[P1] Development of an interactive online alternative to a laboratory-based demonstration in the module: food microbiology

H. Gibson, J. T. Walton, R. J. Dyer and M. Hammerton
School of Applied Sciences
University of Wolverhampton
h.gibson@wlv.ac.uk

One of the key learning outcomes of the level two Food Microbiology module is that students should be able to discuss the microbiological methods available for the analysis of foods. This is a theory module and practical skills and techniques are developed in other specific stand alone practical classes at level two. The Food Microbiology module includes a series of lectures on the routinely used microbiological techniques, but as a practical subject, the demonstration of the techniques and media used is important in reinforcing the theoretical knowledge and enhancing understanding. In previous years, the demonstration has involved prepared materials e.g. agar plates and biochemical test or photographs in the laboratory. The rationale for the development of the on-line alternative was develop an interactive system to support lecture material that would also link with assessments, remove laboratory and demonstration costs and contribute to the School strategy to increase the on-line learning support material.

An interactive online new media programme has been produced to replace the laboratory-based demonstrations. The programme combines interactive graphics of micro-biological methods with formative assessment exercises providing preparation for the summative assessments within the module. Students progress through the programme, which includes a series of fields with test results such as colonial morphologies on selective agars, by answering a series of multiple choice questions based on the theoretical material covered in lectures to reach conclusions about the test results shown. Feedback is provided to explain why the answer selected was incorrect and the system tracks the overall score for each students. The programme was designed to provide a stimulating learning experience to promote a deep approach to learning and also provides the opportunity for distance and self-paced learning.

The effectiveness of the programme was evaluated by analysis of the results of a questionnaire of students' perceptions and student performance in formative (multiple choice results from the programme) and summative assessment (phase test results).

The questionnaire produced some interesting results, although the sample size was small (n=12). All of the students strongly agreed or agreed that this type of material should be used to support lecture material, but only 50% felt that this should be used to replace lecture material. The programme was considered by 75% of the students to be a good replacement for a laboratory-based demonstration. A similar proportion of students felt that the exercise and the feedback helped understanding of the subject and showed how to improve (75% and 73%). Although, 75% though that the exercise was beneficial to test revision, 33% thought that the exercise was interesting but did not prepare them for the test. The questions in the programme were multiple choice questions, and the questions in the phase test were short answer questions. The microbiological methods section of the phase test made up one third of the test paper, with the remainder covering other two other topics not supported by the on line programme. Student performance in the phase test was analysed. It was found that there was no significance difference between student performance on the microbiological methods section of the test paper and the two other topics. The questionnaire responses were very positive, but this did not appear to affect phase test performance, however the number of students was small (n=12). The feedback from students seemed to confirm that the programme enhanced their understanding of the material, but further refinement in the types of questions and material is required to provide closer support for the summative assessments.

[P2] What's a CETL all about?

Karen Moss and Neil Macfarlane
Centre for Effective Learning in Science (CELS)
School of Biomedical and Natural Sciences, Nottingham Trent University
Karen.Moss@ntu.ac.uk

INTRODUCTION

CELS is one of the 74 HEFCE funded Centres for Excellence in Learning and Teaching (CETL), one of only half-a-dozen CETLs with a science theme and the only one dealing with both traditional 'core' sciences – chemistry, biosciences and physics - and the emerging interdisciplinary sciences such as forensic science and sports science.

THE AIMS OF CELS

Creating a new image for science as:
Relevant
Accessible and
Achievable
within both HE and schools

Based on our excellent record in teaching science within HE and our nationally recognised widening participation activities, we are creating a centre to enable teams to develop and trial new approaches to teaching and presenting science to both communities.

THE APPROACH

Create TIP-TOP teams and a building to house CELS

- Teams for Integrated Projects across Science (TIPS)
- Teams for Outreach Projects in Science (TOPS)
- Work with students, NTU's Progression Partnerships and the Royal Statistical Society's Centre for Statistical Education (RSSCSE)

[Team members will have sabbaticals to develop their project area]

The CELS building will form the nucleus of a science-education development centre: providing both space for staff seconded to the centre to develop and experiment with materials/ approaches; and a venue for dissemination events – both locally and nationally. It will include:

- a 100 seat lecture theatre
- 3 seminar rooms
- IT suite
- School lab
- Offices for seconded staff
- Meeting and exhibition space

We want to:

- Use best practice in educational research to design better ways to teach science
- Increase the number of science students and support the learning of science students locally
- Provide a significant new resource base for science teaching nationally

OUR OBJECTIVES

1. **CELS will develop new materials for teaching scientific concepts using existing models of learning**: eg Context-Based Learning (CBL); Concept Learning (CL), Problem-Based Learning (PBL), by devising materials in a range of formats –including e-learning (VLE, Neural Networks), to help students understand and engage with science concepts at a deeper level. Our rationale is that science concepts often focus on abstractions and foster in students the idea that science is idealized and divorced from the real world. Such disconnection makes it difficult for students to apply theories to real life issues and problems. There is evidence that for deep learning to occur students should be able to connect the new topic to their previous experience. CELS needs to help lecturers understand conceptual development in students - particularly concrete and abstract thinking - in order for staff to develop effective learning materials. A focus of CELS will be application of appropriate E-learning tools, in particular the locally developed, highly innovative and interactive learning system the *Neural Network*.

2. **CELS will develop individualised instruction materials to support the learning of entrants to HE with non-standard backgrounds**: Recent research has identified differences in syllabus content between Access courses and 'A'-level (A2) leading to gaps in knowledge and conceptual understanding. This also affects interdisciplinary programmes where candidates' entry qualifications include a mixture of AS and A2 sciences. Individualised instruction materials will be written to support specific student needs and achievement of desired learning outcomes, building on our extensive experience in physics, eg FLAP (Flexible Learning Approach to Physics) and STOMP (Software Teaching Of Modular Physics).

3. **CELS will apply the outcomes of FDTL Assessment projects to all subject areas in science, focusing on formative assessment and portfolios**: outcomes from EFEL (Biosciences) and related cognate FDTL projects such as FAST (Formative Assessment for Science Teaching) will be applied to all science areas locally –through development of assessment criteria, assessment briefs and the use of formative feedback. In particular, CELS will look at the research into more modern assessment methods, which encourage a profile approach to assessment, for example work on portfolios. This allows a focus on process rather than product and concentrates on deeper learning skills such as analysis, synthesis and evaluation, dovetailing with PDP developments.

4. **CELS will raise the aspirations of local people to enter HE through outreach work** including developing a credit rated scheme for students working in schools; experiments to improve interest in, and understanding of, science; and outreach work in all science areas. CELS will build on our existing programmes of activities and links with Progression Partnerships and the RSSCSE schools-based projects eg *Experiments at School*.

5. **CELS will develop methods for evaluating effectiveness of different learning approaches**, both quantitative and qualitative methods will be investigated: CELS will critically evaluate the differences between quantitative, qualitative, absolute and relative measures of the effectiveness of a course in achieving its learning objectives, and demonstrate whether its effectiveness can be measured.

If you are interested in any of these developments, would like to find out more or get involved then please contact: **Dr Karen Moss**, *the Director of CELS*, at the above address.

[P3] Epistemology, teaching, and assessment in physics

David Sands
Department of Physical Sciences
University of Hull
d.sands@hull.ac.uk

Using epistemology to help define a teaching and assessment strategy in science is not new (1). However, science is usually seen as a homogeneous activity, leading to a single, universal epistemology which places observation at the heart of scientific endeavour. In this paper I argue that this epistemology applies much more to chemistry and biology than to physics, which from the Renaissance onwards has driven, and been driven by, developments in mathematics. Therefore observation plays a fundamentally different role in physics than in these other sciences, because physics, and physics alone, is based on deductive, and therefore predictive, mathematical descriptions of the physical world that often precede experimental observation.

The relationship between mathematics and physics dates back to the earliest days of the Renaissance. Aristotle's physics dominated at that time, but it was not physics as we know it today. In fact, a modern physicist reading Aristotle now would probably have difficulty recognising the subject. Aristotle was a philosopher and his essays are philosophical discourses, quite without any overt mathematical content. It was really Galileo who began the process of quantification, by making careful measurements which he likened to 'book keeping' (2). In Galileo's time measurements, units, and errors were not well developed. He famously measured the period of a pendulum using his pulse, for example, and had to develop his own mathematical techniques to analyse his experiments.

The relationship between mathematics and physics goes much deeper, however. Galileo's contribution was to use and develop mathematical ideas to aid the experimentalist, but it was Descartes (2) who developed the philosophy that physics should proceed by developing mathematical models of real world phenomena in order to make deductions about the world. This is an intellectual act of creativity that simply does not occur in other sciences. We understand and define the world in mathematical terms. Within classical physics it is possible to see a one-to-one correspondence between these mathematical models and physical phenomena, but since the advent of the quantum view, and even the relativistic view to some extent, the exact relationship has become less clear. It is not possible to see a wave function, for example, nor to be sure even that one exists separate from the mathematical reality. We can only be certain that we observe wave-like behaviour, but even this is a mathematical definition.

Other sciences do not work in this way, but a single epistemology is assumed. Consider Gowin's 'vee' diagram, which is a well known heuristic used in college programmes in the US [see ref 1], though not so well known in the UK. The 'vee' diagram has been used in a very wide range of applications, including high school physics experiments, and the educational claims made for it are extensive. The idea is that students should organise their thoughts about an experiment into a single page format according to epistemological considerations, thereby freeing the instructor from the difficulty of trying to assess at once the experimental competence, the critical thinking skills employed in the analysis of the experiment, and the report writing skills.

This system places observation at the centre of the epistemology, because the diagram is so constructed as to move the attention from the focus question, ie the purpose of the experiment, down to the objects and events at the heart of the observation. From here it is possible to consider either the methodological sequence or the conceptual sequence, two paths that together make up the 'vee'. Gowin intended that the practitioner is not restricted to this hierarchical, sequential, and linear movement, but should use both sides of the 'vee' interactively. However, it is not clear how this works in practise. In many of the examples quoted in the literature not all of the headings on the conceptual side are used, but progression from 'concepts' through to 'principles' and up to 'philosophy' is clearly hierarchical.

This sort of structure clearly suits sciences where observation is key to the conceptual process. Prior knowledge claims are taken into account in the focus question and in the principles, but it is essentially retrospective. Having made the observation, the prior knowledge claims are assessed in the light of the findings. Of course, this process also occurs in physics, but there is a crucial difference. Physics rests upon the twin pillars of theory and experiment, which exist side by side in equal importance. Without data, theory is nothing but conjecture, but without mathematical methods physics would have none of its predictive power. Facts, as derived from observation, are subsumed into principles, but the principles form a body of prior knowledge that informs the experiment.

The experiment itself is an act of creativity. It is a complex process using equipment which has itself been built on sound mathematical principles. Observations in other sciences, including chemistry but especially biology, are often passive, however. They involve simply seeing what is already there. That is not to say that the modern chemist does not use complex instruments, but there is still a very important place for the test tube. Observations such as these stand alone as a fact upon which hypotheses and models can be based. Rarely do such observations occur in physics.

This epistemology has two important consequences for physics education, both for the way that mathematics is taught, and for the way that we teach and assess experimental skills and understanding. Mathematics in physics can be described by a three-step model which resembles very closely a problem-solving algorithm first developed in 1943 and described in detail by Halford3 in which it is necessary to: translate the problem into an equivalent model; operate on the model; and then re-translate back to the physical situation. For the greater part of the twentieth century a great deal of emphasis was placed on mathematical competence, because analytical methods required it. Today, numerical computation can replace much of the analysis but the encoding and decoding still need to be done. Emphasis on mathematical descriptions of physical phenomena is an important outcome of this epistemology.

In the laboratory we want to assess how well the students have performed the task of understanding the key concepts and background information, and how effectively they have analysed the outcomes of the experiments in terms of this knowledge. This assessment ought to be formative, rather than summative, and, like Gowin's vee diagram, complementary to existing assessment strategies, such as reports, which only partially assess these skills. The epistemology identifies the following as being important *before* the experiment is conducted: the focus question; key prior knowledge, for example important papers or results; important concepts involved in the experiment; the methodology and equipment; the anticipated outcome, if applicable, so that it is clear about what is being measured and why. After the experiment, the student would ideally identify: any concepts required but not identified at the outset; new concepts introduced during the evaluation of the data; changes to the methodology identified in the course of the analysis; the outcome of the experiment; the relationship between the outcome and the prior conceptual understanding. Some of these may not be possible, depending on the experiment, but it is an essential aspect of the epistemology and part of the training that students should at least be aware of the ideas.

REFERENCES

1. ‘Assessing Science Understanding: A Human Constructivist View’, Joel J. Mintzes, James H. Wandersee and Joseph D. Novak, Academic Press 1999.
2. ‘Galileo’, Stillman Drake, Oxford University Press (1980)
3. Graeme S. Halford, Toward a Redefinition of Cognitive Developmental Stages, in Cognition, Development and Instruction, edited by J. R Kirby and J. B. Biggs. (N.Y. Academic Press., 1980)

[P4] Developing enterprise skills in undergraduate physicists

Paula Chadwick, Douglas Halliday, Lowry McComb, Joy McKenny, and Marek Szablewski
Department of Physics
Durham University

ABSTRACT

An enterprise skills seminar has been developed and piloted with a group of first year undergraduate physics students. The seminar is targeted at first year undergraduate physicists with the aim of making them aware of, and developing their own enterprise skills. The seminar emphasises the relevance of these skills to the students by students developing a technology-focused start-up business. One of the intended outcomes is that the students recognise the value of these skills in a wider context, and how these skills may enhance their effectiveness.

The seminar lasts approximately three hours and is broken down as follows:

1. Introduction
2. Enterprise skills explained
3. Warm up
4. Case study
5. Group presentations
6. Review

The optimum class size is 20 with 4 groups working on different case studies.

This poster will report on our experiences of developing the pilot exercise into a full scale seminar and finally running the seminar with the entire first year class of approximately 250 students.

Feedback from the students taking part in the pilot seminar was favourable and lead to further development of the seminar materials which were subsequently used with the whole year group.

The seminar 'Fermiville an Enterprise Game' was run as a non-assessed part of the level one laboratory based module 'Discovery Skills in Physics'. The sessions were well received by the students and engaged their attention very well.

Seminar materials, the role of the introductory material, student feedback and a review of the exercise by staff who facilitated the sessions will be discussed in the poster.

[P5] To Flash or not to Flash: the use of Macromedia Flash as an effective tool for the production of learning objects in higher education

Matthew Hammerton
Biosciences Learning Resource Associate
University of Wolverhampton

Macromedia Flash started its life back in 1997 as a simple onscreen animation package called FutureSplash. Since then, it has successfully matured into an extremely powerful tool for designing and deploying a whole range of media content both online and offline. With the onset of Flash MX in 2002, the programme has expanded its features and enhanced the tools to allow the production of extremely effective learning objects (LO) (Reinhardt and Dowd, 2002).

Some of the benefits of the program can be summarised as:

- **Small file sizes**: Flash has the ability to maintain small files sizes while producing high quality animation. This allows for quick access to LO even for students on modem connections. This can be further enhanced through the programs ability to stream only relevant information, and only as and when this information is needed.

- **Integration of the majority of multi-media file formats**: Rich interactive learning experiences can be built due to the program's ability to import and seamlessly integrate video, sound, graphics and images in a multitude of formats. Flash files can also be embedded inside other flash files allowing smaller LO to be produced and shared between larger LO or programs.

- **Precise layouts**: The program's authoring environment contains a number of tools similar to those found in graphics programs. For example, several objects in a resource can be quickly aligned and resized by selecting the align and match size tools.

- **Advanced graphical representation of complex concepts**: Due to the quality of the drawing tools and the ease with which onscreen graphics can be animated, Flash gives the user a realistic way of representing complex subject concepts.

- **Advanced visualisation of abstract data relationships**: Flash has the ability to produce unique navigational structures allowing for large amounts of abstract data to be accessed and related effectively.

- **Compatibility and Consistency**: LO produced in Flash will not only display consistently across different screen resolutions, browsers and operating systems but also on different devices ranging from the desktop computer to the mobile phone.

- **Re-usability**: The program has several attributes that speed up the e-learning production process while maintaining a consistent look and feel to the LO produced. Symbols and components, the building blocks of any flash file, can be reused in several LO while still maintaining design flexibility. Several e-learning templates and components have already been produced and are freely available on the web. All assets of a Flash file are stored in the file's library allowing for easy access to the file's resources.

- **Accessibility**: The program provides features to support compliance with W3C's Web Accessibility Initiative priority 1 guidelines by allowing for auto-labelling of buttons, tab-order controls and access to assistive technologies such as screen readers (MacGregor et al., 2002). The program's flexibility in learning object design means that the end user can have the ability to choose how they want the information to be presented.

When producing Flash learning objects, there are a number of issues that need to be considered. These can be summarised as:

- **The plug-in**: In order to view Flash LO, a browser plug-in (or player) is required. In the latest survey, 98% of all connected web browsers have the flash plug-in loaded (Heins and Himes, 2002). However, although it is free to download, problems arise when the computer user lacks the administration rights to their computer and thus is unable to download the plug-in.

- **Learning curve**. Although the program gives the developer great freedom in the production of LO, this freedom comes at a price. Learning how to design and develop LO can take a while, especially when using actionScript, Flash's programming language.

- **Abuse of freedom**. Following on from the last point. Due to the ease with which animations can be produced and the freedom that Flash gives to the developer, there has been a mass of gratuitous animation and unusable resources created that serve little purpose for the end viewer. This has caused influential usability pundits to criticise the benefits of using Flash stating that it hinders more than it helps (Nielsen, 2000). Although, this is mainly directed at website production, it is an important issue that needs to be considered when producing any type of Flash resource. The main question being; 'Is Flash the best tool for the production of my LO?'

- **Development time**. Flash includes several attributes (symbols, components and templates) that speed up the development of LO. Nevertheless, when comparing Flash against Microsoft Powerpoint for the production of animations to help the students visualise subject concepts better, then using Powerpoint is likely to require less time and effort. However, when considering the effectiveness of the animation for the student, then using Flash is likely to produce a more effective result.

In summary, Flash offers e-learning developers many possibilities for producing a whole range of LO. These can be broadly summarised as:

- Intelligent formative assessment exercises (directing learning back to content the viewer still needs to learn).
- Interactive presentations
- Animations of complex subject processes
- Case studies based on live data
- Role-playing games and exercises
- Interactive simulations (although this process has really been automated though Macromedia Captivate)

- Synchronous and asynchronous workshops
- Access and navigation of content based on learning styles preferences
- Peer-to-peer chat and data sharing (Bardzell, 2003, Castillo et al., 2004)

The University of Wolverhampton Biosciences Division has successfully produced a number of LO using Flash that demonstrates the effectiveness of the program for learning and teaching. Please have a look at the link below to view Flash learning and teaching resources produced both within the University of Wolverhampton and externally.

http://wolf-nt.wlv.ac.uk/wlv2052/flash_learning_objects.htm

REFERENCES

Bardzell, J. (2003). Macromedia MX eLearning Advanced Training from the Source. Berkeley, Macromedia Press.

Castillo, S., Hancock, S. and Hess, G. (2004). Using Flash MX to Create e-Learning. Vancouver, Rapid Intake Press.

Heins, T. and Himes, F. (2002). Creating Learning Objects with Macromedia Flash MX. http://download.macromedia.com/pub/solutions/downloads/elearning/flash_mxlo.pdf

Macgregor, C., Waters, C., Doull, D., Regan, B., Kirkpatrick, A. and Pinch, P. (2002). The Macromedia Flash Usability Guide. Birmingham, friends of ED.

Nielsen, J. (2000). Flash: 99% Bad. http://www.useit.com/alertbox/20001029.html

Reinhardt, R. and Dowd, S. (2002). Macromedia Flash MX Bible. NewYork, Wiley Publishing, Inc.

[P6] Getting started with Macromedia *FLASH*

A. J. Rest*, R. Wallace† and D. Brattan‡
*University of Southampton
†Nottingham Trent University
‡University of Central Lancashire
dbrattan@hotmail.com

Keywords: Macromedia *FLASH*, science animations, computer based learning, chemistry

KEYWORDS

Simple animations, videos and good diagrams can greatly increase the quality of teaching and learning. They can be used in lecture situations, they can be included in self-paced learning packages and they can be used to improve accessibility for students with learning difficulties. They also have significant potential for interactive applications.

Macromedia *FLASH* is an ideal tool for producing computer-based animations. It is already extensively used by web designers and the '*FLASH* reader' can be downloaded free from the web.

There are already a wealth of *FLASH* animations, JPEG and other diagrams, and videos available for downloading from a range of web sites. There are, however, a number of problems:

- Most of the material is subject to copyright
- Most of the material is not exactly suitable for another institution's learning situations without some modification
- All the material, and especially the *FLASH* software, is in the form of **.flw** files with no explanation of how these were produced. The original *FLASH* source files (**.fla**) are hardly ever available

For the scientific community, there are two additional difficulties with *FLASH*. Firstly, there is the need to learn how to use it and secondly there is the lack of available help that is simple and directly related to scientific ideas. Even the examples which accompany *FLASH* software are complicated and have no scientific content and most books on *FLASH* have similar limitations.

In this Poster the emphasis will be on 'getting started with *FLASH*' for new users from the scientific community.A series of simple *FLASH* animations, some with detailed documentation on the methods used illustrated on computer and appropriate documentation. Those animations produced by the project team will be available for use or modification by other workers. The accompanying documentation, the original source files and the *FLASH* movie files will provide end users with the methodology to develop their own ideas. Animations will be both qualitative and quantitative, e.g. producing data that can be used in further work, and have will have interactive features. Examples for the Poster will include the following:

1. The relationship between mass, weight and pressure illustrated by an animation of atmospheric pressure (North Carolina Science Centre, USA; http://www.dlt.ncssm.edu/TIGER/Cheml.htm)
2. The relationship between m^3, dm^3, cm^3, and mm3 illustrated by an animation (North Carolina Science Centre)

3. An interactive animation on BODMAS (North Trafford College, UK; http://www.axcis.co.uk/34151.html)

4. An interactive animation on the volumes of a cube, a sphere and a cylinder (North Trafford College, UK)

5. A learning package on atomic spectroscopy (Educational Techniques Group Trust, ETGT; http://www.sotn.ac.uk/~ecchemed/etgt/)

6. Electronic structure and the development of the periodic table (ETGT)

Other material available will include:

- The effect of pressure on the volume of an ideal gas
- The effect of temperature on the volume of an ideal gas
- The effect of temperature on the pressure of an ideal gas
- The nature of solids, liquids and gases
- Vapour pressure
- Diffusion
- Atomic orbitals
- Thin layer chromatography separations
- Gas chromatography separations

Dissemination of the results of this work will take place in a number of ways

- Documentation and animations produced in the project will be available for downloading from the ETGT web site (www.soton.ac.uk/~ecchemed/etgt/)
- Documentation and animations produced in the project will be available on a CDROM
- The work will be demonstrated at a ‘Variety in Chemistry’ meeting
- DB and AJR will be available to run workshops at selected sites
- A paper will be written for CERPS

[P7] Plagiarism: do students know what it is?

M. M. Dawson and J. A. Overfield
Department of Biological Sciences
Manchester Metropolitan University
m.m.dawson@mmu.ac.uk

INTRODUCTION

During the last fifteen years, there has been a steady change in emphasis from examination-based assessment to the continuous assessment of coursework. One of the prime reasons for this shift of emphasis has been the need to assess both subject-specific and generic skills in order to ensure fulfilment of learning outcomes, and the recognition that exams often assess only a limited range of skills. With the increasing use of continuous assessment, and with the extensive development of the Internet as a source of learning materials, has come the recognition that students may, with relative ease, download information and claim it as their own i.e. they plagiarise (Evans, 2000; Park, 2003).

Higher Education Institutions in the UK have not been slow to recognise that extensive plagiarism exists and many now take great pains to inform their students of the penalties which will be incurred if students are caught plagiarising. Other approaches taken by individual universities and university departments include investment in electronic detection of plagiarism (Mottley, 2004) including use of the JISC plagiarism detection service (JISCPDS) (http://www.submit.ac.uk) and in the design of assessments that offer less chance for plagiarism. However, we believe that there is a disparity between the students', the tutor's and the University's views on what constitutes plagiarism, and that there is a consequent need to inform students of the precise range of activities covered by the term. Others (eg Parlour 1995) have also felt that students, particularly first year students, are not really aware of what the term plagiarism means.

AIMS AND OBJECTIVES

The aims of this project were to determine what students believe constitutes plagiarism and to produce guidelines for students on what plagiarism actually means.

This was achieved by

- Designing a scenario-based questionnaire in order to determine what students feel constitutes plagiarism.
- Giving the questionnaire to students at all levels including foundation level, on our undergraduate programmes.
- Analysing the questionnaire and conveying the results to all students in our department via the student website, with an individual email prompt.
- Producing a set of guidelines on plagiarism, specifically aimed at addressing any misconceptions which have been made apparent as a result of the questionnaire.

METHODS

The questionnaire was given to students within the Department of Biological Sciences at MMU.

These included students taking a BSc in Biological Sciences (BScBS) or in Biomedical Science (BScBMS). Students on the Foundation programme (Level 0) who took part were all studying a module in Biological Science, but were linked to different degrees within the Faculty of Science and Engineering at MMU.

A paper-based questionnaire was designed using multiple choice questions and case scenarios, the latter being based on actual experience. Case scenarios included use of information taken directly from textbooks, paraphrasing, use of quotation marks, use of diagrams downloaded from the web, extensive downloading of essay material from websites, copying from fellow students and collusion. Students were asked to give reasons for their answers to scenario-based questions. The questionnaire was also scrutinised by two academics* from other institutions, who made recommendations as to content.

The questionnaire was given to Foundation students (n=45), level 1 undergraduate students (n=105) during their induction programme, and level 2 and 3 students (n=28). Students were given 1 hour to complete the questionnaire individually.

RESULTS AND DISCUSSION

The results demonstrated the uncertainty shown by students as to what constitutes plagiarism. While they understood that using someone' s words as if they were their own is plagiarism, they were less certain when it came to appropriating someone else's ideas or practical results. They were not always certain about the boundaries between collusion, plagiarism and permissible group work and between poor academic practice and plagiarism. They were aware that downloading entire essays from single or multiple website constitutes plagiarism, though some students felt this was acceptable, if the websites were referenced. Responses to questions involving copying from friends were mixed. Students were aware of acceptable procedures when downloading diagrams/figures from websites, though did not always know where the reference should be placed.

It is clear that, despite the media attention given to plagiarism, students are not always aware of the boundaries between plagiarism and acceptable practice. Since the penalties for plagiarising may be severe, it is essential that guidelines are provided early in the course. The scenario-based questionnaire used examples likely to be within their experience. This approach is more likely to engage the student than issuing them with a list of penalties should they be caught. The exercise has raised awareness of plagiarism amongst our first year students. We have produced guidelines on plagiarism aimed at addressing misconceptions which have been made apparent by the results of the questionnaire. However, we feel it is useful to carry out this exercise with new students, before giving them guidelines, in order to raise awareness.

This project was funded by the LTSN (Bioscience).

*Professor Trudie Roberts, Leeds University
*Professor Carol Philips, University of Northampton

REFERENCES

Evans, J. A. (2000) The New Plagiarism in Higher Education: From Selection to Reflection Interactions 4(2) http://www.warwick.ac.uk /ETS/interaction/vol4no2/evans.ht#refs (accessed Sept 30th 2004)

Mottley, J. (2004) *Is Google suitable for detecting plagiarism* LTSN Bioscience Bulletin 12

Park, C. (2003) *In other (people' s) words; plagiarism by university students – literature and lessons*. Assessment and evaluation in higher Education 28 471-488

Parlour, J. (1995) *Thou shalt honour thy sources*. THESIS Opinion http://www.thesis.co.uk (accessed Sept 30th 2004)

[P8] The Resource Discovery Network (RDN): using the best of the web in teaching and learning

John Blunden-Ellis
PSIgate/GEsource Office
The University of Manchester
j.blunden-ellis@manchester.ac.uk

WHAT IS THE RDN?

The Resource Discovery Network (RDN) is a set of **free** subject gateways that provide access to fully searchable catalogues of expert-selected high quality Internet resources, and to a variety of other value-added services. All these services are designed for use by UK further and higher education, for both learners and teachers.

WHAT SUBJECTS DOES THE RDN COVER?

The RDN currently comprises eight subject gateways covering the following areas:

- Arts and Creative Industries (Artifact)
- Biosciences and Medicine (Biome)
- Engineering, Mathematics and Computing (EEVL)
- Geography and Environment (GEsource)
- Humanities (HUMBUL)
- Physical Sciences (PSIgate)
- Social Sciences (SOSIG)
- Sports and Leisure (Altis)

Four of the gateways specialise in the sciences; Biome, EEVL, GEsource, and PSIgate.

WHAT DO THE RDN SUBJECT GATEWAY CATALOGUES OFFER?

Each gateway maintains its own catalogue, comprising informative descriptions of specially selected high quality Internet resources. All resources are searchable by subject keywords, or by browsing subject headings. As all the resources are pre-selected, this means that those looking for information will only find resources that are informative, useful, and relevant. In other words the user is 'two clicks away from rich information'. In total there are about 100,000 resource descriptions in the RDN catalogue covering a wide range of resources including: lecture notes, tutorials, FAQs, news, reference, government publications, image banks, animations, etc.

HOW CAN I USE THE FREE RDN SERVICES FOR LEARNING AND TEACHING IN SCIENCE?

The RDN gateways offer a range of additional services that provide alternative routes into the resources listed in the catalogues, or exploit particular subject themes. Focusing specifically on science/engineering, some additional services include:

Virtual Training Suite (VTS). The popular and successful RDN Virtual Training Suite aims to help students, lecturers and researchers in UK higher and further education to develop their Internet information literacy and ICT skills (though it is also freely available for any one else to use).

It offers a set of FREE ‘teach yourself’ tutorials, delivered over the Web, each of which offers Internet skills training in a particular subject area. There’s a tutorial for most of the subjects taught in universities and colleges.

The tutorials offer ‘any time, any place’ training and include quizzes and interactive exercises to lighten the learning experience. They offer a subject-based approach to Internet skills training, enabling you to: Tour key websites, discover how to search the Internet, review and judge websites, and reflect and plan to work efficiently. http://www.vts.rdn.ac.uk

Full Text Tutorials and Lecture Notes in the Sciences. PSIgate provides free access to nearly 4,500 full text tutorials and lecture notes in the sciences, accessible via the catalogue. http://www.psigate.ac.uk/newsite/

Spotlight. This is an award-winning science webzine authored by a well-known science journalist. *Spotlight* provides monthly articles on topics of current interest in science. All articles are searchable by keyword or browsable by broad subject area. The archive covers all areas of science including such varied topics as: extra-solar planets, DNA, viruses, the Gulf Stream, and toxic wallpaper. *Spotlight* is useful as a source for project and essay ideas, teaching material, keeping abreast of hot topics in science, for promoting science to the public, and for those interested in the process of making the esoteric in science accessible. http://www.psigate.ac.uk/spotlight/

World Guide. A very successful series of guides to over 270 countries and territories. The Guide includes articles, features, interactive maps, demographic data, satellite images, scrollable city images, and a data comparison tool. Bringing together a wide range of resources into one place, this popular service is useful for learning and teaching projects and ideas, with a wide variety of visual aids. http://www.gesource.ac.uk/ worldguide/

Interactive Tutorials and Subject Packs. A set of 92 interactive tutorials covering the basic principles of chemistry and physics provide both problems and worked solutions. This is available from PSIgate. http://www.psigate.ac.uk/newsite/reference/chemlecs/

A full text online course in chemistry is also provided by PSIgate, comprising over 70 separate topics in physical and inorganic chemistry. http://www.psigate.ac.uk/newsite/reference/plambeck/chem1/ ua101.html

Subject Packs are provided on specific topics in chemistry, physics and the earth sciences. Each pack lists and describes ten high quality information-rich web resources that may be accessed immediately. Additional sources of information are also provided. http://www.psigate .ac.uk/education/

Hot Topics. EEVL Hot Topics is provided in conjunction with Cambridge Scientific Abstracts (CSA), and offers in-depth reports on topical engineering, mathematics and technology issues http://www.eevl.ac.uk/hottopics.htm

PSIgate Hot Topics currently contains over 50 separate features on all aspects of science http://www.psigate.ac.uk/newsite/featured.html

News and Jobs. PSIgate Science News and Jobs. Users can keyword search across 60 news feeds simultaneously for the latest science information. http://www.psigate.ac.uk/newsite/allnews.html

EEVL OneStep Industry News. Users can keyword search across 70 news feeds simultaneously for the latest technology and engineering news information. http://www.eevl.ac.uk/onestepnews/

In addition, look for **Timelines** and **Quizzes** provided by some gateways.

HOW IS QUALITY ENSURED?

All resources added to the RDN catalogues are individually selected by subject experts or information professionals. Ongoing reviews ensure that the quality and currency of the catalogued material is maintained.

HOW DO I ACCESS THE RDN GATEWAYS?

All the subject gateways are freely accessible via either the central RDN website:

http://www.rdn.ac.uk/ or via the individual science and engineering related gateways:

http://www.psigate.ac.uk/newsite/: Physical Sciences

http://www.gesource.ac.uk: Geographical and Environmental Sciences

http://www.eevl.ac.uk:Engineering/Manufacturing / Computing/Mathematics

HOW DO I MAKE CONTACT?

RDN Executive Office:
Email: rdn-feedback@rdn.ac.uk
Tel: 0161 275 6109

For physical sciences contact:
Email: feedback@psigate.ac.uk
Tel: 0161-275 8729

For engineering/ technology/ computing contact:
Email: R.A.McLeod@hw.ac.uk
Tel: 0131 451 3576

[P9] Use of PharmaCALogy software in a problem based learning programme to teach pharmacology for extended and supplementary nurse prescribing

I. P. L. Coleman and A. S. Watts
School of Applied Sciences
University of Wolverhampton
IPLColeman@wlv.ac.uk and A.S.Watts@wlv.ac.uk

ABSTRACT

Pharmacology is taught on a module dedicated for nurse prescribers who have a limited physical science background. To facilitate learning a problem-based approach is adopted, to enhance students' knowledge of drug action a software PharmaCALogy package was use. Students were alternately given a lecture or encountered the software as a prelude to a short test a week later. The process was repeated with their roles reversed, followed by use of a questionnaire to evaluate user experience. Generally students receiving the lecture performed better on the test but after experiencing both forms of learning there was little difference between test performances. Response was positive with regard to the software especially the aspect of visualising drug interactions. However, lack of prior knowledge and paucity of time on task were seen as negative features. The responses indicate measures that may improve the student experience by taking greater note of learning styles and existing IT skills.

INTRODUCTION

'Advanced Pharmacology for Supplementary and Extended Prescribing Practice' is a dedicated module provided for post-registration nurses in part fulfilment of a course that enables them to operate as extended and supplementary nurse prescribers. A problem based learning approach has been used on this module whereby students approach a study of drug action from the perspective of their immediate life/work experience. To aid the process, one lecture to emphasis the nature of drug targets is given. Though appreciated by students, the practice was at odds with the module philosophy on the basis that problem-based learning is constructivist in its approach, allowing students to participate in their own learning process. To replace this rather instructivist element, the current study was initiated with a view to the eventual replacement of the lecture by the students' own active interaction with dedicated pharmacology software. The study sought to review the effectiveness of learning via the computer assisted medium set against the learning achieved by the more traditional lecture.

METHODOLOGY

Thirty post-registration nurses from a variety of professional backgrounds studying the module were divided into two groups, A and B. With one exception all were female and aged between 30 and 55. In the first week Group A undertook a study of the topic 'Drug Targets'. The students were supported by two members of the module team and provided with instruction sheets, which also contained questions to provide a focus for working through the software.

Table 1: Results of test for students one week after 1st lecture or software presentation

	Experience	n	Mean (%)	Standard deviation
Week 1 Group B	Lecture	8	45.13	17.89
Week 1 Group A	Software	13	26.92	13.31

p<0.007

Table 2: Results of test for students one week after 2nd lecture or software presentation

	Experience	n	Mean (%)	Standard deviation
Week 2 Group A	Lecture	11	57.73	13.30
Week 2 Group B	Software	8	58.13	21.03

p>1.74

Table 3: Results of test for students one week after receiving lecture presentation

	Experience	n	Mean (%)	Standard deviation
Week 1 Group B	Lecture	8	45.13	17.89
Week 2 Group A	Lecture	11	57.73	13.30

p<0.05

Table 4: Results of test for students one week after receiving software presentation

	Experience	n	Mean (%)	Standard deviation
Week 1 Group A	Software	13	26.92	13.31
Week 2 Group B	Software	8	58.13	21.03

p<0.001

Table 5: Results of test for all students (both Groups combined)

	Experience	n	Mean (%)	Standard deviation
Week 1 Group A+B	either	21	33.86	17.33
Week 2 Group A+B	either	19	57.89	16.44

p<0.02

Students were encouraged to work in pairs rather than encounter the software experience on their own. At the end of the session, the students were provided with the answers to the questions. Group B students were given a conventional Powerpoint lecture on the same topic; the structure of the lecture was assembled to match the content of the computer software as closely as possibly. One week later, both Groups were assessed by means of a short 10-question test. Then Group A received the conventional lecture whilst Group B experienced the software presentation, following the same procedures as in the previous week. One further week later, both groups completed the same short 10 question test and also answered a 20 point questionnaire to evaluate their experience of the use of dedicated software. Students were asked to respond on a five point Likert scale (1 = strongly agree to 5 = strongly disagree).

RESULTS AND DISCUSSION

Test results showed a significant difference between the groups, the students in receipt of the lecture gaining a far better grade than students who used the software (Table 1, $p<0.007$). However, a week later, following a cross over between the groups (so that those who received the lecture in the first week used the software and vice versa), the test results showed virtually similar marks and demonstrated no significant difference between the groups (Table 2, $p>1.74$).

Tables 3 and 4 compare the results of students for the lectures and software between week 1 and week 2. There is some improvement in test performance in the second week comparing lecture group from week 1 with that in week 2, the difference is just about significant ($p<0.05$) but there is a considerable improvement between the two software groups from week 1 to week 2 which is significant ($p<0.001$). Pooling the data (software users plus lecture recipients) suggests a general improvement in test performance from week 1 to week 2, which is statistically significant ($p< 0.02$).

The results suggest initially that the lecture may be a more effective medium whereby students acquire knowledge, however by the second week there is no real difference between the groups. As a positive comment, to achieve an average score of nearly 60% might be considered successful learning. However it does suggest that a blend of conventional delivery with computer assisted learning is the more effective process, and that on the basis of improved knowledge of subject content it may not be appropriate to use the software on a stand alone facility in its current form of use (Andrrewartha, G. and Wilmot, S. 2001).

REFERENCES

Andrrewartha, G. and Wilmot, S. (2001) Can multimedia meet tertiary educational needs better than the conventional lecture? A case study. *Australian Journal of Educational Technology* 17, pp 1-20

[P10] A good big 'un ...: adaptive technology and scientific software

Nick Musgrove*, Shirley Evans†, Richard Homfray* and Tony Sales†
*School of Applied Sciences, University of Wolverhampton,
†Royal National College for the Blind, Hereford

The University of Wolverhampton attracts an increasing constituency of additional needs students as a consequence of Government and University initiatives (e.g. Flexible Access Project, Widening Participation etc.) as well as transfer from linked institutions.

The School of Applied Sciences has an extensive portfolio of specialist software and teaching packages[1] and this, coupled to an increased emphasis on the use of ICT in producing assignments; laboratory practical and field reports, essays, projects etc. could be seen to be increasing the difficulties encountered by some of our students whose needs were not met by our standard IT provision.

The use of screen magnification software is now well established (Neuman, 2002; RNIB, 2003) and we describe our use of the facilities implemented in Matrox multiple output graphics cards to improve access to ITC for our visually impaired and other students whose needs may be met by increased magnification.

Our current 'student specification'[2] machine has been upgraded with a dual output graphics[3] card to enable the use of monitors in varying configurations and hardware magnification settings. The use of twin 21-inch monitors provides additional output options for the range of software used in the School and is particular useful in those specialist scientific, graphics and spreadsheet/statistics packages where voice recognition/control software may be inapp-ropriate or not available.

[1] SAS Intranet, WOLF [Wolverhampton On Line Learning Framework. University VLE], GIS, Remote Sensing and various statistics packages as well as specialist teaching packages such as 'Sheffield Biosciences Software' and 'Biochemical Simulation'.
[2] Pentium 4:2·4 GHz, 512mb RAM, 40Gb HDD,
[3] Matrox Millenium 440, 550 or 750 models

EXAMPLES OF CONFIGURATIONS USED

Clone/variable magnification mode

The first monitor is set to low magnification circa x1- x2, enabling the user to 'search' the document and locate features of interest (paragraphs, graphics etc.). The chosen area can then be selected using the mouse pointer and the selected feature then appears, filling the second screen to a magnification determined by the extent of the area chosen, but varying between x1 to around x10. Options are available to set the system to control the boundaries of the magnified area using the cursor or 'follow the mouse'.

Single monitor cycling through Pixel TOUCH magnifications

Predetermined magnifications are available on the first (or only) monitor via the so called 'PixelTOUCH' facility where key strokes allow cycling through x1, x2 and x4 magnifications; at the latter magnifications, the 'follow the mouse' system allows the user to navigate around the screen and concentrate on any desired detail.

Our initial experience at Wolverhampton is based on a limited range of student needs, examples of which are given below.

Student A (visual impairment)

Found the principal advantages were provided by the magnification options within the system (particularly when used with the 21-inch monitors), which facilitated working with Word and Excel as well as making Internet use easier.

Student B (dyslexia)

Found the magnification options useful when working with Word and when viewing / reviewing the lectures and other support materials made available on WOLF.

Student C (dyslexia and dyspraxia)

Initially enthusiastic but did not make enough use of the facility to provide any valid feedback

RNC TRIAL

The system is also being tested as an additional tool for teaching visually impaired students at the Royal National College for the Blind at Hereford. The optimal set up was found to have the primary monitor positioned on the right behind the mouse and the secondary monitor on the left behind the keyboard. This allows the user to access the Pixel-Touch 2x or 4x magnification facility on the secondary screen alone, or use the DualZoom feature so that they can have a magnified screen in front of them whilst the teacher can see the whole screen on the monitor on the left.

SUMMARY

Whilst not claiming this system is a panacea it appears to have benefits for particular students in specific situations or when using specialist software.

A principal advantage over other commercially available screen magnifiers is the price; £50-£60 (plus a second monitor if needed) instead of £500+ for the market leaders.

Users benefit from the screen not 'jumping around' when menus etc. are opened, whilst the teacher can see the 'whole picture' without having to alter the learners view.

It is of course possible to use the Matrox monitor card with a single monitor in PixelTOUCH mode to provide similar facilities for use at home etc.

Matrox dual output cards can provide an invaluable and economic teaching aid as well as increasing access to ITC and helping to meet the additional needs of a disparate group of learners.

REFERENCES

Neuman, Z.,(2002) Visual impairments and technology. In Phipps, L., Sutherland, A and Seale, J (eds) *Access All Areas: disability, technology and learning*. JISC Techdis Service and Association for Learning Technology.

RNIB (2003) *Factsheet: Low Vision; Technology in Learning and Employment*. Royal National Institute of the Blind