Information and Communications Technologies:
Issues for Learning and Teaching

Grainne Conole, Ros O'Leary, Sian Baynes, Jules Cook and **Gill Butland**
Institute for Learning and Research Technology
University of Bristol. UK
g.conole@bristol.ac.uk

Abstract

Current national thinking in the UK places Information and Communication Technologies (ICT) high on the agenda (with an emphasis on integration and embedding ICT) and hence it is evident that ICT will need to be considered in all aspects of strategy development. The following paper outlines the key issues associated with Information and Communications Technologies (ICT), which affect learning and teaching provision and associated strategic thinking within Higher Education. The paper begins with providing a wider contexualisation of these issues in terms of national drivers in the UK and in particular outlines the increasing importance that is being placed on the development of appropriate higher-level strategic thinking with respect to ICT development and implementation. The paper goes on to relate these national developments to a specific institutional case study, which illustrates how the national work is being translated at a local level. The case study will also highlight some of the key issues that are emerging as a result of local implementation. The paper concludes with some recommendations based on this work.

Context: The External Setting

National strategy and policy with respect to technology-based learning sits within a context of rapid technological change. It has become increasingly important within the University sector, as is evident by the high prominence of Information and Communication Technologies (ICT) within the Dearing review of Higher Education and the growth of

"learning technology" and associated research work (Squires, Conole and Jacobs, 2000). More recently, there is evidence that this area is maturing; it is becoming integrated into the core business of institutions, and in particular is being considered as part of a wider, more generic learning and teaching debate. This incorporation into institutional culture was emphasised recently by Laurillard who outlined the key elements of a new learning agenda for UK Higher Education Institutions (HEIs) (ALT, 1999). This matched well with Gibbs' recommendations for key components which emergent learning and teaching strategies should consider (Gibbs, 1998). These recommendations have been taken on board in the UK; the Higher Education Funding Council for England (HEFCE) now requires all HEIs to have in place a clear and demonstrable learning and teaching strategy as a condition of funding. In parallel the Joint Information Systems Committee (JISC) has being developing a framework for institutional Information Strategies, as a result most HEIs now have in place an Information Strategy (IS), an IS co-ordinator and an overarching steering group to ensure that the strategy is appropriately embedded into the institution. It is clear that the focus is on considering the wider implications of ICT within context as the following extract from the JISC's five year strategy for 1996-2001 (JISC, 1996) illustrates:

> The successful implementation of information systems into higher education is arguably more a matter of economics, sociology, psychology and even politics than of any technical rationality. Although technological developments are important, such progress needs to be tempered by a sensitivity for the human issues which are ultimately much more critical determinants of eventual success or failure. The JISC will also seek to identify and promulgate information on likely costs and benefits. The development of Information Strategies by the institutions is an important step in identifying and addressing, where appropriate, the necessary changes

The above indicates that ICT is moving from being associated with peripheral innovations and developments to underpinning and affecting all aspects of learning and teaching within institutions. However, it is also clear that the "ICT-debate" should not be addressed in isolation, but needs to be considered across all institutional strategy and policy and also within the wider context, including relevant national strategic thinking and developments. The latter has a profound effect and influence on funding mechanisms and national initiatives and to what extent ICT features within the various funding themes. Current national drivers in the UK for example, reflect some of the thinking above. There is evidence of an increased prominence of the importance of ICT in recent calls. For example, the National Grid for Learning (NGfL) and the University for Industry (UfI) are recent major initiatives to increase the base-level ICT

skills within the community and to provide a solid technological infrastructure for education from primary through to tertiary level. The shift towards embedding ICT is well illustrated by the Teaching and Learning Technology Programme (TLTP), where the last phase of funding for the programme clearly shifted from development of materials to integration (HEFCE, 1997). Recent UK calls for proposals from JISC confirm the above, with a great focus on developing 'joined-up' technologies and providing a solid technical infrastructure with a critical mass of materials through the development of a Distributed National Electronic Resource (DNER).

A related driver in the UK is the teaching quality assessment process. It is now a requirement that all subject areas are reviewed on a regular basis to assess the quality of their teaching provision. Institutions are required to provide baseline documentation and evidence their achievements against a set of six quality indicators, covering the teaching, learning and assessment process and procedures and the supporting resources and infrastructure. In part support of this, the institutional strand of the Teaching Quality Enhancement Fund states that institutional learning and teaching strategy "will play a crucial role in improving learning and teaching in HE". In particular HEFCE states funding for this strand could be directed at:

- Developing high-quality staff, including supporting membership of the ILT
- Innovations in learning and teaching, especially in the use of information communication technologies (ICT)
- Transferring and adopting good practices
- Activities to increase the employability of graduates and diplomates, including work experience and developing key skills

Laurillard (1999), identified the following as key areas of importance for national strategic thinking in this area:

- Innovation in learning and teaching (especially ICT)
- Staff development in teaching skills
- Transfer of good practice, especially for HEFCE programmes
- Ensuring that ICT initiatives (such as CTI and TLTP) are embedded in HEIs and that the work has lasting value
- Focus on employability (linked to Government directives and initiatives in this area), work experience and key skills
- Collaboration within and between institutions

The international perspective reflects the UK-national developments outlined above. International drivers in this area include the rapid growth of the "mega-University" sector (Daniels, 1998) and the potential threat on the more traditional University structure. Other important factors include the exponential rise in corporate and industrial educational provision, the embedding of the concept of lifelong learning across sectors, the impact of mass cross-sector programmes such as the EU Framework V and more specific (and focussed) national initiatives such as the Australian distance education developments.

The fact that all UK HEIs are now required to have in place a learning and teaching strategy as a condition of funding means that in the future it is likely that this will be used as an important performance indictor of individual institutions. As part of this work, Gibbs' positional paper on HEI learning and teaching strategies will help to inform the guidelines for future developments in this area (Gibbs, 1999). It would be interesting to compare the learning and teaching strategies audited as part of Gibbs' work with the new strategies which institutions now have in place and in particular to map the changing role of ICT within these plans.

Paul Clarke (the director of the recently established Institute for Learning and Teaching, ILT, in the UK) has stated that Institutional learning and teaching strategies are critical for the further development of HEIs and furthermore that they should be linked closely to the institution's own Information Strategy. It is evident therefore that these two strands, along with the institution's overarching strategy, should form the core focus for institutional thinking and future direction. However, for this to be effective, institutions will need to be clear about the inter-relationships between different strategies and have in place mechanisms to monitor these.

ICT evidently now impacts across all aspects of the teaching, learning and research provision within institutions. The importance of ICT (and its potential impact) means that it cannot be marginalised, or its use considered in isolation. Rather there is a need to integrate ICT strategy and policy across all levels, embed it firmly into relevant policy and practice, and ensure co-ordination and cohesion between constituent elements. This also suggests that there needs to be a long-term approach and in particular a need to develop meta-strategies and a means of inter-relating the different strategic developments.

This section has highlighted some of the current national drivers with respect to ICT in Higher Education the UK and in particular the increasing importance which is being placed on the establishment of appropriate higher-level strategic thinking to support appropriate and timely use of ICT to support learning and research. The next section will relate this national thinking to developments at a local level with a case study of the

development of ICT and its relationship to institutional strategies at the University of Bristol.

ICT Developments and Strategy at the University of Bristol

Historically the University of Bristol has relied on learning and teaching innovations developed on the whole by enthusiasts. These have been encouraged through special initiatives such as the Teaching Initiative Fund or catalysed by timely external influences (funded from national initiatives like JISC and TLTP) or major technological advances (wide-scale uptake of email, the arrival of the Web). Associated strategy and policy work is often not resonant (or sometimes even aware) of these developments and hence there has been a tension and a lack of ability to scale up good practice.

The following services or working groups/committees are all currently involved in overseeing or supporting the use of ICT in learning and teaching. The section below outlines each, along with a brief description of their role with respect to ICT.

The Learning and Teaching Group, is a working group of the education committee and develops learning and teaching strategy and policy at undergraduate and postgraduate level across the whole university. It advises the Vice-Chancellor on allocations from the Teaching Initiative Fund and considers the development of innovative teaching methods. In addition it considers other policy and planning matters referred to it by the Education Committee. This group has recently been responsible for the development of the University's new learning and teaching strategy. This has been carried out in consultation with representatives across the University and in particular in discussions with the groups described below.

The Learning Technology Support Service (LTSS) aims to provide a University-wide framework for the adoption and implementation of appropriate learning technologies in support of learning and teaching. It provides training, staff development and information, and undertakes to support small departmental projects (often being involved with Teaching Initiative Funded projects) and undertakes University-side projects such as Computer-assisted Assessment and Virtual Learning Environments. It focuses on the pedagogy of using learning technology in teaching and aims to share best practices and disseminate information on latest

developments to the University teaching community. The LTSS also inputs into the core modules of the Teaching and Learning Programme for new lecturers (run by the Graduate School of Education) as well as running an ICT module for this programme. LTSS is co-located with the Institute for Learning and Research Technology (ILRT) which is a project-based organisation concerned with innovation in the use and application of learning technologies within an educational context. More details of ICT activities within ILRT are outlined below.

The Information Strategy Steering Group (ISSG) is responsible for the University's Information Strategy and has devised and agreed the following Guiding Principles (Browning, 2000):

- The primary source of University information will become the networked electronic form
- Information will be freely available within the University unless there are good reasons why it should not be
- Printed information will be derived from the networked electronic form
- The provision and maintenance of much core information will become widely devolved
- The training of information providers will be crucial in achieving this goal

The newly established Information Services Division (Library, Computing Services, Management Information Systems and the Institute for Learning and Research Technology) are currently developing a strategy to support the Information Strategy and the Learning and Teaching Strategy.

The new learning and teaching strategy (Clarke, 1999) has had to take into account all the factors which impinge on learning and teaching provision, and in particular to have a good understanding of the wider context and current developments outlined above. The strategy has attempted to link these aspect and to find a way of best utilising University services and working groups (like those outlined above) to enhance the learning and teaching provision and to achieve the aspirations set out in the learning and teaching strategy.

In particular, the distance learning and faculty innovation were highlighted in the development of the strategy and were deemed as being likely to impinge on the development of ICT to support learning and teaching and therefore need to be considered within the context of the services and committees outlined above. With respect to distance learning, it was agreed that the new learning and teaching strategy needs to have a clear institutional position on the relative importance of distance learning. Any increase in distance provision will clearly have a direct impact on the associated support services. In terms of Faculty innovation there are a range of innovation across the university. Specialism and focus vary, but include the following:

- partial module delivery on the Web (for example in Psychology, Education),
- use of computer-assisted assessment (for example the University's in-house Engineering and Maths Test and Learn developments and work in Earth Sciences),
- experimentation with different asynchronous communication and collaboration,
- use of ICT to support research or inter-institutional work,
- innovative use of video in teaching and the use of video conferencing with partner or collaborative institutions (for example the Dental School).

The learning and teaching strategy aims to build on and go beyond this innovation in order to ensure the use of technology becomes part of the mainstream activities across the Institution. To enable this, an audit across the institutions revealed the following key factors.

- Lecture theatres and AVA equipment are currently the provision of suitably equipped lecture theatres and associated computer support is variable across the University. An adequate supporting infrastructure is becoming increasingly important to support the rise of the number of technological learning and teaching activities.
- Computer support within departments is variable across the University; in some departments ICT- related responsibilities are left to a named academic. The strategy will need to address this and ensure that adequate support and provision is available across the Institution.
- Each department has a nominated Teaching and Learning Adviser. These are considered to be the key to cascading down the new strategy and helping to implement it at departmental level.
- There is a range of externally funded projects across the institution, which support innovations in the use of ICT. The balance between these funded projects and internal learning and teaching innovation will need to be addressed. In particular, the strategy aims to better integrate these types of activities in the future and link project and research work more demonstrably to strategy. Examples include:
- Three departments who are involved with new UK Learning and Teaching Support Networks (which is a recently established subject-based national network to support learning and teaching):
- LTSN Economics
- LTSN Education
- LTSN Social Policy, Administration and Social Work

Ensuring that the national benefits derived from association with these centres is translated across the institution is crucial.

- The university hosts a large well established research and development centre, the Institute for Learning and Research Technology (ILRT), which is involved in a significant number of ICT-related initiatives, projects and services (http://www.ilrt.bris.ac.uk/). These include subject-specific information gateways and portals, learning and teaching developments, and digitisation projects and services. These are supplemented by a host of underlying research and development projects on both technological and pedagogical issues with respect to developing and using ICT. Again the new strategies need to ensure that the university is gaining maximum benefit from these activities.

Issues

The development of the new learning and teaching strategy at the University of Bristol has highlighted some key ICT issues which need to be addressed within the institution if ICT is to become firmly embedded within the system. In particular, a change in the emphasis of learning and teaching and a shift towards as increasing use of learning technologies will have a consequential effect on a number of areas. Some of these are briefly described here.

- Timetabling. An increasing shift towards technology-based learning consequentially means an increase in flexibility, which in turn means increased flexibility in timetabling and staff teaching hours. We will need to consider how the whole process can be managed, and also how we move to a more adaptive form of accounting for staff time. This also feeds into resourcing and the need to have a flexible academic-driven approach to allocation of resourcing to develop and support this.
- There is divergent opinion within (and outside) the institution on how ICT should be used: ranging from ICT used primarily to supplement other forms of teaching to the more radical view that ICT will lead to a fundamentally different way of teaching. We need to have an institutional view on this, which can be clearly communicated internally and externally. By clarifying our position in this way it will be easier to plan and phase in associated developments and change. This can then be more transparently linked to resourcing, training and associated infrastructure change.
- Assessment is a driver for much of our learning and teaching and links closely to resource requirements and student movements. The Learning Technology Support Service has been evaluating and researching the options for Computer-assisted assessment, whilst providing and supporting the University's in-house assessment software, CALnet, which as a Web-tool enables teachers to provide formative questions and tests over the Web. In general, the audit has indicated that the technology is still not mature enough to cope with the demands of electronic assessment, although this is likely to change significantly in the next year or two. Electronic assessment is therefore likely to become an increasingly important feature in the University's ICT strategy over the next few years, for both onsite and distance provision.
- Students are increasingly going to expect high quality delivery and access to appropriate resources. Can we guarantee this? Developments need to be linked to resources and imaginative strategies used to supplement main provision.
- The IT infrastructure. A number of dilemmas have emerged with respect to infrastructure. On the one hand, whatever we put in today will be out of date tomorrow; there is no way of predicting what will be the key drivers for the future. On the other hand, we do not currently maximise the potential of the technology we already have; for example video conferencing uptake within the institution has been slow (although it is picking up). In part this is a consequence of the natural inertia associated with culture change, but more pragmatically

there needs to be a threshold level of staff IT-competence, a degree of confidence in institutional IT-support, matched with a realism as to what is realistic (within time, technological and resource constraints).

- Licensing – There is a direct conflict between an open, study anywhere, anytime philosophy and the realities of resourcing. The computing services at Bristol have developed a networked infrastructure for the student halls of residence, known as the RESnet initiative, which goes some way to provide students access to their University IT-environment from home. However we are not yet able to offer anytime, anywhere provision, with personalised and portable desktops.

- We need to ensure that all students are exposed to ICT throughout their time at the University. This is important because it will ensure that our students are equipped to take maximum advantage of the potential ICT during and beyond their course and time at the University. This means they will need exposure to a wide range of ICT throughout their courses and, implicitly suggests that ICT use should be a common aspect of most of our courses in the future. This also suggests the need for more ICT-focussed support and administrative services. It is also likely that in the future students will expect a certain level of provision and that they are likely to play an increasingly active part in driving the University's ICT-developments.

- Threshold level of IT-skills. This is been addressed in staff development provision for academic staff, through the basic IT courses offered by Computing Services and the more pedagogically focussed courses, workshops and support offered by the LTSS. However, initial evaluation of this provision clearly highlights that associated with this is an issue of time. Time for staff to attend and complete the staff development sessions, time to reflect and then time to experiment, innovate and evaluate. One of the most important drivers for increased use of ICT amongst staff comes from the informal cascade process of transfer of knowledge between the enthusiasts and the wider teaching body. This is not currently recognised as an important process.

- Support for students. The increasing impact of ICT in all aspects of the University's work means that there is an urgent need to ensure that students attain a threshold level of IT-competence in the early stages of their time at the University. Initial induction of this kind will then need to be supplemented by ongoing support. Who should develop such a support framework and how this should be maintained is still undecided. This could be developed into a complete IT-support programme (online and elsewhere).

- Impact – the extent to and the way in which ICT is used will have a considerable impact on the spaces which are used for teaching and the way in which they are used. This includes traditional standard teaching space (such as lecture, seminar rooms, and laboratories).
- Access – A move to increased use of ICT will lead to consequential increase in the demand placed on students to use ICT and hence an increased demand on IT equipment within the University. Increasingly students will opt to have home equipment, and it is likely that a PC (or equivalent) will become a standard application in the home within the next few years. However, in the interim, care must be taken to ensure that we do not violate our commitment to access and move too quickly to technology-based learning at the expense of some students.
- Accessibility – Continued care must be taken across the board with respect to accessibility, to ensure that any ICT-decisions do not have a significant, irreversible or catastrophic effect on students with disabilities.
- There is a major issue about quality assurance and monitoring of course incorporating an increasing degree of technology-based learning. Currently the University has no standard mechanism for dealing with this.

Recommendations

The following section outlines eight recommendations arising from these work, which are designed to help institutions in working towards better integration and use of information and communication technologies to support learning and research.

1. Use and integration of ICT is a complex issue and it is important that higher-level strategy work is coherent and focussed. Work on the development of learning and teaching strategy, information strategy and faculty/departmental strategy should be combined to come in line with national recommendations and developments. An overarching learning and teaching strategy should incorporate a vision for the use of learning technologies within the University. A set of guidelines for good practice should be developed in parallel. The initial "skeletal" set of good practice guidelines can then be fleshed out as discussions on the overarching strategy and policy developed. The reason for setting down guidelines for good practice is threefold: i) it will give some grounding for current work, ii) it will fuel discussion on the wider strategy and policy debate and iii) it will provide a mechanism for

updating and developing developments in this area, whilst disseminating good practice across the institution.

2. Universities should consider carrying out a positional audit of the use of ICT in learning and teaching across the institution and should develop an associated mechanism for providing an ongoing database on innovations in this area. The University of Bristol has recently carried out an ICT-audit, the results of which are described elsewhere (Butland et al, 2000).

3. Staff development for this area is often reasonably well provided for within institutions, however more thought needs to be given to provision of student support. Universities may want to consider developing a support framework for student support – an online "IT help desk", which would point to study guides, workshops and support, as well as more specific module information and support.

4. Institutions need to be clear of their position with respect to the balance between innovation in this area and the development of cutting-edge technology applications and the confines of the IT infrastructure and support.

5. In general, there is a need for a clearer mechanism for communication and decisions about ICT-related matters across institutions and this should be addressed within the strategy and policy developments.

6. Universities need to develop appropriate recognition and reward structures for innovation work in learning and teaching (including accreditation, promotion, incentives and remuneration).

7. Greater consideration needs to be given to the evaluation of the cost and educational effectiveness of learning and teaching innovations and developments, particularly with respect to the use and integration of ICT. This needs to become a standard aspect of innovation project work, but should also be evaluated at an institutional level to assess cross-faculty impact and factors.

8. A flexible timetabling system, which can make maximum use of teaching space and encourage innovative approaches to delivery is essential if Universities plan to move to move flexible modes of development and delivery.

Conclusion

This paper has described the issues associated with the increased use of Information and Communication Technologies within Higher Education and in particular how they relate to a wider learning and teaching context. It has related these general issues to the local context and shown how this translates into a series of practical questions that need to be addressed. Finally, the paper concludes with some suggested recommendations for

dealing with this and ensuring that the enormous potential offered by greater use and integration of ICT is realised and harnessed in an appropriate way to enhance and enrich the learning experience of students.

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