monitoring work that VLL projects and activities are motivating university teachers to reconsider their teaching practices and module delivery in creative ways and developing their thinking through regular contact with other VLL projects and activities.
- Also, the VLL CETL has contributed to a further spread of educational research in non-education departments, but supported by VLL staff.
- Additionally, some VLL projects are also starting to contribute to subject specific research agendas, e.g. the development of so-called geo-widgets in the School of Geography, originally for learning and teaching purposes, is also starting to contribute to further developing flood events modelling theories.
- In addition to these effects on learning designs, the VLL has also been able to contribute to and to facilitate cross-departmental links, which are leading in turn to further collaboration and informal exchange of ideas between university departments.

> "As long as people can see how the technology can be used for them, they'll overcome any kind of fears they might have specifically about the technology"

Developing a collaborative culture

A key aspect in the VLL CETL implementation process has been to collaborate closely and successfully with central services departments such as Information Services and Estates. Initial collaboration with Information Services has been somewhat challenging at times due to both the VLL CETL and Information Services needing to develop a working relationship that differs from Information Services' traditional role. However, good working relationships have been developed through constant and ongoing collaboration where a culture of positive and supported risk taking for Teaching and Learning innovations has been put into practice.

> The CETLs make full use of new learning and teaching technologies as they emerge

This risk taking collaborative culture is vital for developing and rolling out projects and activities across the university as a means to enhance student experiences and to promote innovative approaches to learning and teaching at the University of Nottingham.

6.3 University-wide impacts

The VLL has developed successful links with a range of internal and external partners. These links vary in nature from network membership via local, national and international partners, to business, and research and design partners. These various links are summarised below.

The VLL CETL has been developing a series of activities targeted at maximizing impact across the university at various levels:

VLL Briefing Events and Fora

- Offering lunchtime slots providing staff from all departments and schools and at all levels with the opportunity to find out about VLL activities and potential ways of collaborating.
- Providing lunchtime fora based on presentations by and of VLL project partners aimed at raising VLL project profile and offering potential opportunities for collaboration.

VLL consultation with the e-learning team and Information Services

- The VLL meets both formally and informally with the University's e-learning team in order to develop its activities as development partners as appropriate.
- The VLL activities in the use of new technology developments in learning and teaching have created ongoing and dynamic partnerships with Information Services in their role as technology advisors and support services.
- One of the VLL CETL co-directors is a member of the university wide e-learning and e-knowledge committee.

VLL contribution to the updated University of Nottingham Learning and Teaching Strategy

- The VLL has contributed to the University of Nottingham's 'Learning and Teaching Strategy 2007-2012'. The new strategy recognises the contributions that the CETLs make to learning and teaching overall, the CETLs' role 'in creating learning environments that enrich students' learning opportunities and their acquisition of transferable skills' as well as
- The CETLs' role in 'making full use of new learning and teaching technologies as they emerge' (e.g. in the Hallward Learning Hub and other CETL hubs across the University of Nottingham)
- The university's aim to 'establish further CETLs to complement the existing CETL programmes within the University.'

Collaborative work with other University of Nottingham CETLs

The VLL works collaboratively with other CETLs

- As a means to influence university learning and teaching policies (as illustrated in our contributions to the new Learning and Teaching Strategy document)
- On an individual project basis, i.e. the VLL team supports other CETLs' individual projects where particular visual learning expertise is required
- On an informal level, i.e. exchanging information as and when appropriate and relevant

Representation on University Committees

- The VLL is represented by its co-directors on various key committees and university groupings such as the Educational Development Advisory Group (EDAG), the Learning and Teaching Development Fund (LTDF) Group, the e-learning and e-knowledge committee, the Staff and Educational Development Unit (SEDU), and the Promoting Enhanced Student Learning (PESL) website development group.

Additionally, the VLL team has contributed individually to creating an internal strategic impact. In particular, the VLL team has provided detailed comments and feedback on the forthcoming University of Nottingham Learning and Teaching Strategy. Internal strategic impact of the VLL CETL (and other CETLs at the University of Nottingham) is illustrated further with the interview data below from VLL CETL partners:

> 'The CETL initiative has created an awful lot of momentum. […] in the past, these projects have just stopped … and all that energy and all that good work comes to a halt. … it would be a shame to see that happen again.'

> 'With the visual learning element of our CETLs, we really have something here that could benefit the wider community in Nottingham – we're a Science City, there is the Regional Development Agency, …'

> 'There are other lecturers in the school who also got promotion as a result of the CETLs … and as a spin-off, we've got some other funding for teaching and learning initiatives.'

In addition to the overall internal strategic impact it is important to note that these interview quotes also indicate some CETL impact on individual career development, 'soft' gains such as contributing to creating vibrant and dynamic learning and teaching environments as well as internal impact having potentially an effect on the overall city environment through the opportunity to be involved in Science City activities or collaborating with the Regional Development Agency.

Local partners and networks

The VLL is developing these networks both through its projects, through its generic activities such as lunchtime presentation slots

"With the visual learning element of our CETLs, we really have something here that could benefit the wider community in Nottingham"

> It is important to recognise the soft gains such as contributing to creating vibrant and dynamic learning and teaching environments

and Visual Learning fora as well as through its membership of the East Midlands CETL network and related links, such as to the Nottingham Science City initiative.

The VLL is also developing new links with new national and international partners based on similar approaches to visual Learning, e.g. video conferencing and use and development of electronic interactive flipchart systems with the University of Toronto and the University of Texas.

On a national level, the VLL is developing links with the National College for School Leadership (NCSL). The VLL and the NCSL are particularly interested in jointly developing and researching visual learning technologies in the areas of teacher training and teacher continuous professional development.

Some new and dynamic business partnerships are developing, which are currently leading to the exploration of research and design collaborations and post-CETL research and commercialisation links. In particular, the VLL is developing a close partnership with Questmark Limited, one of the UK's leading suppliers of video conferencing systems and related technologies. This partnership is leading towards a range of research and design collaborations, which contribute in turn to develop existing and new applications of visual technologies further in a range of HE settings. The VLL is also forging a successful relationship with Polyvision UK, who are the suppliers of the previously mentioned Thunder™ interactive electronic flipchart system. The VLL is currently negotiating how research and development partnerships can be set up in order to co-develop – possibly combined with the partnerships with the University of Toronto and the University of Texas - the interactive electronic flipchart system further for uses in educational settings.

7.0 Summary and Conclusions

We have demonstrated in the previous sections a wide variety of impacts of the VLL. A number of key points have been raised by the wide range of VLL activities and projects in relation to enhancing and enriching student learning:

- Student learning is enhanced through raising student motivation as demonstrated in the previous sections of this report.
- Student learning is enhanced through contextualizing and embedding new visual learning applications into current modules.
- Student learning is enhanced when students are given opportunities to develop both subject specific skills and knowledge as well as generic skills and critical thinking.
- Student learning is enhanced when students are given opportunities to develop and adopt their own ways of using visual learning applications and when these developments are supported appropriately both by subject teachers and technical support staff.

We have also presented in the previous sections a wide range of emerging teaching practices as developed through VLL activities and projects. Whilst these practices are varied and reflect the wide array of projects and activities developed by the VLL, they also share some fundamental features which have been touched upon in previous sections:

- Technology supported VLL projects and activities are not primarily driven by the use of technology, but by an overall aim to develop effective pedagogies for Higher Education that include highly visual elements of learning and teaching.
- Visual learning is not narrowly defined and can vary widely from one subject area to another.
- Visual learning can contribute to establishing links between separate subject areas, but using similar approaches to visual learning or exploiting similar technologies.

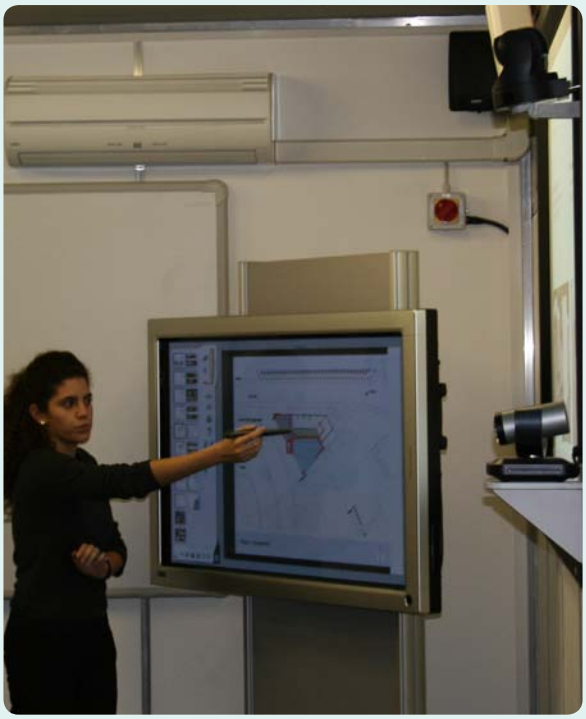
University systems and practices have overall been supportive of VLL activities. Some key conclusions to consider are:

- Initial technical support and advice: The VLL (and a range of other CETLs) are at the cutting edge of developing and using new technologies. This requires technical support at the most basic level and some flexibility from technical support services. It is important to allow piloting of new technologies as part of CETL activities in order to develop learning and teaching in the long term.
- Ongoing technical support: Many VLL activities and projects use technologies. Technologies need to be adequately supported and serviced.

> “The VLL provides opportunities to work together and to have that supported, enabling everybody to have what they’re doing recognised”

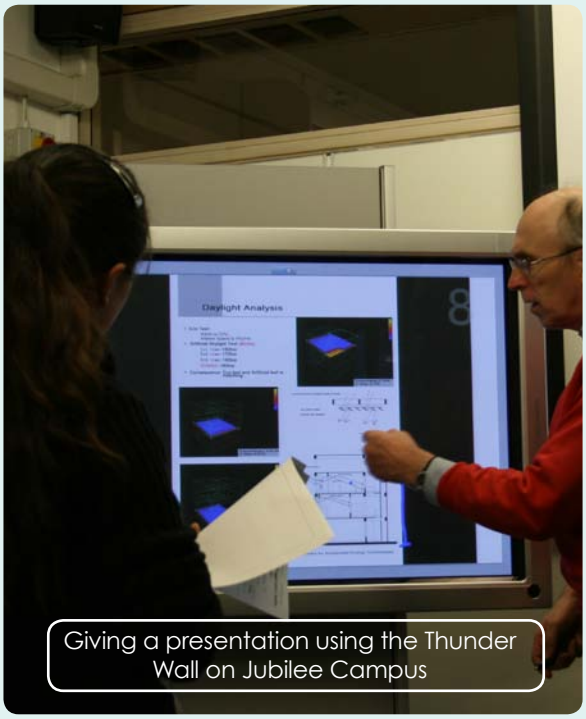
> We learned lots of communication and people skills as we had to work together as a group

We are confident in asserting that the VLL is a highly successful CETL that contributes to learning and teaching across the University of Nottingham and beyond on a range of levels described in this report. In the new phase of development, the VLL will consolidate and expand of its current activities with a particular focus on developing research into visual learning, and the systematic and creative dissemination of our project findings over the remaining CETL funding period. This will maximise the chances of the VLL remaining a key part of the infrastructure, which supports high quality learning and teaching practices, research and development work at the University of Nottingham in the years to come.



Students from the School of the Built Environment use Thunder for their group work

The Thunder Wall in Hallward Library



Giving a presentation using the Thunder Wall on Jubilee Campus

Appendix 1
Awards made by the Visual Learning Lab - Summary

Round One

Awards made September 2005 funding both purchase of capital equipment and staff research time

School of Nursing
Using Teaching and learning observatories in nursing education
The use of Teaching and Learning Observatories (TLOs) has been developed over the last 6 years within the School of Education by linking schools, teacher training institutions, teachers, teacher trainers, trainee teachers and students to each other through interactive video links. The TLO model is currently being exported into the School of Nursing. The use of interactive video links will allow remote teaching between teaching sites. It is also envisaged that TLOs will be used to link nursing students into healthcare practice settings, so that they can explore these in a supported way from the School of Nursing.

School of Chemical, Environmental and Mining Engineering
Developing problem-solving through visual learning in simulated, virtual and mixed reality environments
Recent advances in computer graphics and virtual reality technology enable students to engage from their university base with problem-solving learning in and through alternative environments such as a future workplace. Examples include the ViRILE learning environment developed as part of the university's flagship e-learning strategy (Chemical, Environmental and Mining Engineering) which replicates 'real' industrial processes with over a billion discrete configurable states. This allows unlimited scope for student experimentation and differentiated problem-solving tasks.

School of Molecular Medical Sciences
Enhancing learning in pathology through the use of visuals
Pathology is a highly visual subject and effective teaching delivery relies on the availability of high quality visual learning aids. The subject is taught on 2 sites (at least), which means developed resources provide significant added value. The project builds on evidence gained from positive student feedback on a workshop where students used laminated coloured paper cells to discuss aspects of immunity (eg T helper cell interactions). Individual pieces could be moved around to show relationships, whilst students described the appropriate interactions. The pieces were drawn and printed from PowerPoint (then cut out and laminated). This naturally lends itself to using the same images within an e-learning package where animation can provide relevant dynamic qualities. Therefore the project will involve development of a computer based version of the immunology workshop and then a comparison of the students perception of the e-learning package compared to the card-based workshop, both of which having the identical learning outcomes. The study will compare how students interact with the material and their perceptions of each method's pedagogical value. This will inform the development of further visual learning material for deployment in medical sciences and suggest ways to enhance student interaction and learning.

School of Psychology
Understanding visual learning by using visual records
This project is concerned with developing effective visual learning environments. To do so, it aims to understand more about the processes of visual learning by conducting empirical studies of learners interacting with such technologies. Rich descriptions of the learning process are taken which include: Prior knowledge and abilities (e.g. spatial abilities); Learning outcome measures; Video of individuals, groups using technology; Audio of speech; System logs and navigational data.

School of Computer Science and Information Technology
Visual learning aids for computer graphics
This project aims to build a development environment which allows the students to create and manipulate virtual objects, i.e. to provide a constructivist alternative to the existing teaching mechanisms. The variables which can be altered and experimented with in the worlds will be based on the computer graphics theory for module G5BGRA (approx 80 students per year).

School of Chemical, Environmental and Mining Engineering
Visual widgets
SChEME has set out to test and develop 2D and 3D visual spatial skills while addressing fundamental scientific and engineering concepts. The project is developing a range of virtual, visual widgets accessible to a wide range of students. The project aims to explore transfer of virtual spatial ability and visual learning to ability in 'real' world settings and to provide guidelines of how technology might be most effectively used.

School of Geography
Assessment in geography via video production
In order to enhance and develop student learning some modules in undergraduate geography courses are being assessed via student produced videos. The VLL supports the further development of these visual assessment practices through providing two video learning suites in order to support staff and students using video media in teaching and learning.

School of Education
Engaging staff in professional development through VL
The aim of this project, based on existing experience with visual learning approaches in the School of Education, is to engage staff in a School-wide process of professional development centered around a dialogue about the ways visual learning can enhance learning and teaching, including innovative approaches to assessment.

School of Geography
GeoSpatial Widgets
This project aims to utilise the same interactive visual framework as in the Visual Widgets project in SChEME but in a more overtly geographical context. It is producing new exemplars of 'visual learning' illustrating how several interactive graphical techniques can complement traditional teaching where difficult concepts need to be communicated. These include associating 3D landscape views with 2D maps of the same area, and an interactive flood model illustrating the interrelationship between rainfall events and water flow through a catchment. In addition several applications are designed to create a practical interactive exercises where it would normally be difficult, including a lab-based emulation of a Location-Based Service on a mobile phone.

School of Education
The use of video data to support learning and teaching
This project focuses on supporting research and development related to visual learning. The aim of the project is twofold:

- Establish an electronic archive of video data to support the development of learning and teaching at the university, and as a pedagogic research tool based on IRLTHE projects,
- Provide methodological support for staff (and students) using video data in their pedagogical research and development activities through an up to date literature review.

The outcomes of the project will include some ongoing technical support, an easily accessible video archive, a set of 'guidelines' for the use of video as a research tool and a set of visual learning-related resources.

Round Two
Awards made January 2007 funding purchase of equipment

School of Veterinary Medicine and Science (three awards)
Examining Clinical Cases through Digital Photographs
This grant will support the development of a bank of digital photographs of clinical cases for use by staff and students in the School of Veterinary Medicine and Science (SVMS). The images will be collected by SVMS staff and clinicians working in veterinary practices, which have links with this new University Degree Course. Images will be collected utilising a bank of digital cameras and stored on an open access central server.

Linking Teaching and Practice Sites through Video Conferencing
SVMS has a close working relationship with a number of high quality veterinary centres and 'clinical associates', who assist with the new veterinary degree course. High definition video conferencing will be installed in several of these centres, linking them to the main SVMS building. This will allow live and recorded footage of clinical cases to be used in teaching and learning activities at Sutton Bonington. This facility will be developed as a basis for interactive teaching along the lines of the Teaching and Learning Observatory in the School of Education.

Enhancing Teaching of Veterinary Clinical Skills through the use of Visualisers
A state of the art 'Ceiling Visualizer' will be installed in the main SVMS Dissection Lab. It will facilitate modern approaches to enhance student learning such as guided dissection, live demonstration of specimens, dissections and surgical approaches. The innovative approach of guided dissection as a structured introduction to the area and tasks for each dissection practical essentially rely on this type of equipment. All material could be displayed on plasma screens around the lab to improve the visibility of live dissections. The same time excellent digital photographs and video clips can be collected and stored for a variety of web based teaching purposes including E-dissection material and material for Web CT. The equipment could also be used in video conference interactions with Clinical Associates enabling integration of dissection lab material in clinical teaching at remote settings via high end videoconferencing.

School of Pharmacy
Enhancing Lab Teaching through Visualisation Technologies
This grant will allow the School of Pharmacy to improve laboratory teaching environments through the provision of interactive whiteboards, visualising cameras, and digital visual display screens. These facilities will be used by staff and students to assist with laboratory-based learning, video-conferencing with other sites/academics/ students, and for independent use as part of e-learning packages.

Biomedical Sciences
Producing "Virtual Specimens" for visualising complex models
A high quality digital camera will be purchased along with the necessary equipment for capture of 3D images of anatomical specimens to produce interactive "virtual specimens" delivered via the Web or projected in lecture rooms. The understanding of spatial relationships in molecules such as proteins, nucleic acids and other macromolecules is a highly visual process, which will be greatly assisted by the purchase of stereo 3D projection facilities and state of the art molecular graphics software.

Modern Languages and Cultures
The Cultural Exchange as a Virtual Means of Intercultural Learning
The development of a Cultural Exchange will provide students studying modern languages (French, German or Spanish) - including engineers - and their tutors to engage in authentic debate and communication with tutors and students studying English in partner institutions across Europe. Using an interactive website and video conferencing the Cultural Exchange will develop linguistic, cultural and technological skills. The outcomes will include a visual mapping of cultural elements displayed on the website as well as further spin offs in terms of widening participation, strengthening Ningbo links and U21.

School of Chemical, Mining and Environmental Engineering (SChEME) (two awards)

IWB and problem-based learning: technology-enhanced visual learning for teaching difficult concepts in laboratory sessions

Not only will the purchase of a flexible interactive whiteboard and digital camera facilitate student understanding through using visual methods in practical and experimental work, it will also maximise the student learning experience through supporting and developing interactive laboratory teaching methods and innovative assessment.

Submersive Visual Technology –'learning in extremis'

This project further develops existing visual widgets applications. It is centred around a one person submarine fitted with controls and linked to the outside world through audio and video links. The submarine will be used by groups of students as a means to develop team decision making and team building skills. Whilst its initial uses are envisaged to be mainly within engineering, these will be developed further in the future with a range of other schools and departments.

Biosciences

Visualising Real-Time Plant Cell Structures

This unique electronic microscope instrumentation will permit the capture of real-time images that will facilitate the teaching of plant cell structure and function to undergraduates, postgraduates, post-doctoral workers and visiting researchers. It will be available for use by all staff in the Plant Sciences Division and, by arrangement, by other interested parties outside the division. The instrumentation will also form an integral part of present and future Eu-supported Leonardo da Vinci teaching programmes in plant micropropagation, cell and protoplast culture.

Humanities

'Showing Seeing Centre' & 'Visual Analysis Lab

Archaeology and Classics are both highly visual disciplines. In order to further develop the use of visual in teaching and learning, the VLL supports the creation of two new facilities, the Showing Seeing Centre and the Visual Analysis Lab.

The Showing Seeing Centre will provide a context for students to work with visual resources using 3D-enabled computers for access to virtual reconstructions of archaeological sites and ancient civilizations, e.g. in gaming environments. Students will also have access to a range of equipment for digitzing and analysing visual material and for producing presentations and portfolio material. The equipment provided by the VLL consists of a wall-mounted LCD-screen, 4 high-spec laptops, a high-spec A4-scanner, colour laser printer and a Playstation.

The Visual Analysis Lab will provide facilities for teaching and learning in relation to the identification of archaeological remains (such as plant materials, animal bones and ceramics). The equipment provided by the VLL consists of two high-quality microscopes linked to digital cameras, a laptop and a data projector.

Graduate School

Exploring the effects of portable visual learning technology on the experience of learning

The VLL is funding pocket PCs with camera and video capability in addition to audio and visual file playing functions of an MP4 player. This equipment is seen as a means for enhancing the potential for active engagement with the technology and range of contexts in which visual learning may take place. The aim of the use of this equipment is, in collaboration with the School of Nursing, to give immediate access to mobile visual technologies for a number of specifically targeted postgraduate students and at the same time explore the benefits of visual learning for these and other postgraduate groups. The central question for students therefore is How does having this device change your learning? The exploration will include examination of:

- Types of learning materials accessed
- Volume of material accessed
- Perceived effectiveness of the learning material
- Uptake of different types of material
- Time management benefits
- Range of learning contexts
- The suitability of the visual format for learning compared with audio format
- Unforeseen uses of the technology

Institute of Film and Television Studies

Virtual Film Making Lab

The VLL is supporting the piloting of a virtual film making lab in the Institute of Film and Television Studies in the School of American and Canadian Studies. The piloting of film industry standard video and film editing equipment that closely mirrors that of film and TV professionals. The availability of this equipment will allow students in film and television studies to combine their theoretical and historical research with hands-on practical experiences.

Learning Sciences Research Institute

Using Video-Conferencing for Remote Co-Supervisions and Lectures

To support high quality teaching learning and research in multiple sites with the aid of state of the art video conferencing facilities across different campuses and institutes. The facility will enable co-supervision of research students in Malaysia and China as well as preparations for cross-linked lecture theatre spaces across the Nottingham campuses. A focus on High Definition equipment will act as a test-bed for enriching the concept of learning spaces.

Computer Sciences

Visual Examples of Algorithms for JAVA Programming

This proof of concept initiative will animate a set of visual examples and algorithms for supporting students in a first level module on JAVA programming. Whilst the examples will be developed in Computer Sciences, the materials will also be relevant for students across all Sciences, Engineering, Social Sciences, Humanities and Business Studies since Java programming is used across the disciplines.

Appendix 2
VLL Coverage by Department and Faculty - Summary

Faculty	Unit/Department to which VLL award made
Arts	Modern Languages and Cultures Archaeology Institute of Film and TV Studies
Engineering	School of Chemical, Environmental & Mining Engineering
Medicine and Health Sciences	Nursing Molecular Medical Sciences Veterinary Medicine and Science Pharmacy Biomedical Sciences
Science	Psychology Computer Science Biosciences
Social Sciences, Law and Education Other	Geography Education Graduate School Learning and Sciences Research Institute (LSRI) Hallward Library Learning hub

Appendix 3
Visual Learning Lab Fora

Fora held to date:

March 2007 Professor Claire O'Malley

ASSESSING THE ROLE OF A VIRTUAL REALITY SIMULATION IN HELPING LEARNERS TO CONSTRUCT AND INTERPRET VISUAL REPRESENTATIONS

This talk presents some findings from a study of pairs of undergraduate chemical engineering students learning with the VIRILE virtual polymerisation learning environment. In particular the study looked at whether adding a dynamic representation of chemical process flow to the VIRILE environment led to changes in chemical engineering knowledge relevant to the functioning of a polymerisation plant, ability to interpret and produce process flow diagrams, and understanding of the chemical plant. Some general conclusions will be presented in terms of the benefits of dynamic multiple visual representations for learning.

June 2007 Dr Ed Lester, Jack March & Dr Gary Priestnall

LABWIDGETS Interactive games for visual learning

Labwidgets are games designed to utilize and measure several transferable skills which have been identified by employers as vital characteristics in new graduates. These skills include team working, leadership, decision-making, communication skills, reasoning under pressure, logical thinking and spatial awareness. They can generally be played by anyone, with a choice of various skill levels. Most undergraduate courses do very little to teach or assess these skills, in part because they are so difficult to quantify, and therefore there is no scope for feedback to the students. The way users interact with these games can be logged and improvements in performance monitored.

This forum will present the original LabWidgets project and ongoing developments, including a spin-off project called GeoSpatial Widgets where skills such as map reading and spatial orientation are being explored. A hands-on session will give an opportunity to try several of these 'visual learning' applications and to discuss related experiences across a range of disciplines.

Students benefiting from images presented using a ceiling visualiser in a pharmacy lab session

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