Teaching and Learning RESEARCH BRIEFING

Number 16

IT for Education Research: using new technology to enhance a complex research programme

The Teaching and Learning Research Programme has an IT infrastructure designed to enhance research, development and user engagement. It was developed and is hosted at the Centre for Applied Research into Educational Technologies (CARET), at the University of Cambridge. It includes some established technologies together with novel elements designed to respond to project and programme demands. Its contribution to the success of TLRP may point the way for other research programmes.

A Digital Repository holds project publications, conference papers, research briefings, video and other resources. Submissions to the repository can be made by all TLRP projects and are available to the public.	→	Project outputs which would otherwise be distributed across many locations are in a central collection. Projects can publish electronically to a wide audience within and beyond the TLRP.
Virtual Research Environments provide researchers with shared storage and collaboration and communication tools. Electronic tools are combined within secure, access-controlled environments.	→	The management of research is made easier, especially across geographically dispersed projects. Using a secure, well-supported software platform reduces technical demands on projects.
Dissemination Tools allow projects to publicise events and findings, and assist users in finding research of interest to them.	→	The reach and impact of research is extended, and projects can engage users more easily. Outputs are available to the whole education sector and to other users such as policy-makers.

The research

The TLRP IT infrastructure

Background
The TLRP is the UK's largest-ever programme of education research and is the largest programme managed by the Economic and Social Research Council. It has a budget of over £30 million from 2000 to 2008 and by early 2006 it incorporated 53 active and completed projects. It is occurring during a period of rapid technological innovation. The development of thinking about networks and networking, in some cases importing models of networks from the world of internet communication, has had an impact on expectations of both educational research and professional development. Networks are increasingly used to provide access to resources, and as sites (albeit 'distributed' ones) for knowledge construction and the development of new professional practice.

Two other sets of issues have informed our work. The first is the concern, central to TLRP, to develop sector-wide research capacity, as elaborated early in TLRP's development by McIntyre and McIntyre (1999) and Dyson and Desforges (2002) and latterly reiterated by Pollard (2005). The second is a demand for practitioners in a range of settings to have access to high-quality, relevant and timely research, to assist the development of teaching as what David Hargreaves (1996) has called 'a research-based profession'. Effective electronic networks are essential for such developments.

We have made use of a range of existing and emerging technologies. In our development and evaluation work we have drawn on the collective expertise of staff at CARET in Cambridge; members of TLRP and its projects; and of AERS, the Applied Educational Research Scheme of Scotland.

DSpace: The Digital Repository
DSpace is a novel but stable technology initially developed jointly by MIT Libraries and Hewlett-Packard. It is freely available to research institutions worldwide as an open source release and has a global developer and user community. It allows research projects and other users to capture and describe digital works using a custom workflow process, and distribute digital works over the web so that users can search and retrieve items in the collection and preserve digital works over the long term.

The TLRP DSpace, developed and hosted at CARET, allows members of TLRP projects to submit electronic copies of published work, conference papers, research briefings, training materials and other resources to a central location. From here they can be accessed by the widest possible audience. Resources in DSpace are accompanied by a metadata record, which describes them and helps people to find them. Submissions are moderated by TLRP staff, who check the suitability of submissions and the accuracy of their metadata records.

DSpace uses the DCMES (Dublin Core Metadata Element Set) as the basis of resource description, although this can be extended in order to provide more specialist and domain-specific descriptions. In the TLRP Archive, resources are 'tagged' with domain-specific terms relating to educational sectors, curriculum areas, research approaches and other educational themes, set out in the 'TLRP Metadata Vocabulary'.

The TLRP Vocabulary
To offer access to as many potential users of research as possible, TLRP has developed a descriptive vocabulary which is the basis of a consistent keyword system used by all projects to describe their outputs, including all those submitted to the DSpace digital repository.

This vocabulary has a hierarchical structure with three tiers. The 15 top-level terms are derived from the cross-programme themes of TLRP as a whole. Nearly 300 subsidiary terms have been progressively identified through a series of consultation exercises involving representatives from TLRP projects. This vocabulary has evolved over the lifetime of the programme, reflecting the elaboration of theoretical perspectives as TLRP has progressed.

TLRP is represented on a number of working groups concerned with educational metadata. The vocabulary it has developed has been made available in SKOS (Simple Knowledge Organization System – an interchange format for thesauri) so that it may be incorporated into, or mapped against, other vocabularies such as the British Educational Thesaurus and the National Curriculum Metadata Set.

DotLearn and Sakai: Virtual Research Environments
Groups of education researchers characteristically use a range of electronic tools in support of their work, both individual and collective. TLRP provides two Virtual Research Environments (VREs). Each offers a range of tools within a single, password-protected online environment. The available tools include personal information management facilities such as file storage and scheduling, central data storage, and collaborative tools such as discussion boards, 'chat', announcement and shared schedule tools. Sub-groups, with restricted membership, can be established, either to make management of information easier or to address concerns about issues such as confidentiality.

Initially, the DotLearn platform was used to provide these facilities. In 2004, a CARET/TLRP team was awarded a grant to evaluate the Sakai Virtual Collaboration Environment as a potential platform for support of Virtual Research under the JISC (Joint Information Systems Committee) VRE Research Programme. Sakai allows the combination of a range of tools and services in a modular framework. 'Worksites' may be configured as Virtual Learning Environments or to support different types of groups and communities.

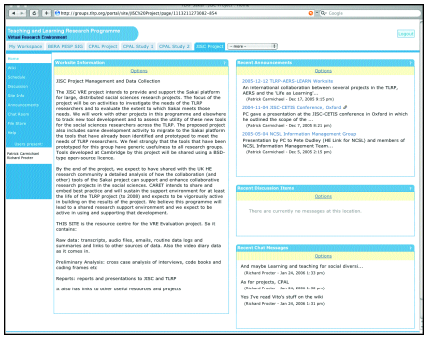


Figure 1: A Sakai 'Worksite' showing multiple collaboration tools. Visible are 'panes' with worksite information, recent announcements, discussions and chat. Other tools (in the left menu) include the wiki and file store

TLRP Project members have participated in a series of requirements-gathering activities to explain their current collaborative activity and explore new forms of collaboration which they could undertake if the tools were available. Some forms of collaboration they suggested were related to research itself, such as the contribution of data sets, and collaborative quantitative and quantitative analysis. Other concerns included managing and publicising events and more general community-building activities. A number of specific requirements have emerged from this process and these have informed subsequent development of new Sakai tools. These relate to version control of documents, support for workflow in tasks such as preparing documents for publication, and the provision of an environment in which authors can work collaboratively on documents, reducing the need to email multiple copies of documents with tracked changes around

a group. In response to this last need, a 'wiki' collaborative writing tool has been developed and forms part of the core Sakai toolkit, available to all TLRP projects (and others) using the Sakai platform.

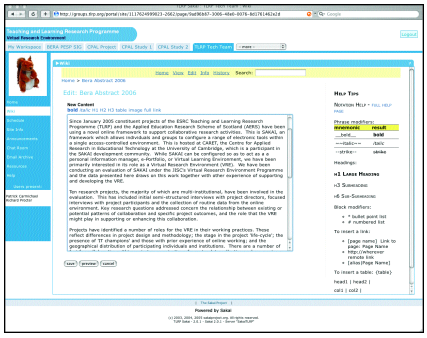


Figure 2: The Sakai Wiki Tool in Use. Here, the authors of this briefing are collaborating in writing a conference abstract

News, events and publications
The Repository and Virtual Research Environments described above are principally intended to support education researchers within TLRP projects. But they also form elements of a broader electronic infrastructure designed to engage the widest range of users both in and with research. While the main TLRP website provides information about programme and project activities, it is dependent on users coming to the website and searching for material relevant to their interests and needs.

TLRP news and events are therefore publicised in a variety of ways:

- on the website, where a permanent archive of news and events is maintained;
- by email, which may be managed either from a dedicated database, or from within the Sakai VRE;
- via RSS (Really Simple Syndication) newsfeeds to which users may subscribe, either reading the news in a web browser or embedding 'Latest TLRP News' in a website of their own.

The content of the DSpace repository is also publicised in the same ways. Metadata about submitted items is exposed via an OAI (Open Archives Initiative) interface which generates themed lists of publications, which can be integrated into the web sites of projects, user groups and individuals. The repository also generates its own RSS newsfeed of the latest submissions. The OAI interface also allows search engines to gather information about project and programme publications. Other institutional repositories, such as the ESRC's Society Today database and the British Education Index, are able to integrate TLRP content, reducing the need for multiple submissions of bibliographical details of project outputs.

Major implications

For individuals engaged in and with research
The immediate appeal of integrated environments (web browsers set to read RSS news feeds, or a Virtual Research Environment such as Sakai) is that new features and functions are made available. At the same time, a decision to broaden one's repertoire beyond email use and web browsing – by contributing to a wiki, engaging in online collaboration around data analysis or submitting a conference paper to a digital repository, for example – brings with it additional responsibilities. Individuals need to be sensitive to 'digital divides' and not to make assumptions about the technological resources of research participants and collaborators as well as other research 'users'.

Ultimately the use of new technologies should not constrain individuals from developing and implementing good practice in research. The implementation of new technologies should, as with any other aspect of research practice, be subject to continuous review and critical scrutiny.

For groups engaged in and with research
The technologies described here make it easier to manage research projects, particularly those that are geographically distributed. They also offer many new means by which users can engage with ongoing research and with the outcomes of research.

Research groups may need to develop an IT strategy that covers the lifespan of their project and extends beyond it. This is likely to go beyond concerns with internal communication and 'impact', and might well include:

- access to resources during and after projects;
- practical issues such as naming conventions, authorship and attribution
- ethical and confidentiality protocols;
- policy on archiving not only data but also research instruments, analytical frameworks, metadata schemes and the results of analysis;
- publication policy covering electronic and paper publication;
- user engagement strategies tailored to the widest range of users of the research, taking into account their technological capabilities.

For institutions and associations engaged in and with research
Institutions developing 'research cultures' will need to offer support for groups of colleagues in addressing issues raised by new technologies of the sort which TLRP has piloted, and may also need to have long-term policies for support, digital archiving and the enforcement of confidentiality arrangements. Established protocols for dealing with confidentiality may need to be revisited and audiences may need to be considered more carefully than in external settings. Existing mechanisms for peer review may also need to be reconsidered in the light of the comparatively open nature of many of the technologies described here.

TLRP is committed to offering these technological resources to the education research community. Take-up through the Applied Education Research Scheme of Scotland has been very successful and the Programme is working with the British Education Research Association to explore how VREs may be used to support the work of Special Interest Groups and other activities within the association.

References
Dyson, A. and Desforges, C. (2002) *Building Research Capacity: Some possible lines of action.* London, NERF.

Hargreaves, D. (1996) Teaching as a Research-based Profession: possibilities and prospects. *British Educational Research Journal 23,* 141–161.

McIntyre, D. and McIntyre, A. (1999) *Capacity for Research into Teaching and Learning.* Cambridge, Teaching and Learning Research Programme.

Pollard, A. (2005) 'Taking the initiative? TLRP and Educational Research'. Education Review Guest Lecture, University of Birmingham, 12 October.

Further information

The following websites describe some of the technologies described here in more detail, and most offer demonstration sites and opportunities to download software for installation:

- DSpace
  http://www.dspace.org
- DotLRN
  http://www.dotlrn.org
- Sakai
  http://www.sakaiproject.org
- Dublin Core
  http://www.dublincore.org
- SKOS
  http://www.w3.org/2004/02/skos/
- Open Archives Initiative
  http://www.openarchives.org

A series of conference papers that extend the information in this briefing have been presented at TLRP conferences and elsewhere, and may be accessed via the TLRP Digital Repository (http://www.tlrp.org/dspace) or the TLRP Archive Site (http://www.tlrp-archive.org). In addition, a special edition of *Technology, Pedagogy and Education,* describing the role of new technologies in supporting the activities of the programme and some of its projects, will appear in 2007.

Websites
The main TLRP website (http://www.tlrp.org) makes use of and has links to the features described in this briefing. The TLRP Digital Repository is at http://www.tlrp.org/dspace. The TLRP Archive Site (http://www.tlrp-archive.org) has further technical information and developer resources. The ESRC site mentioned is http://www.esrcsocietytoday.ac.uk.

The warrant

Where new technologies have been developed, or where novel approaches have been employed, this has taken place in consultation with a wide range of researchers and users inside and outside the TLRP. Systematic gathering of user requirements has been accompanied by formative evaluation in a process which we have described as responsive design.

Wherever possible, the technologies and approaches used conform to international standards, including those issued by the World Wide Web Consortium and IEEE. This is particularly the case where interoperability between TLRP systems and those of partner organisations and public bodies are concerned. Dublin Core, SKOS, RSS (Really Simple Syndication) and OAI (Open Archives Initiatives) were selected because they are widely-used and well-supported standards with which partners and end users would be able to work.

We have also been concerned to submit our strategies and findings to the scrutiny of a range of audiences at conferences and seminars and to respond to feedback. We have presented at events where the primary audiences are researchers and end users (TLRP and BERA); at those concerned with research methods (ESRC Research Capacity Building Network and National Centre for E-Social Science) and at technical conferences (DSpace User Group and JISC Virtual Research Environments Programme).

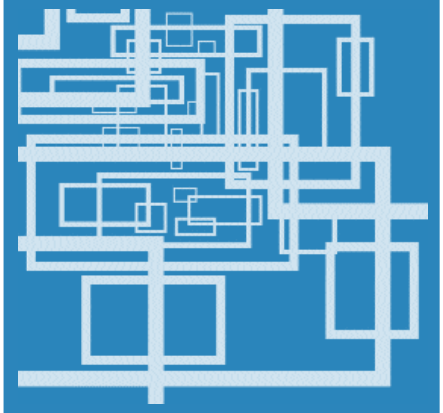
Project Contact
Richard Procter (r.procter@ioe.ac.uk)
TLRP (Room 509)
Institute of Education
University of London
20 Bedford Way
LONDON WC1H 0AL
Tel: 020 7911 5578

ISBN 0-85473-735-9
9 780854 737352

Project team
Patrick Carmichael, CARET, University of Cambridge
Richard Procter, TLRP, Institute of Education, London
Raad Al-Rawi, CARET, University of Cambridge
And other members of the CARET Staff

February 2006

Teaching and Learning Research Programme



TLRP is the largest education research programme in the UK, and benefits from research teams and funding contributions from England, Northern Ireland, Scotland and Wales. Projects began in 2000 and will continue with dissemination and impact work extending through 2008/9.

Learning: TLRP's overarching aim is to improve outcomes for learners of all ages in teaching and learning contexts within the UK.

Outcomes: TLRP studies a broad range of learning outcomes. These include both the acquisition of skill, understanding, knowledge and qualifications and the development of attitudes, values and identities relevant to a learning society.

Lifecourse: TLRP supports research projects and related activities at many ages and stages in education, training and lifelong learning.

Enrichment: TLRP commits to user engagement at all stages of research. The Programme promotes research across disciplines, methodologies and sectors, and supports various forms of national and international co-operation and comparison.

Expertise: TLRP works to enhance capacity for all forms of research on teaching and learning, and for research-informed policy and practice.

Improvement: TLRP develops the knowledge base on teaching and learning and collaborates with users to transform this into effective policy and practice in the UK.

TLRP is managed by the Economic and Social Research Council research mission is to advance knowledge and to promote its use to enhance the quality of life, develop policy and practice and strengthen economic competitiveness. ESRC is guided by principles of quality, relevance and independence.

TLRP Directors' Team
Professor Andrew Pollard ▮ *London*
Professor Mary James ▮ *London*
Professor Stephen Baron ▮ *Strathclyde*
Professor Alan Brown ▮ *Warwick*
Professor Miriam David ▮ *London*
e-team@groups.tlrp.org

TLRP Programme Office
Sarah Douglas ▮ *sarah.douglas@ioe.ac.uk*
James O'Toole ▮ *j.o'toole@ioe.ac.uk*
tlrp@ioe.ac.uk

TLRP
Institute of Education
University of London
20 Bedford Way
London WC1H 0AL

Tel: +44 (0)20 7911 5577
Fax: +44 (0)20 7911 5579

T·L·R·P TEACHING & LEARNING RESEARCH PROGRAMME
E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL