

New learning ecologies

Promoting learning in the digital age - a holistic perspective

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Abstract

New challenges face Higher Education in a knowledge-based, net-centric economy as we gear up to meet the pressures of global competition. There is a need for a holistic perspective in catering for the needs and interests of learners in a digital age: it is argued here that a culture of collaborative action enquiry via regional networks is what we must strive towards if we are to meet these challenges successfully. How is this to be achieved? Increasingly schools, colleges and universities are harnessing new technologies and the Internet to enable interactive learning and collaborations with external organisations. Institutions in Higher Education should now embrace a strategy of developing and publishing web links with *all* of the components that make up their regional educational network: community colleges, public and private colleges, libraries, science parks etc. This would be a move towards new learning ecologies that can engage everyone - learners, teachers, administrators and decision-makers - in promoting a learning culture. *Pandora* and *m-Portal* are among current ULTRALAB projects with the potential to support such learning ecologies.

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'A culture of action enquiry is what we all need if our learners are to progress as fast as they expect, as the economy needs and as our imaginations will allow.'

Professor Stephen Heppell

Introduction

Key challenges for Higher Education in the digital age include:

- Effects of global competition
- Trend towards object-oriented systems
- High speed networking
- Mobile Internet
- Promoting collaborative action enquiry
- Creating new learning ecologies

New learning ecologies are proposed as a means whereby Higher Education can take a lead in turning these challenges into opportunities.

Effects of global competition

In the UK as elsewhere, movement towards a knowledge-based, net-centric economy is having marked effects on the educational marketplace, as we gear up to meet the pressures of global competition. There are signs that educational services will increasingly be managed by commercial organisations with a strong profit motive.

A growing number of commercial organisations seek to capitalise on the changing market: Oracle's Knowledge Universe is an example: a non profit organisation that provides tutorial services for IT certification programs and benchmarks its digital educational services against leading US universities. There is also the Jones International University, one of the first exclusively virtual universities. Such examples of investment interest in the education market from non-traditional sources underline the need for Higher Education to meet these challenges with innovative uses of digital technologies that are needs-led. We have to find new ways of keeping in touch with what those needs are - this is not just a matter of getting the content right. The skilled workforce seen as critical to the new economy requires an innovative and flexible educational system that can provide quality services throughout an employee's lifetime and can deliver these in a responsive, cost-effective way.

Trend towards Object orientation

As the educational system is revamped and new learning platforms emerge that use the Internet and multimedia formats, there is an associated need to seamlessly blend components from different sources into e-learning programmes. This means that materials created today ideally need to use object-oriented systems.

Segments of the market are already beginning to apply 'object-oriented engineering' philosophy, i.e. giving e-learning objects computer-readable 'metatags', to enable easier cross-system exchange of data. This trend is expected to develop quickly as internal initiatives within companies such as Oracle create products with 'learning object' functionality and as standards such as XML evolve. Higher education must be part of these developments.

High-speed networking

Broadband means higher bandwidth, enabling Assymetric Digital Subscriber Line (ADSL), Digital Subscriber Line (DSL), Video Digital Subscriber Line (VDS) technologies - new types of communication line that can outperform ISDN. Although like the rest of the mobile industry, broadband has suffered from the poor investment climate, change is beginning to come as consumers' interest in mobile games and entertainment leads to video-on-demand from mobile devices, and as businesses' need for a mobile workforce requires flexible access to rich data. Real change will of course

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need new business models designed specifically for Internet, as well as convergence protocols; this may be some years hence.

While a main limiting factor is cost, the potential benefits for learning are considerable. Currently there is considerable confusion about the significance of symmetry in bandwidth, particularly for learning. At ULTRALAB our solid research conclusions from a number of media rich bandwidth hungry projects over a decade is that symmetry is a key component of a broadband learning environment as learners put in and contribute rather than simply download and interact. This skews broadband for learning away from ADSL towards other more symmetrical DSL technologies (VDSL for example).

Mobile Internet

New generation mobile handsets

New generation mobile phones and hybrid Personal Digital Assistants are emerging, with more bandwidth and speed to transfer data. Increasingly, handsets are turning into 'world phones' or 'microbrowsers', capable of dealing with the Web, receiving and sending e-mail, as well as storing sound files and other data. High screen resolution even allows you to view full-page width documents e-mails and Web pages without horizontal scrolling. All this, together with significantly more processing power, means that your phone is fast becoming your computer.

Cell phones as modems

Nearly 50 million people are expected to use the wireless Internet by 2005, via high-speed wireless networks such as Aerie Networks and via wireless network using the 802.11 standard [1] from companies like Sputnik. Universal Mobile Telecommunications Systems (UMTS) [2] forecasts 2 billion users worldwide by the year 2010. While these are bold statements to make, a growing number of wireless carriers are offering a service for wireless Web-enabled phones, laptops and Personal Digital Assistants (PDA's) to the Internet, enabling cell phone/handhelds to act as modems.

Need for Open operating systems

The industry needs end-to-end mobile architecture standards, hitherto competition has inhibited the bringing in of these new technologies. According to MobillInfo, [3] Nokia's broader 'Open Mobile Architecture' standard is a big step forward and deserves wide support; unfortunately, not least because of inter-vendor rivalry, this is not likely in the near future.

Handset makers and Microsoft have placed emphasis on proprietary but allegedly 'Open' operating systems like Symbian and Windows-powered Smartphone 2002-based phones, but they are still expensive. Nevertheless the next push is towards a global, unified network IP-based infrastructure, to bring increased flexibility - and open standards and support.

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Meanwhile Wireless Application Protocol (WAP) continues to work as a *de facto* standard for delivering wireless data on smart phones and other mobile devices. Tremendous hype built around WAP during 1999 and 2000 brought the dream of 'mobile internet', i.e. the convergence of the Internet and the mobile phone. However WAP was not really tuned for the phone and users increasingly perceived a gap between WAP's promises and delivery. User experience of WAP is set to change as increasingly the new mobile devices offer better input and output solutions. At the same time the industry is undergoing immense transformation, from being technology-led by the telecommunications sector to one that is consumer-centric: the 'push' technology of WAP 2.0 (just like SMS) opens up new opportunities for education to develop m-learning services and applications. Multimedia Messaging (MMS) is another highly interesting development.

Promoting Collaborative Action Enquiry

For Higher Education, continuing to progress not only means keeping in touch with emerging technologies, it means being ready to exploit them as they come onstream. This in turn means developing new perspectives, new models of learning, new ways of enabling learners via these technologies. Stephen Heppell outlines the enormous challenges facing busy professionals:

- How do we keep in touch with emerging technologies?
- How do we integrate them into the learning environment?
- How do we share the results of our successes and our ongoing trials with new technology?
- How can we evaluate the changes we see - are they better than what went before?
- How can we evidence our own successes to our colleagues around the region?
- How can colleagues understand the new things that computers might add to learning if their own experience of learning has been different?
- How can our teaching be pollinated by the ideas of others, yet retain a unique culture and identity?
- How can we update each other on copyright and other legal issues?

There is a clear need for a culture of collaborative action enquiry permeating all levels of the educational framework. How is this to be achieved? The next push needs to be the creation of new learning ecologies that can facilitate the levels of collaborative activity that we are going to need if we are to meet the challenges of the digital age.

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Collaboration between schools, colleges, universities and other organisations already takes place in both real and virtual environments. What is now needed is for Institutions in Higher Education to take a lead in extending these links to include all of the components that make up a regional educational network: not only community colleges, public and

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private colleges and schools, but also libraries, museums, science parks and business organisations. The resulting new frameworks would in effect be learning ecologies that can engage everyone - learners, teachers, administrators and decision-makers.

What should be their primary areas of focus?

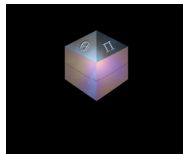
John Seely Brown points to the success of the Web:

"... where each of us is part consumer and part producer"

and where is perceived:

"... an interesting shift between using technology to support the individual to using technology to support relationships between individuals. ... With that shift, we will discover new tools and social protocols for helping us help each other, which is the very essence of social learning. It is also the essence of lifelong learning a form of learning that learning ecologies could dramatically facilitate. And developing learning ecologies in a region is a first, important step toward a more general culture of learning." [4]

Pandora [5] and *m-Portal* [6] are among current ULTRALAB projects with the potential to support such learning ecologies.



Pandora

The Pandora website has been developed as a resource to promote e-learning within the Anglia Polytechnic University regional network. It offers a collaborative action enquiry framework for both ICT novices and experts to share their knowledge, ideas and expertise.

Pandora is database driven and offers:

- Access to a growing collection of resources
- Opportunities to contribute to the database online
- Membership of a collaborative action enquiry
- Action Enquiry Modules.

As Stephen Heppell explains:

"Technology and the curriculum move on, teachers have more wonderful ideas and students push our ambition for them, constantly. That's why this Learning Age is such a wonderful (but exhausting) time."

For those exploring and contributing to the growing collection of resources on Pandora, there may be many things of interest to discover - better understandings of:

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- What ICT can do for learners
- Web protocols and associated issues
- The contribution made by investment
- Evidence of the changes in practice leading from initiatives.

The Pandora Collaborative Action Enquiry

The principle is simple: we want people to reflect critically on an enduring activity spanning a period of time in months or more. They are asked to reflect on their own practice and how, to what extent and why they thought the use of ICT was a success - or not, as the case may be. Those wishing to earn APU credits can take APU's Action Enquiry Module: colleagues can opt for traditional (face-to-face) delivery mode, or choose delivery via the Internet. The 30 credit module offers everyone, including those as yet unfamiliar with ICT, the opportunity to share in the development of good practice, disseminate the results on the Pandora website and to gain credit at undergraduate or Masters level. In addition people will also be facilitated in publishing their findings in refereed journals.

Pandora may be on the way to supporting a learning ecology, but to realise its full potential, Pandora needs to link in with a much wider range of educational and training providers and services in the region, reaching out to public, private and business sectors.



m-Learning: a pan-European project

Rationale of the project

m-Learning [5] is a 3-year pan-European project which began in October 2001. The project is funded by the European Commission under the Education Area of the Information Society (IST) Programme and led by the UK's Learning and Skills Development Agency (LSDA). Project partners are Cambridge Training and Development Limited (CTAD) and ULTRALAB, also in the UK, as well as the Consorzio Centro di Ricerca in Matematica Pura ed Applicata (CRMPA) in Italy and Lecando AB in Sweden.

The project addresses three social/educational problems relating to many young adults in the EU in the age range 16-24:

- poor literacy/numeracy
- non participation in conventional education
- lack of access creating ICT "haves"/"have-nots".

It is reasonable to suppose that most of these young adults will have access to a mobile phone. Accordingly, the m-learning prototype products utilise mobile technologies to attract these audiences back to learning. The products will also be relevant to older learners.

A phased approach

Activities are undertaken in 2 phases:

- Phase One: 1 October 2001 - 31 July 2002
- Phase Two: 1 August 2002 - October 2004

m-Portal

m-Portal [6] is a main ULTRALAB contribution to *m-learning*. It is a microportal layer, i.e. an interface for mobile devices, acting as a gateway to other resources. *m-Portal* utilises readily available higher and lower technologies such as WAP and SMS. Its primary objective is to encourage and enable the young adults in accessing learning opportunities provided by other *m-learning* partners:

- CTAD learning modules
- LECANDO course management system
- CRMPA Learning Intelligent Advisor (LIA).

It is envisaged that with discursive functionality, and flexible access to other resources, *m-Portal* also functions as a learning environment in its own right.

Designing for communication and interaction

The development team members share social-constructivist convictions, this means that they see the pedagogical value of a successful *m-Portal* application in the extent to which it can support virtual networked and collaborative learning which is need driven, not technology driven. Online interactions not only help people to develop thinking skills and gain new knowledge as they explain their ideas to others, they can also promote social skills - this will be especially relevant to target audiences.

m-Portal is accordingly designed for interactivity and is intended to promote learning via scaffolding: asynchronous peer support and realworld mentoring. It is envisaged that learners will be able to:

- choose different modes of access to *m-Portal*
- create their own microportals
- choose between different learning environments
- interact socially online, e.g. via chat, themed discussion and debate
- access learning opportunities created by project partners
- consult with others in considering their own learning goals, needs and strategies, and in creating their own learning programmes.

Supporting different learning paradigms

In progressing their experiential learning in these ways, users will be seen to operate primarily within a social-constructivist paradigm. However in accessing the different learning opportunities provided by project partners, users may also expect and encounter instructional and/or revelatory paradigms. They will also exhibit different learning styles. The challenges for the *m-Portal* developers therefore lie in creating a variety of *m-learning* resources that can accommodate such differences, creatively exploiting what makes mobile devices unique.

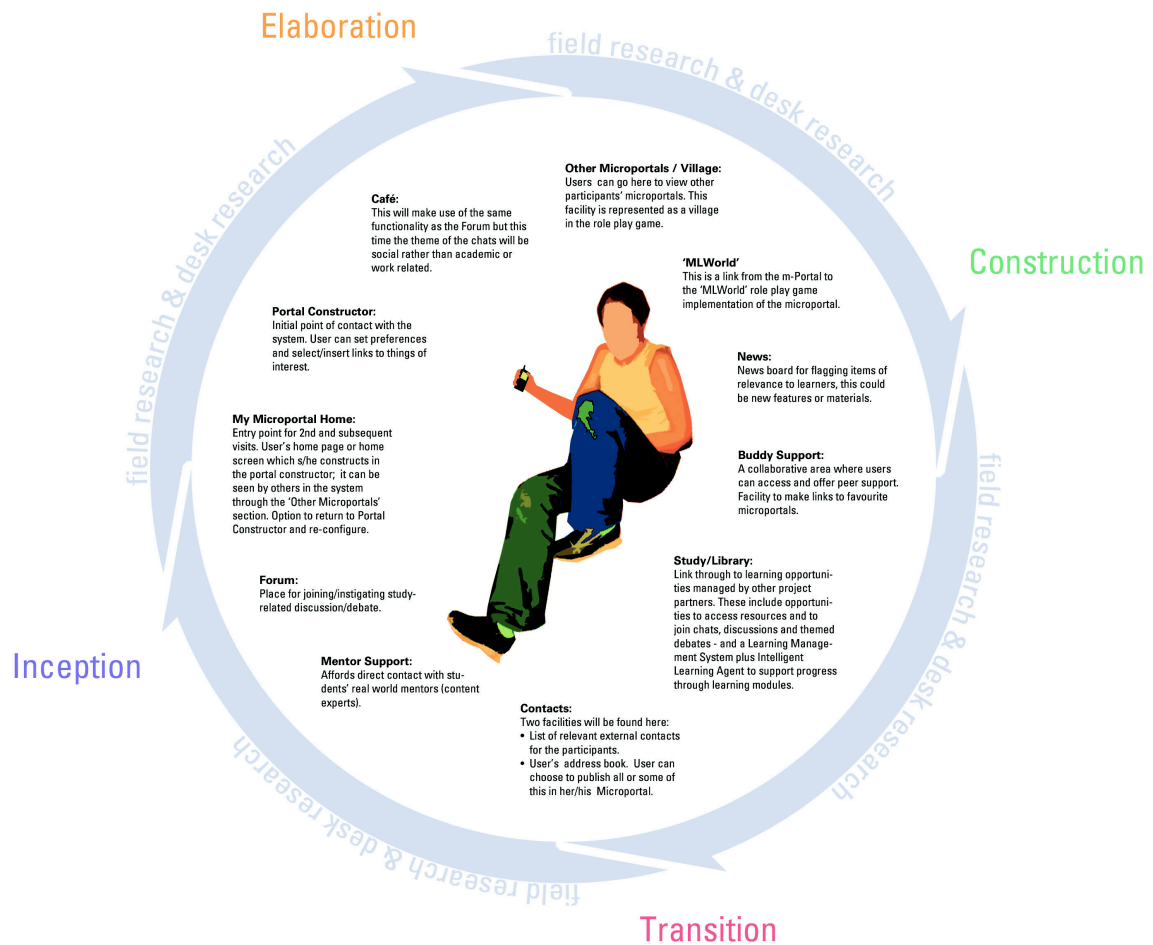
Combining desk research and field research

Within a collaborative project such as *m-learning*, problems can range from the purely technical to the educational and political. The associated tensions call for a multidisciplinary approach in the design processes - and for debate towards a shared pedagogy for e- and *m-learning*. Our Field Research will make a strong contribution here, engaging members of target audiences as co-researchers. Desk research is also undertaken, prior to and during the Field Research, to keep in touch with developments in the field.

The diagram below illustrates the potential functionality of *m-Portal*, and how this is informed by research throughout the entire project life cycle. With a stretch of the imagination, the conceptual design for *m-Portal* can be seen as the beginnings of a template for learning ecologies:

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A way forward

In Higher Education, currently much attention is paid to making individual modules - or whole degree programmes - available online. It has been shown that rapid advances in technology mean that we can now be ambitious in designing future programmes. Take-up of these programmes will depend on learner motivation - there is a pressing need to pay attention to the affective and social components of learning online. There is clear evidence from ULTRALAB research that the Internet becomes a powerful conduit for learning only when individuals have their own identity, the tools to make a contribution that stands with a parity of esteem alongside others' work, and a clear sense of communication with their peers.

In view of the increasing complexities of the challenges facing us, we need to engage learners as co-researchers to work alongside us and other experts. Collaborative action enquiry needs to take place across the whole range of Higher Education, drawing on a wide range of educational resources - hence the need for learning ecologies. Web-enabled initiatives such as Pandora and m-Portal can be seen as a step in the right direction.

References

1. *IEEE 802.11 website* <http://www.ieee802.org/11/>
2. The UMTS Forum, *What is UMTS?* at: http://www.umts-forum.org/what_is_umts.html. 2002.
3. MobillInfo home page at: <http://www.mobileinfo.com/>
4. Seely-Brown, J., *Learning, Working and Playing in the Digital Age*, AAHE Conference on Higher Education, March 1999, content reproduced at: http://serendip.brynmawr.edu/sci_edu/seelybrown/
5. Pandora home page at: <http://www.pandora.ultralab.anglia.ac.uk/>
6. m-Portals page at: <http://www.m-learning.org/mPortals.html>
7. m-Learning official website at: <http://www.m-learning.org/>

Annotated Bibliography

This is not intended to be a comprehensive or academic bibliography. It supplements the references given above and refers to just a few of the related materials that are available on the Internet, to allow readers to easily follow up topics mentioned in the paper.

All URLs were re-checked 7th October 2002.

PDA's and Handhelds

T-file: *Tomorrow's technology today* <http://www.t3.co.uk/> (*News, plus opportunities to compare prices, buy and sell online*)

NetworkWorldFusion: <http://www.nwfusion.com/topics/pdas.html>
(*Claims to be the leader in network knowledge. Source of news, opinion, reviews, White papers and paid research*).

Mobile-Portal: <http://www.mobile-portal.com> (*service only available to Vodafone users*)

MViva Mobile service: <http://www.mviva.com> (*service available to any mobile phone*)

Zdnet.com White Paper: *Afaria Session Manager* available at:
<http://itpapers.zdnet.com/paperGateway.asp?WID=514948604850&referrer=ZDNet> (*For those interested in Mobile Device Management Solutions: detailed usage scenarios showing how Afaria's Session Manager provides solutions to challenges associated with Mobile Device Management. An example of a range of zdnet White Papers.*)

T3 at: <http://www.futurenet.com/> (*Free newsletter, mobile devices*).

Techtarget.com: *Glossary* at:
<http://searchWebServices.com/r/0,,5090,00.htm>
(*Regularly updated facility - search 140 terms in alphabetical subcategories*)

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Networking

James Bond Meets The 7 Layer OSI Model

<http://www.pe.net/~rlewis/Resources/james.html> (a lighthearted and useful overview of the the International Organization for Standardization (ISO) model for computer networking)

Cysive: *Making the right choices now for a mobile future*, White Paper at:

<http://www.cysive.com> (focus on multi-channel access - Web, and/or Web services)

World Wide Web Consortium's XML Protocol: Simple Object Access Protocol (SOAP) <http://www.develop.com/soap/soapfaq.htm#1> (straightforward explanations)

Mobileinfo: <http://www.mobileinfo.com/>

(Very useful website providing regular updates on the fast-changing mobile market)

Mobileinfo: 2.5G and 3G http://www.mobileinfo.com/3G/3G_Index.htm

(example MobileInfo page with table of contents for topics)

Searchnetworking: *Networking News and Analysis*, <http://searchnetworking>

(a free service where you can search for content and thousands of pre-screened web sites)

Lancaster, T: *Voice over IP*, 2002

http://searchnetworking.techtarget.com/tip/1,289483,sid7_gci835498,00.html?FromTaxonomy=%2Fpr%2F286859 (example serachnetworking web page - one of a number of tips providing food for thought)

Do Wireless LANs pose a health risk to the consumer? Wireless LAN

Association, 2001, <http://www.wlana.org/learn/health.htm>

(View of the health risks from the industry association)

Bartel C: *Frequently Asked Questions on deploying a wireless network*, CMU,

http://www.cmu.edu/computing/documentation/faq_wirels_tech/WireTechFAQ.html (FAQs ranging from the general to the specific)

Education and Youth

Berger C: *Wireless: Changing Teaching and Learning "Everywhere, Everytime"*, Educause Review, Vol 36 No 1, 2001,

<http://www.educause.edu/ir/library/pdf/erm0116.pdf> (Concerns wireless use, includes information on computer carts)

The Gallery of courses taught with Technology

<http://iccel.wfu.edu/gallery/>

(Postings on how people are using technology to enhance teaching and learning. Quality of entries varies)

Palm: *Penn State Abington Students Use Palm Handhelds for Collaborative Learning*, <http://www.palm.com/education/studies/study10.html> (A case study)