Beyond ECDL: basic and advanced ICT skills for the new library professional

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Abstract

This paper reports on a new multimedia-centred ICT module, called Fundamentals of Information and Communication Technology (FICT) for Postgraduate Information and Library Studies students at the Graduate School of Informatics at Strathclyde University. It had radical aims (introducing novel ICT skill content in a progressive manner, encouraging deep learning and self-directed study) and used a weekly survey and a post-module survey to investigate its operation. Skills learnt were compared to skills required during student placement in libraries. Conclusions are drawn as to its success in matching the needs of future library professionals.

Introduction

At the Graduate School of Informatics at Strathclyde University (in Glasgow, Scotland), the Postgraduate Masters courses in Information and Library Studies (ILS) and in Information Management (IM) were recently redesigned. One major objective in their redesign was to position ICT(information and communications technology) in general, and multimedia in particular, at the core of the curriculum for students on

both courses, one with a library/information service focus, the other with a business focus.

As part of the core component of each course, modules were added to address the issue of ICT skills, Fundamentals of Information and Communications Technology (FICT) was introduced for the ILS course, and Fundamentals of Business Information Technology (FBIT) was introduced for the IM course. The teaching for both modules was identical, the only variation was in the assessment, for the ILS course an assignment related to spreadsheets and databases focusing on user numbers and issue statistics was provided, whereas for the IM course the assignment was based around hotel occupancy rates.

The rationale for this sharing of ICT content was that student and employer needs in both areas were seen to be nearly identical. ECDL (the European Computer Drivers Licence), the standard measure of basic ICT competence, was seen as an baseline for the new modules and was incorporated as an adjunct to their academic nature.

The European Computer Driving Licence (ECDL) is an internationally recognised computer skills certification programme spanning some sixty countries. It is also known as the International Computer Driving Licence (ICDL) for countries outside of Europe. It was launched in 1996. Its objective is to:

"raise the level of core knowledge about Information Technology (IT) and computer skills competency on a global basis and provide an internationally recognised certification." (http://www.ecdl.com/main/about.php)

ECDL/ICDL consists of seven modules: Basic Concepts of IT, Using a Computer and Managing Files, Word Processing, Spreadsheets, Databases, Presentation and Information and Communication. When all seven modules are completed a candidate receives the European/International Computer Driving Licence. While ECDL is an accepted basic ICT qualification in libraries in the UK, the FICT module was intended to take ILS students beyond ECDL, into deeper skill sets that would be vital to their future professional careers.

Aims of the Fundamentals of Information and Communications Technology (FICT) module

The main aim of FICT was to position multimedia as the core of ICT, rather than as merely the latest component. It was hypothesised that students think of ICT and multimedia as near synonyms. The web and CDs/DVDs are intrinsically multimedia in nature, so students should have recognised this. All popular operating systems also come with software to display, and give basic editing control over, multimedia. Hardware devices to create and manipulate multimedia (scanners, digital cameras and digital audio players) are replacing analogue counterparts.

A related aim was to use web and HTML as the delivery medium for multimedia, to keep multimedia integrated with mainstream IT. Previous to web, multimedia required special software applications to create and deliver multimedia shows (e.g. Hypercard, Toolbook, Director etc). The output files from these specialised multimedia packages could only be viewed through player versions of the producing

package and would not integrate with any applications. These packages were inherently complex as they used metaphors like books (Toolbook) or timelines (Director) to organise multimedia. They inevitably involved a certain amount of programming to synchronise display and create effects. Because of this multimedia had to be taught in a separate module only to students with the necessary technical skills to cope. This always ran against the grain as all students felt they wanted to create multimedia but what seemed simple to appreciate was too difficult in practice to produce.

It was hypothesised that these problems would not affect multimedia delivered via web pages. First, delivery was usually just a matter of having a link to a file containing audio, video etc, and the appropriate plug-in or helper installed for that file type. Second, navigation between pages was handled by simple hypertext links. Obviously, professional, 'filmic' type multimedia presentations are impossible but at least the web democratises multimedia.

On the theme of democratising ICT skills, of making them accessible to all, the module was intended to accommodate students beginning with different skill levels but attaining a common high skill level by module end. There is an assumption that has been around for as long as ICT skills have existed and that is that one cohort of students 'in the future' will arrive not needing ICT skills! This has always proved to be fallacious, for a number of reasons. ICT skills are a moving target and expertise, say in use of MS-DOS commands, is now of historical interest only. People tend to pick up skills with particular popular applications (e.g. web browsers, word processors) but lack the need to do the same for applications that are of less immediate interest to them (e.g. web page creation tools, databases) and which typically have much steeper learning curves. Also it is ironic that most people have no idea of the range of applications and functions that come with their computers, let along the vast range of applications available for download or purchase!

Thus student cohorts continue to arrive with a mixed range of skills, from no skills to expert. The approach taken on this module was to deal with this range by aiming learning materials and delivery at the students with basic or non-existent skills. The pragmatic reason was that this was where the greatest need for improvement lies. Students with existing skills were to be accommodated by adding 'advanced' material to each content 'chunk' on the module. Thus those who progressed quickly through the basics were given something to engage with.

A related aim was to start the module with basic content (e.g. file formats, saving and retrieving files), but to progress through to advanced levels of skill in vital topics (e.g. troubleshooting, installing/removing software) later. The FICT module at its heart consisted of nine successive two-hour computer laboratory class sessions:

Week 1: Essential ICT Skills – using a web browser, introduction to ECDL, copying/deleting and naming files, using an emailer, netiquette, using a newsreader

Week 2: Searching the web – basic search engine use, basic query construction, judging information quality on the Internet, advanced searching (reference engines, meta engines, directory engines, robot engines, specialised engines, searching discussions)

Week 3: Introduction to online databases – searching Lexis-Nexis, finding UK/European legal information

Week 4: Introduction to HTML and Javascript – creating HTML with a text editor, basic page formatting, images, links, tables, frames, basic scripting in Javascript

Week 5: Multimedia – image formats and basic editing, sound and video formats, embedding, streaming media, file compression, downloading and installing software

Week 6: Security and troubleshooting – desktop management, shortcuts, installing/uninstalling hardware and software, backups, encryption, anti-virus software, troubleshooting

Week 7: Spreadsheets – designing worksheets, entering data, addressing, constants and formulae

Week 8: Databases – viewing/adding/editing/sorting data, data queries, producing reports, linking tables

Week 9: Introduction to Dreamweaver – basic page formatting, images, links, tables, frames

A sequence of lectures accompanied most of the above sessions, delivering an overview of theory and concepts and examples of use. Some lectures contextualised ICT in future work situations in which an information professional would need guidance. For example, the case for and against Internet filtering was explored, along with technical options available.

It is proposed that the above sequence of computer laboratory class sessions offers a logical progression from simple to complex skills. From previous student cohorts it was noted that basic file management skills in terms of being able to locate named files in particular directories on particular devices were problematic. For example, with previous cohorts, tutors had found on a later module that students could not copy all the data files for a set of web pages constructed for an assignment from a directory on a hard disk to a floppy disk. Another problem noted from past cohorts related to web searching. Web searching is a skill students think they possess but merely searching using their favourite search engine must be shown to be woefully insufficient for a would-be information professional. Equally, being able to search online databases is a core skill of an information professional and these need to contrasted to web search engines which are free, easier to use, but much less reliable in terms of quality.

One exception, in terms of following an easy to hard progression, is the teaching of HTML by hand coding before using a page creation tool. Hand-coding first was decided upon so that students would fully appreciate the underlying nature of web pages, that is as content marked up for display by tags. Understanding how tags work would mean that how any web page displays could be ascertained by students by viewing the HTML source of that page. When a web page creation tool (in this case Dreamweaver) was introduced, students hopefully would see both how much time it

saved them but also that it had disadvantages in taking away some level of 'micro' control, which they could regain by simply adjusting tags themselves.

The approach of starting with simple web pages, and then adding features, meant that the freedom and creativity engendered by web would be exploited to the full, by following up inclusion of images on web pages with more complex media items. This has already been stated as the most fundamental aim of the module, and would be achieved by giving students enough HTML capabilities and access to plentiful multimedia resources to allow them to draw themselves into the joy of multimedia creation.

This typically is where many ICT skills modules stop but it was decided to take this one to a new high level. It is not necessary to be able to fix or solve every computer problem but some knowledge of how to determine the nature of problem and basic steps one should take to apply 'first aid' are critical skills. Fundamental to good computer 'housekeeping' is being able to manage the desktop and add and remove hardware and software. Mastering this forms a sound platform on which to build basic trouble shooting skills. These involve using information from internal Help files and external sources on the Internet to diagnose a problem and possibly to try simple remedial measures. If a fault cannot be solved it is more professional to be able to say what it might be than simply leave everything to someone else. Many computer problems are of a sufficiently trivial level to be solvable by even basic troubleshooting skills (e.g. cables not properly connected, etc).

Linked with this topic it was noted that most students from previous cohorts had shown very low levels of security awareness. Student excuses in the past for missing assignment deadlines had related to losing files because of a disk failure or a virus. Backup routines and the use of virus scanners were thus included. Students also had not known that 'deleted' files could be recovered or how to password encrypt sensitive information

Coverage of applications was left to last, so that skills relating to understanding computers as a complex system would serve to contextualise them. Spreadsheets and databases are both essential information handling applications and were each covered. Word processing and presentation software would be covered by the ECDL materials and students were to be expected to attain competent skill levels in the use of these packages by using a self-tutoring package.

Another important aim was to focus on problem solving and conceptual model building in computer laboratory class sessions. Based on past experience it was felt very wrong to teach ICT by rote learning of functions, for example, by describing to the student in detail every action and mouse click necessary to do a particular task on a computer. This approach was very bad for 'deep learning', as the student was drilled in the actions needed to do a particular task in one way. While effective in terms of training, if the task or the system used was only slightly different, then following through a set sequence of actions would hit an unexpected junction at some point. When using the 'deep learning' approach active learning materials like work sheets should encourage the students to consider what to do at vital stages. If the student succeeds then they would have 'deep learned' a vital concept. If the student failed then a tutor would be the next level of 'teaching resource' to help in deep learning.

Another aim was to develop teaching materials that were independent of special, dedicated computer laboratory facilities, to universalise their use. All ICT skills modules have the problem of having to be delivered in a computer laboratory. The problem with computer laboratories, ironically enough, is that they are primarily set up not solely for meeting teaching needs but for security and ease of maintenance within a technician and resources budget. The same computer laboratory might have to support a diversity of modules, which means that some of those modules might find that the platform and applications presented in the computer laboratory were optimised for other modules.

Thus it was decided to develop teaching materials that were are universalised as possible, in that they were not tailored for a particular version of Windows and could accommodate certain problems with the underlying systems. For example, students might be warned about possible installation problems in a protected environment.

Another aim, which is linked to the preceding one, is that universalised learning materials could be used at other times and locations by students. There are sound didactic reasons for expecting students to work in their own time. Students must not take the view that timetabled teaching time, even in a computer laboratory, is all they must put in to master a topic. All modules expect that students should put in extra time and just because students are not in a computer laboratory should not mean that they are unable to further their ICT skills via learning materials. It should not be forgotten that students should be using ECDL materials to pick up the basic skills they impart and that students would be encouraged to self-assess themselves on these skills using a self-teaching ECDL package, available on and off campus to students

The last aim must relate to assessment of skills learned, in that the module must assess formally student learning and skills with a comprehensive range of methods. It was hypothesised that different types of assessments would be needed on this module. A multiple choice test would test breadth of comprehension of technical terms and problems. Short answer unseen examination questions would test overall comprehension of the range of concepts. Seen long examination questions would probe the depth of student's knowledge in a crucial area. Finally student application skills would be revealed by an assignment involving solving a realistic case study with real data.

Evaluating the Fundamentals of Information and Communications Technology (FICT) module

Since this module was a radical departure from previous modules a comprehensive evaluation system was implemented. Online questionnaires were designed for the students to complete before each computer laboratory session. The questionnaires were designed to gauge the students' views on the previous week's computer laboratory session, the rationale being that with a week to practice and enhance the skills covered, the student should be able to make a more reflective analysis of the content. Note that feedback was also obtained from the IM students following the FBIT module, the identical twin of FICT.

In addition to this weekly feedback, a final questionnaire was conducted in early 2003, two months after teaching on the module had ceased and all assessment had been undertaken. Again, this timescale was adopted to facilitate reflection on the parts of the students and also to take into account any skills used by ILS students while on the compulsory placements associated with the course.

Weekly Feedback

While analyzing each individual lab session one week after students had participated seemed a good idea, it was found that as the weeks passed on a "questionnaire fatigue" set in. This was something that was not expected, as the questionnaire was designed to be quick and easy to complete. However, there also seemed to be a correlation between the difficulty of the content in the labs and the willingness of students to complete feedback on them. Coupled with the added pressures of assignment deadlines later in the semester, all led to the feedback in the first few weeks being relatively across the board in terms of student numbers, while late in the semester, the response was low. The following graph illustrates this point clearly:
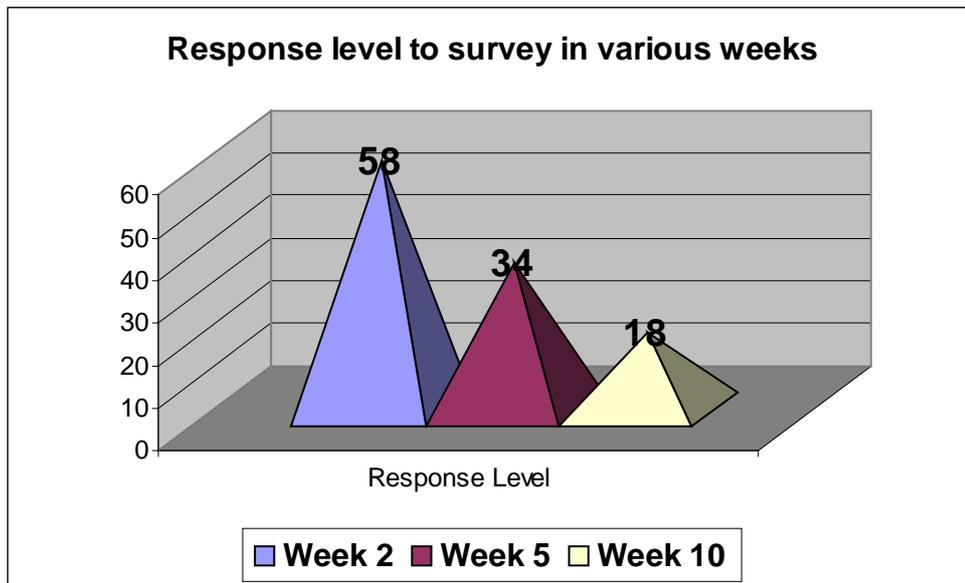

Figure 1 - Response rates to lab feedback

While attendance at computer laboratory classes remained relatively constant, the survey responses dwindled as the semester went on. In terms of evaluation for next year, the tutors have decided to limit the questionnaires to one or two in the first semester to try and achieve as large a response as possible.

In terms of the specific computer laboratory sessions, the one on web searching reflected a sense of confidence amongst most students, although the majority of students rated it as either useful or very useful, based on a response rate of two thirds of the combined cohorts:
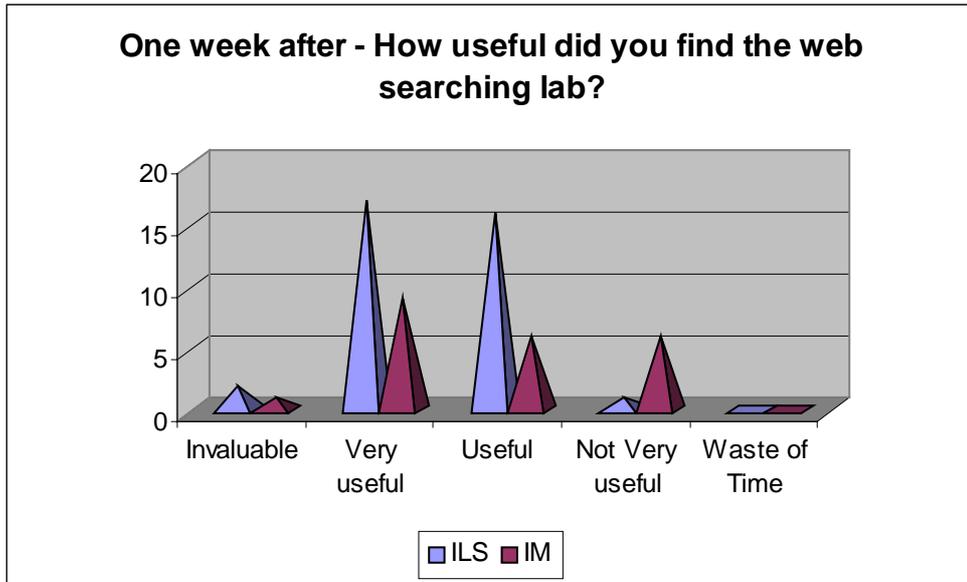
Figure 2 - One week after - How useful was the web-searching lab?

In stark contrast with this was the feedback on the multimedia laboratory class, albeit on a much smaller response rate of around a third of the total class. The overwhelming feedback from students was that they did not find this laboratory class as useful as the web-searching laboratory class, even though the multimedia laboratory class was imparting to them vital skills in understanding the delivery and use of multimedia information:
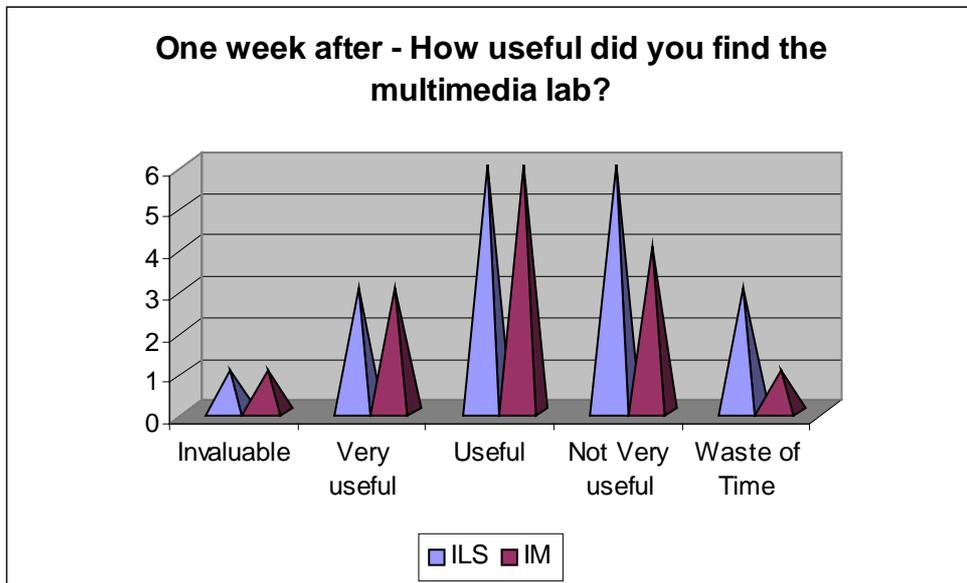

Figure 3 - One week after - How useful was the multimedia lab?

The response does seem to indicate something the tutors felt during the sessions, that there is a general sense of confidence in students based around the use of web browsers generally, but a distinct lack of understanding of the importance of multimedia in this area. It has to be noted that part of the difficulty relating to this laboratory class were technical in nature, the laboratory used was a general purpose

university computer laboratory and as such were locked down extremely tightly for security purposes, not allowing plug-ins for instance to be downloaded or used appropriately. This led the tutors to suggest that students attempt some activities either at home, or in the local public library or cyber center, and this suggestion was not warmly received by the students, and may reflect some of the frustrations they felt. Some of the general comments on the multimedia lab are below:

> Most of the things in the lab didn't work due to the computer configuration although I'm sure they'd have been good to see.

> Very frustrating when you could not download the plug-ins - this prevented us from seeing how the multimedia functions actually worked and wasted a lot of time.

> I suppose it was quite useful, but with so many things not seeming to work properly in the lab, it just became frustrating.

> I think the topics covered are important and there were too many things that could go wrong with the exercises that we were unable to do in the lab - what is the point of having a two hour session with staff on hand to help if the most complex part of the labs has to be done unsupervised, I have a computer but many of my pals on the course don't what are they supposed to do with the continual message: (NB NOT POSSIBLE IN LABS)!!!!!!!!

This is a difficult problem to overcome, as the content is believed to be vital, yet how that content is taught becomes problematic since the tutors do not have control over setting and configurations in labs across campus. It is felt that the approach next year will be to more strongly encourage students from the start to attempt the laboratory classes outside of the university facilities as well as inside.

Exactly the same problem was encountered in the laboratory class dealing with ICT troubleshooting and security, as ironically the security in the laboratory prevented much of what was intended for the content to be unworkable, even though the information being communicated was absolutely vital. More than half of the ILS students who responded rated the laboratory class as either not very useful or a waste of time, and again this is believed to reflect frustration at the technology rather than frustration at the content, although given that the ethos of the particular laboratory class was to encourage students to troubleshoot on their own and not panic, the responses to the questionnaire were disappointing, as they tended to reflect a tendency on the part of the students to do the opposite:
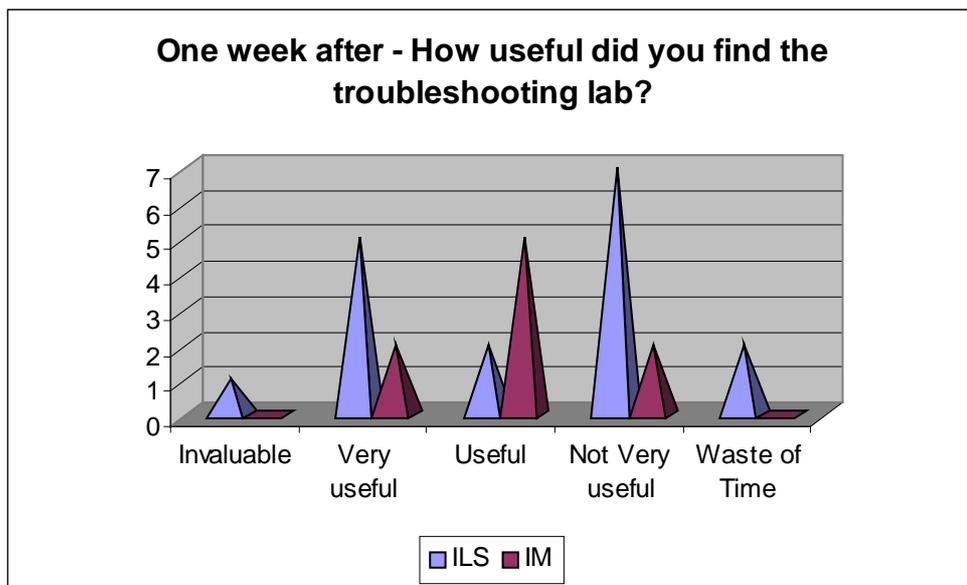
One week after - How useful did you find the troubleshooting lab?

Figure 4 - One week after - How useful was the troubleshooting lab?

One of the more disappointing components of teaching modules based so much around multimedia and troubleshooting is that it is sometimes difficult for the students to interpret the linkages tutors attempt to make because they do not have the practical experience in the front line to understand just why the skills taught are important. As mentioned earlier, while many feel comfortable surfing the web or using applications, many still fail to grasp that the role of the information professional must extend beyond this into the realms of supporting users in understanding and manipulating the technology. The tutors feel that from the beginning of the modules next year a strong message to students is needed that being an information professional is not solely about finding information, it is also about managing access, and understanding the technology used to manage access.

Final Questionnaire

The final post module questionnaire was undertaken two months after teaching and assessment on the modules had been completed, and after students on the ILS course had completed their compulsory placement in libraries and information services in Central Scotland. In terms of response to this questionnaire, 31 of the 54 ILS students responded, and 12 of the 28 IM students responded. This equated to just over half of all students on the combined courses.

The first question asked related to how successful the students felt FICT and FBIT had been in developing their ICT skills generally. The graph below indicates the response to this question cross-referenced with the skills the students believed they had before beginning the modules:
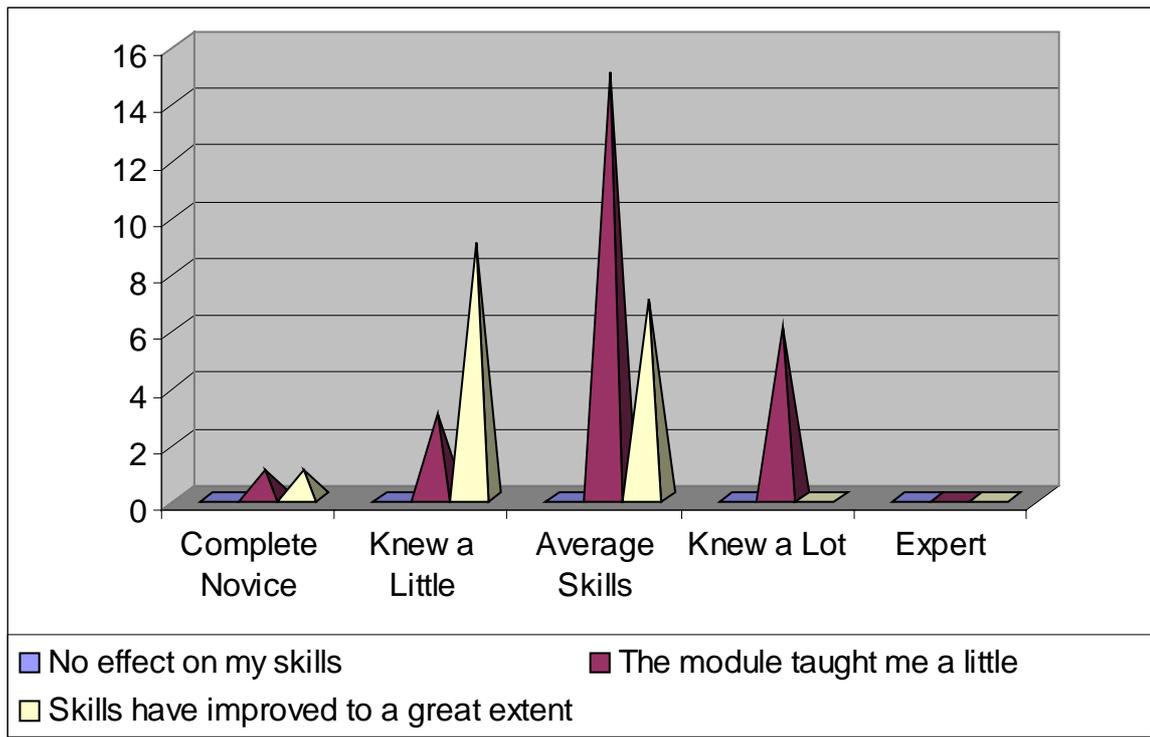
Figure 5 - Have FICT/FBIT improved your ICT skills?

As can be seen, the biggest improvements seen were in those students who were already comfortable with ICT generally, those students who joined the modules with average skills or who knew a little, seemed to gain most from the modules. Encouragingly for the tutors involved in the modules, no one who responded indicated that they felt the modules had no effect on their skills. One student's comments on the modules did seem to contradict the findings above, however:

> I think the course was more useful for those students with less ICT experience and the labs were good in terms of allowing these students extra support. I understand that it was necessary to ensure we were all at the same level but felt personally that I was covering a lot of old ground with the sessions.

The next question related to how useful FICT and FBIT had been across the curricula of both the ILS and IM courses. It was always the intention that the content of the modules would support other modules taught in the Graduate School, and this does seem to have been borne out in the results of the questionnaire:
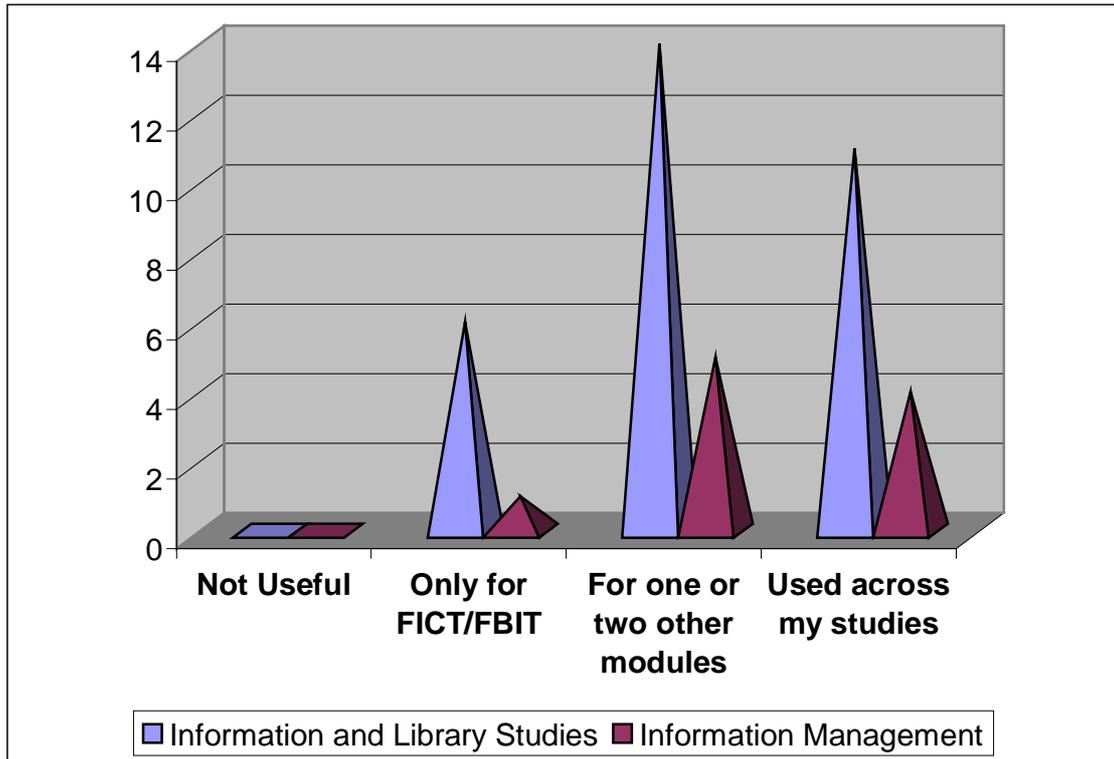
Figure 6 - How useful have FICT/FBIT been across your other studies?

Moving on to the specific lab components of the modules, the students were asked to rate each lab in terms of difficulty. There were three options to choose for each lab:

- Straightforward
- Managed with Practice
- Extremely Difficult

Relating this to specific topics, the first session faced by the students was related to essential ICT skills, which involved understanding the desktop, manipulating files and filenames. This session was deemed to be predominantly straightforward by most respondents:
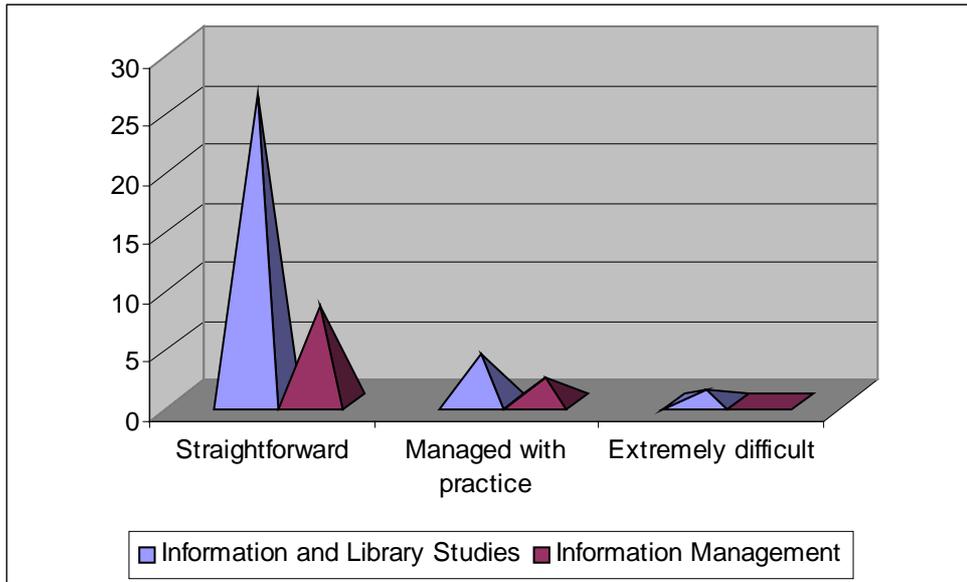
Figure 7 - Difficulty with session on essential ICT skills

The subsequent sessions on web searching and using online hosts were similarly received by students and reflect the fact that students do come to the modules with a basic grounding in web technologies and a perception that they can surf the web well.

The feedback on the sessions where students were asked to either create, or understand the creation of multimedia content proved to be more problematic. A session on basic HTML was rated in the following way:
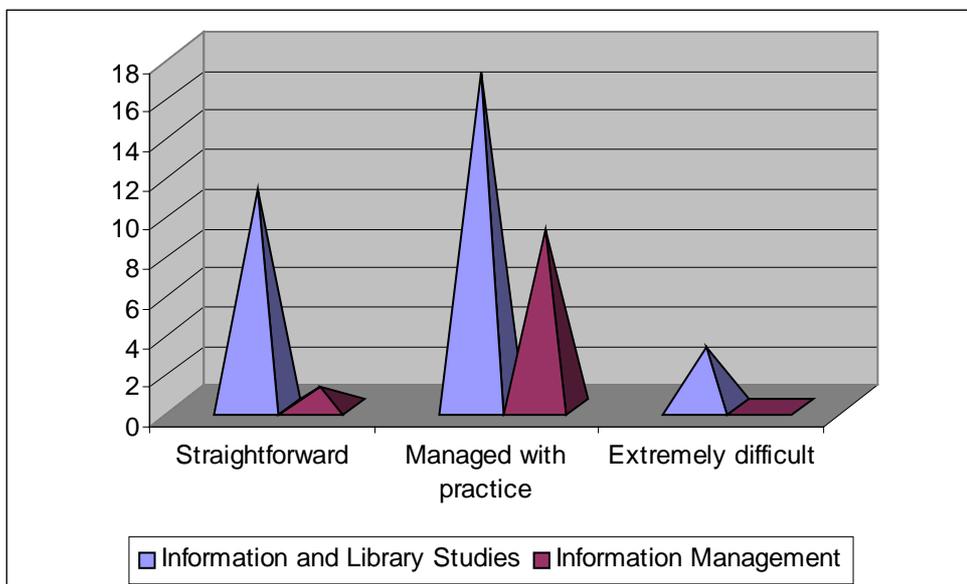

Figure 8 - Difficulty with session on basic HTML

A session on multimedia, which involved students gaining experience in using streaming media, graphical file formats, audio and video formats, proved also to be challenging for many students, suggesting that while students may feel confident using web technologies and generally surfing, more emphasis needs to be placed on

their ability to manipulate and understand the importance of these formats for future information delivery:
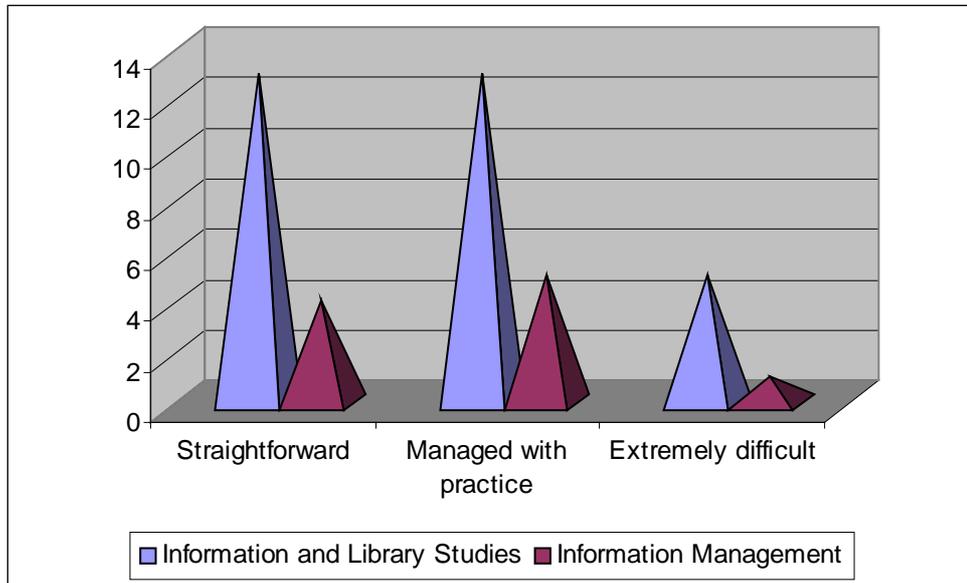

Figure 9 - Difficulty with session on multimedia

Another challenge presented by the computer laboratory session on multimedia was the technical infrastructure of the computer laboratories themselves. The security levels on the computers in the campus labs made certain activities impossible, such as installing and configuring plug-ins such as Real Player, and while these activities were written into the labs for the students to attempt, many could not undertake the tasks and subsequently became frustrated. The same result to an even more problematic situation for the lab on ICT troubleshooting, and the results from the questionnaire reflect the difficulty with this issue. One student commented that:

> The Troubleshooting module needs more one-to-one tutoring, although in a job situation an IT support system would be available, hopefully!

Notwithstanding the ever optimistic outlook of the new generation of information professionals, there did seem a tendency among many students to fail to realise that the management of the ICT was becoming much more part of their role in an organization, and that the ICT support may not be there when necessary. The skill set is no longer one solely of an applications based focus but the ability to understand the new modes of delivery, and troubleshoot them where necessary. The graph below indicates how difficult students found the session related to ICT Troubleshooting:
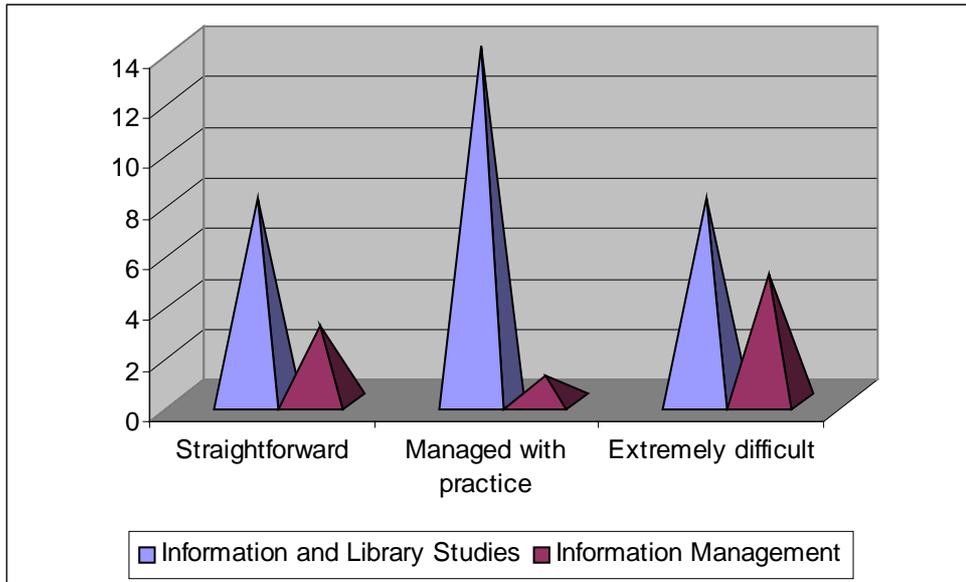
Figure 10 - Difficulty with session on ICT troubleshooting

The vast majority of students across both the ILS and IM courses found that this session needed extra work, which again reflects the need to concentrate on this must crucial of skill sets. The ability to support the user in the use of ICT extends beyond mere support of application packages and web browsers.

Library Placements

A crucial aspect to examine for the module tutors was how much of what was taught on the modules was relatable to real world scenarios, and to this end, questions were also asked related to ICT use while on placement. The graph below indicates how much time each student estimated they spent using ICT while on placement:
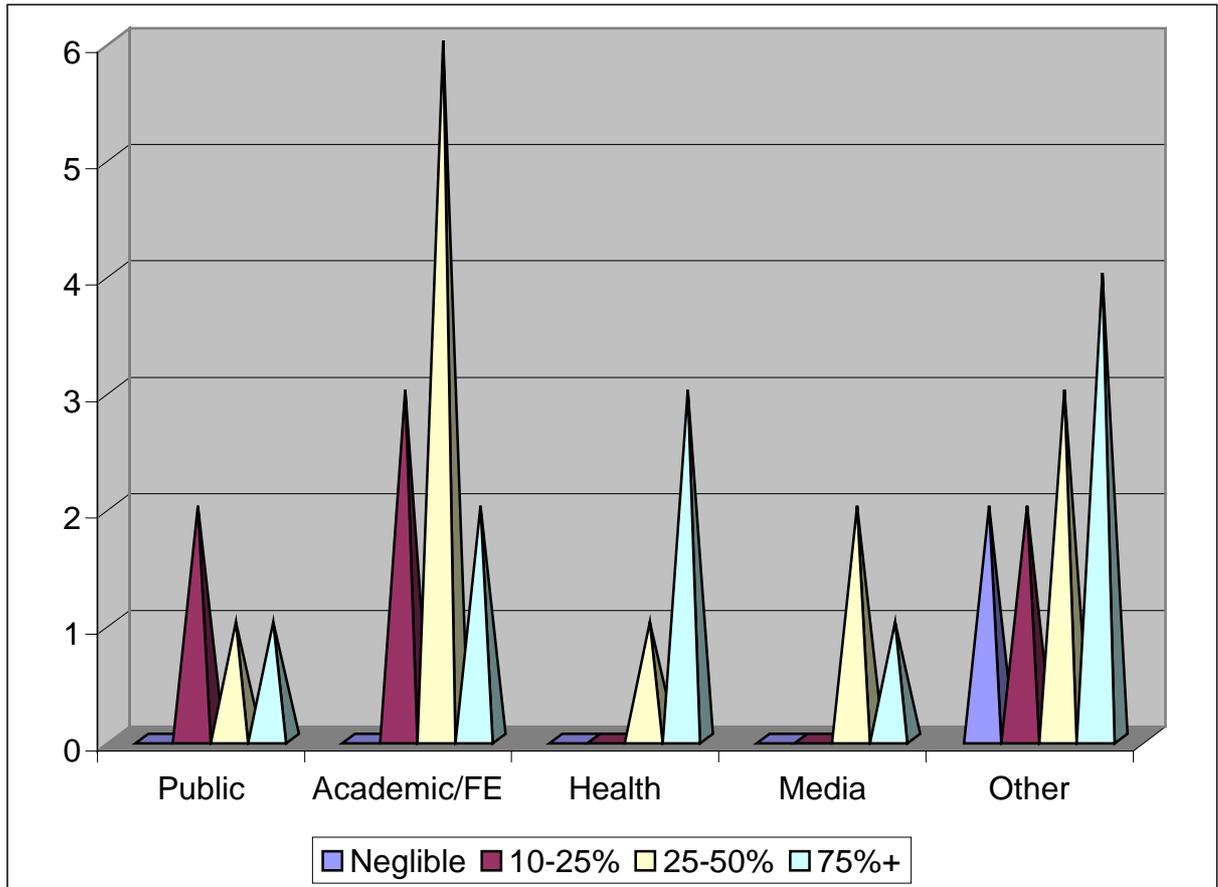
Figure 11 - Time using ICT on placement by sector

The results reflect an extensive use of ICT across sectors, and reinforce the need for the modules to be at the core of the ILS course. Students on placement were also asked how useful the lab sessions had been to them while on placement. With regards to the lab on essential ICT skills, there seemed to be a very real demand for the skills taught in this session:
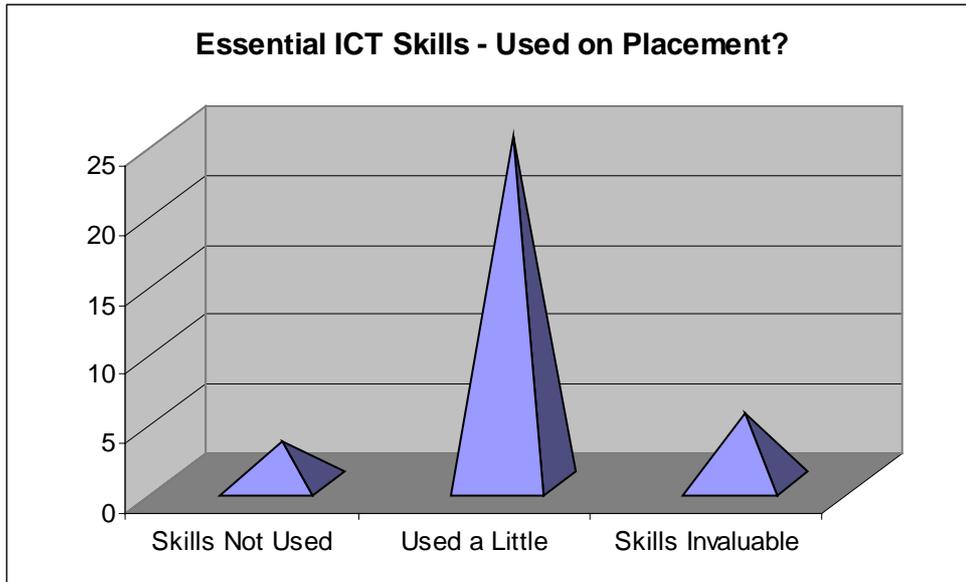
Figure 12 - Skills used on placement - Essential ICT skills

This data is certainly encouraging for the tutors, as it reinforces the need to go beyond applications and understand the technology in a more holistic fashion.

One of the more unusual aspects of the placements for this cohort of students, was that the vast majority of them did not involve the student supporting the public in using ICT, as the following graph illustrates:
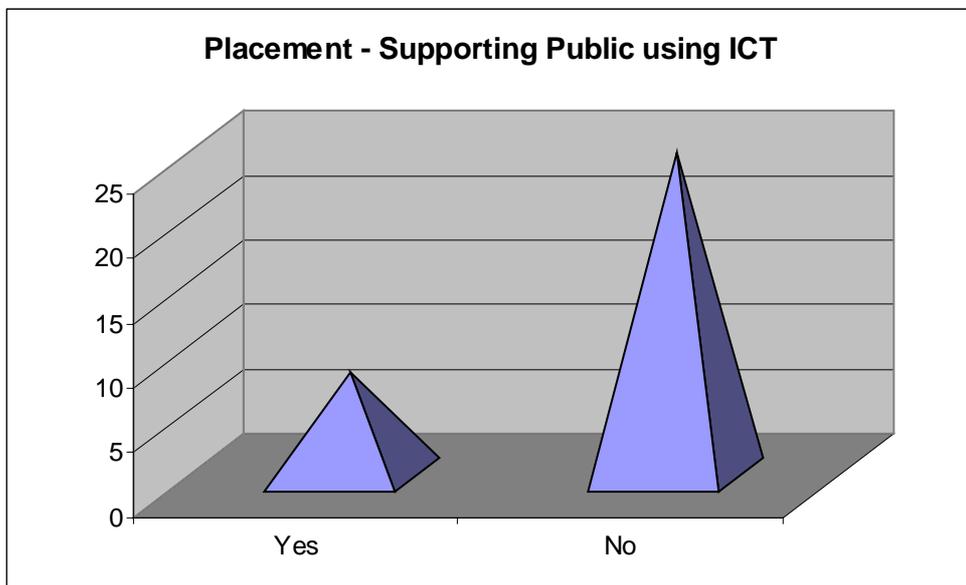

Figure 13 - Did your placement involve supporting the public using ICT?

This is obviously not reflective of the vast majority of information professionals and indicates that much of the data in this part of the survey, while useful, needs to be treated with caution. For instance, in response to the question whether or not the skills learned in the multimedia lab were used on placement, the following results were returned:
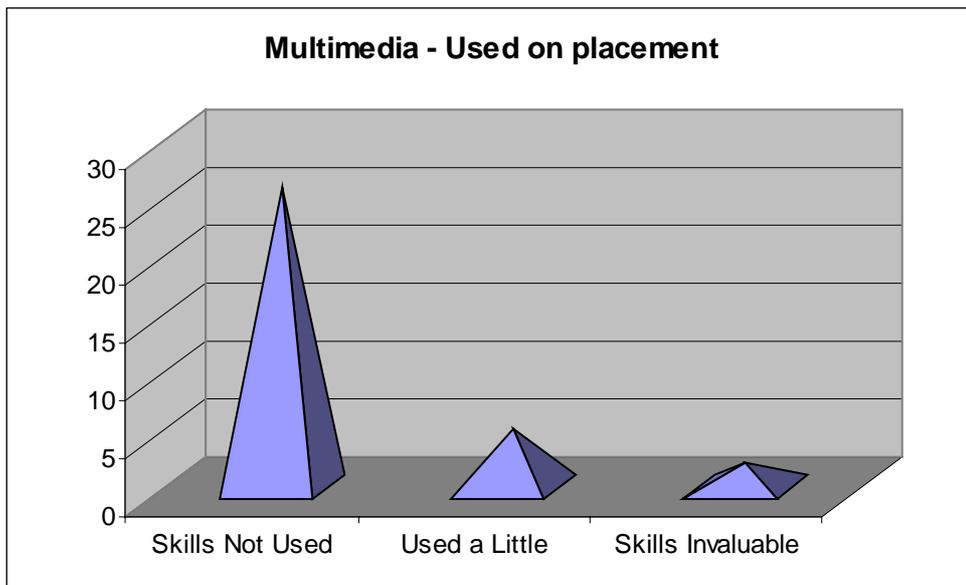
Multimedia - Used on placement

Figure 14 - Placement - Skills from multimedia lab used?

While the response to the same question related to web searching was as follows:
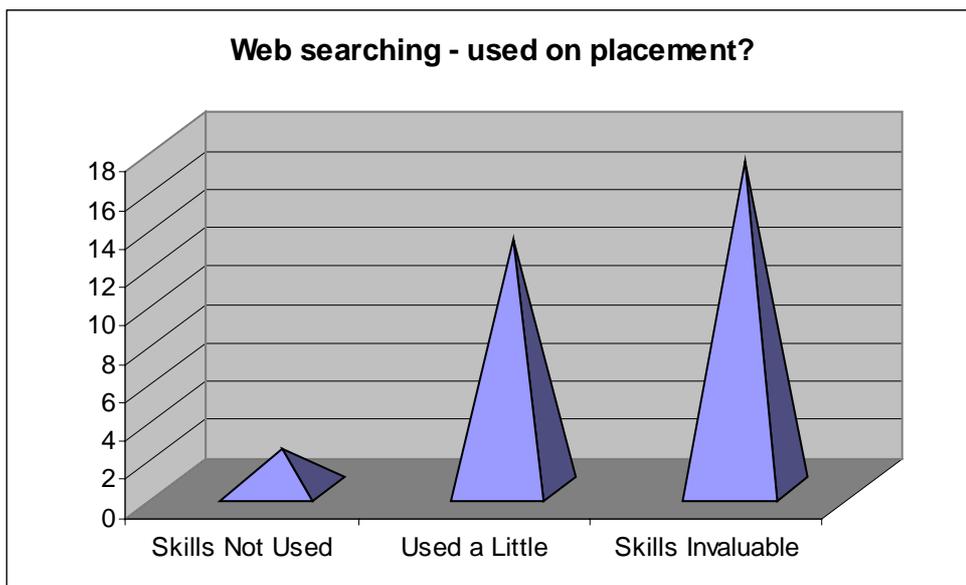
Web searching - used on placement?

Figure 15 - Skills from web searching lab used?

One important point that this may indicate is that the students have still yet to grasp that in their web searching they will be by default using multimedia skills when they load a piece of audio or streaming media, or download an image for later use, and the module tutors have taken this on board to reflect a further emphasis for next year that the linkage needs to be better made between the use of the applications and the understanding of the content. One student commented:

> Until you showed us Encarta with its text, sound and images, I
> didn't get it.

That the students do tend to take multimedia for granted is not a problem initially, and certainly did not seem to be so on the placements undertaken by the students from Strathclyde. However as they go into the workplace for real, and need to manage the multitude of resources that are currently engulfing libraries and information services, the movement away from a straightforward applications-based knowledge of ICT needs to develop into a holistic skill set that reflects how multimedia makes up a vital strand of the information loading onto desktops across sectors.

Conclusions

The main aims of the FICT module were to put across the importance of multimedia and to give students experience of building multimedia with web tools, and these were to a large extent fulfilled. Interestingly, ILS students were perhaps not as aware of multimedia as a technology as had been assumed and the unsuitability of the computer laboratory disappointed the exploratory and creative expectations of some students. The module did seem to accommodate students will different skills levels and students certainly recognized the progression built into its content.

The concept of learning materials for use anywhere was not well received, and neither was the onus on students to learn in their own time. For a later delivery a more radical strategy might be to set a 'laboratory task' but not use a laboratory, thus forcing students to find an alternative venue. Since this might be more kill than cure it will be approached with caution. The Graduate School of Informatics is currently reviewing its own computer laboratory provision and a more amenable computer laboratory environment would be very beneficial.

The ILS student cohort achieved a standard distribution of marks for their assessments for the module, thus showing that they had engaged with the content reasonably successfully. It is certainly heartening to see that their feelings about the module afterwards, and their perceptions of the importance of its content, seen after work placement, are positive. Examples of deep learning are apparent, in for example the self-realization of lack of web search skills and of ignorance of non-web sources like commercial hosts. It is hoped that in the second semester of the ILS course, where core ICT skills are built on with specific elective modules, for instance Digital Archiving, Planning and Managing an Internet Service, and Web Design and Architecture, that ILS students will recognize this module as preparing them for the movement beyond ECDL.