A Holistic Support Environment for Open and Distance Learning

Bob Banks[1]

Abstract

This paper describes an online Learning Environment developed and trialled in collaboration with eleven Further Education Colleges, and lessons learned regarding the management and support of online learning.

We have provided a model and online support for the whole enterprise of open learning, covering course delivery, integration of multimedia and interactive learning resources, assessment, student tracking, contextualised communications and course authoring, with flexibility to support individual learning needs.

Introduction

The world of education and training is undergoing enormous changes. Part of this comes from new perceived learning needs - for lifelong learning, constant updating of knowledge and skills as peoples' worlds continually change. Learning needs now are often immediate, varied and unpredictable. This, along with new economic pressures on educational institutions, provides huge challenges, as well as huge opportunities. In meeting these, many educators are looking to information technology in support of learning - whether desperately clutching at a straw, or eagerly embracing the opportunity to fulfil cherished dreams. But how information technology should best be used, and how it should fit into existing institutions and ways of working is a complex question which we are only starting to answer.

The Learning Environment club has been one forum to help us move towards answers - In the club, eleven Further Education colleges[2], together with a software supplier[3], and some associate institutions[4] have come together to address these issues. The remit of the club has been:

- To ascertain key requirements for IT support for learning
- To develop and evaluate prototype Learning Environment software.
- To ascertain the best ways of using this kind of technology to benefit learners and institutions as a whole
- To identify educational and management issues which need to be addressed in moving forward, including critical success factors.
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[2] Broxtowe College, Nottingham, Clarendon College, Nottingham, Doncaster College, Manchester College of Art and Technology, Newark and Sherwood College, the Sheffield College, Solihull College, Thomas Rotherham College, Trowbridge College, West Cheshire College, Wirral Metropolitan College.
These colleges represent a very wide spectrum from very large to small, urban to rural, experienced in online learning support to inexperienced, etc..

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[4] the NCET (National Council for Educational Technology), South Yorkshire Open College Federation and Sheffield Hallam University.

Although the club has focused on the Further Education sector, we feel that most of the lessons are general across all sectors of education.

The club has run from July, 1995 to May, 1997. During this time, three versions of the prototype software have been released, each building on the last and on feedback from colleges.

The Scope of the Learning Environment

Early on the decision was made to develop and provide support for a complete model for the whole enterprise of open, flexible learning, bringing together:

- on-line access to varied resources - including multimedia and interactive resources
- support for the entire learning process
- a flexible curriculum
- tracking of individual student progress.
- management overviews of programmes and groups of students.

This strategy was certainly more ambitious than a gradualist approach, focusing on just one part of the system, but we feel that it provided a lot of insight into benefits and problems of a holistic approach. In addition, the holistic approach requires the working together and sharing of insights from staff in a number of roles, such as:

- Curriculum staff
- Personal Tutors
- Key skills support staff
- Resource Centre mangers, and learning pack authors
- Distance learning support staff
- IT support staff
- College managers

The club was effective in catalysing discussion between staff in all of these areas.

Requirements which were identified

These requirements were derived in a series of workshops with Club members (a mixture of information specialists (librarians), senior managers, IT support people and curriculum planners):

1) Full support for a resource-based, student-centred open learning model. This implies:

1a) Making learning resources available to learners in two ways:
- Direct access to the learning resources which are key for each learner. This includes both core materials for the module of learning which the learner is pursuing, and materials added in by a tutor to meet the individual needs of a learner.
- Through the learner locating them him/herself - through searching and browsing - with the resource itself available online - not just the catalogue record (as well as retaining access to books, videos etc. which are not held online).

In other words, support for both structured learning and research.

1b) Further extending support to the entire learning process, which was defined for our purposes in figure 1 - following e.g. Revans (1988) (see also Cowham, 1997).

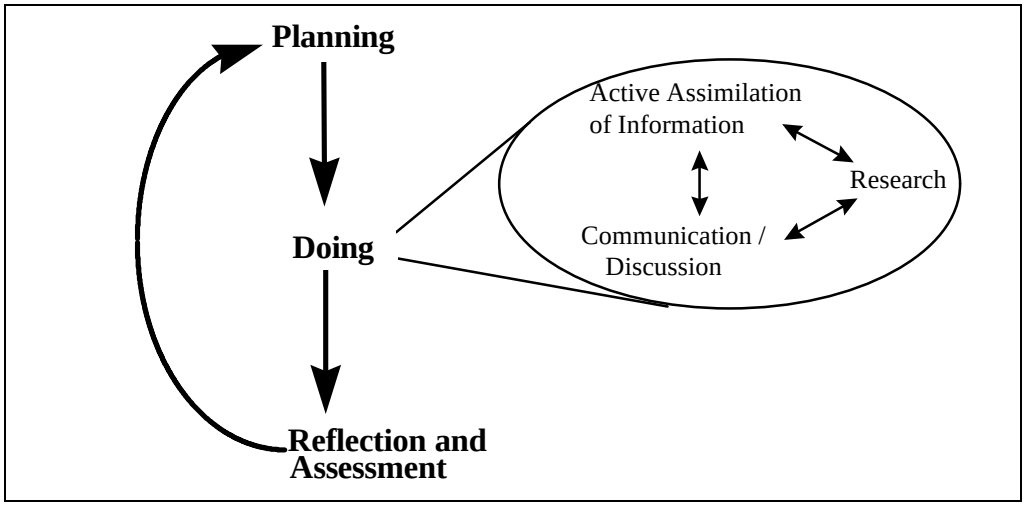

Figure 1 - Learning model for the individual learner

In this model, planning and reflection, with the student taking responsibility for his or her own learning are seen as integral to learning (FEDA, 1994). Assessment is necessary both to provide an external record of what the learner has achieved (summative) and also to guide the next round learning by identifying strengths and weaknesses (formative).

1c) Embedding communication / discussion within the core structure of the learning.

This approach is fairly standard educational practice. However, there are a number of potential advantages of embodying it with IT support (quite apart from increased accessibility), for example:

- making the process explicit and visible
- recording the stages of the process - eg action plans, and making these visible to all participants (student, tutors, employer, etc.) for reflection and review.
- integrating the parts of the process together - eg the resources / activities for information assimilation, and e-mail etc. for communication and discussion.

2) Flexibility is of the essence. This means meeting the needs of individual learners, rather than providing standard fixed courses, which learners can take or leave. It also implies adapting the offering as needs change - not just on a fixed annual cycle. This would encompass, for example, support for individually tailored learning programmes, with the capability to provide the learning resources that are just right for a particular individual, and to change these immediately as the needs of the individual (or group) change.

3) To achieve this, support for the learner is likely to be provided by a team which may comprise (for example) a curriculum area specialist, an information specialist, a personal tutor, and a workplace training manager. There is hope that a new,

predominantly online, support regime may work better than traditional arrangements, through:

- One-to-one asynchronous access to the right support person for the student the moment questions arise through (for example) integrated e-mail. Rather than having to wait for next week's tutorial with the one member of staff who is assigned to him or her, the student can direct a question at the appropriate person(s) - e.g. curriculum specialist, librarian, or (importantly!) fellow students, and hope to have a response within a day or two.
- Availability of up-to-the-minute information on student progress to the team of tutors, with the automated ability to focus in on problem areas - e.g. overdue assignments - enabling tutors to spot any problems as soon as they arise.

Certainly, effective support for individual student tracking (Donovan, 1996) was seen as very important.

4) None of this is possible without the right learning resources being available. Generally speaking, it will be impossible for staff to develop the bulk of the resources for a course themselves. The model has to be sharing and re-use of materials, both within an institution, and between institutions. Key to this are:

- Effective and flexible search facilities for locating the right materials. (Also, ideally, automatic notification facilities when new relevant materials become available.)
- The added value obtained by cataloguing materials for optimum accessibility. This principle extends to external resources - such as Web pages etc.
- The design of materials for re-use. This encompasses both adaptation of materials for new purposes and also use of materials in a number of contexts. For example, a resource may relate to a number of curriculum areas and also to key skills in number, communication, etc..
- The appropriate level of quality assurance for an institution's resources.

The ability to automatically monitor usage of resources to evaluate their effectiveness and help plan future acquisitions is important.

5) Support for students (and staff) working from a variety of locations, such as home, the workplace, community centres, or open learning centres in the college.

Information and Communication Models and Implementation

To fulfil these requirements, an **information model** was developed (figure 2), validated with members of the club, and implemented. Because of the methodology and software toolset used (Banks et.al., 1996), rapid incremental development was possible, with comments from users feeding back quickly into the model and the software. In the model, the ovals denote the main kinds of information held (referred to as "domains"). The lines denote links between them.

Some significant points are:

- The curriculum model is split into delivery and assessment strands, following recommended practice in FE (FEU, 1995, Fforwm, 1995) enabling greater flexibility in meeting students' needs.

- The model supports active learning, through "activities" which each student undertakes (individually or in a team), and which are supported by learning resources.
- The model supports competency based assessment (as well as other forms). The units can be broken down into sub-units, sub-sub-units etc., all of which can be marked as achieved as appropriate. This will be when the appropriate evidence (either activities or APL evidence) is successfully completed and / or when all the sub-units have been achieved. In the current model there is a basic degree of automation of this process of marking chunks of assessment as achieved. This could be extended to provide fairly comprehensive automation. Technically this would not be hard, but it would involve a significant exercise in knowledge acquisition to determine the full range of rules which might be required to guide the updating of the status of each chunk.
- Each activity may provide evidence for any number of chunks of assessment. For example, a survey of patient needs could provide evidence for the achievement of elements in a mandatory Health and Social Care unit, but also for elements of key skills units in number and IT.

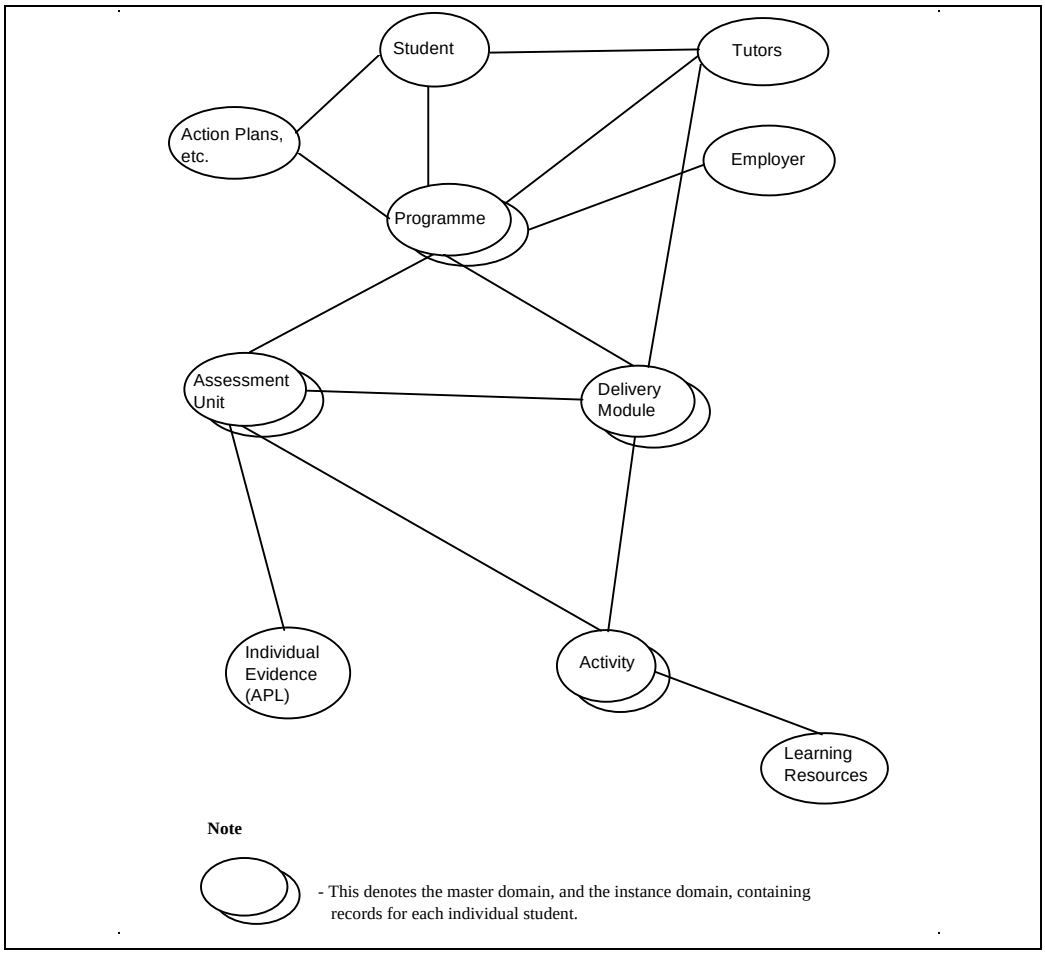

Figure 2 - Learning Environment Information Model

- When students enrol on a programme (standard or individualised), individual "copies" of the programme, delivery modules, assessment units and activities are automatically made. This means that:
    - the progress of each student is recorded individually

- each student has their own copy of each activity, which they can complete online as appropriate.
- each student's programme and modules can be individually tailored - e.g. providing extra activities to reinforce areas where the student has difficulties, or to challenge and extend able students.

- Re-use of resources (including activities) across the whole range of the curriculum is supported.

The **User interface** for students and tutors is based around three modes of interaction, supporting strongly structured, guided work, free exploration / research, and online communication.

- Structured mode, through the users' "workspace" where the core information they will most commonly be working with is presented to them (e.g. figure 3).
- Unstructured or research mode - where the user can formulate queries and explore freely through the entire information base - in so far as they have the appropriate permissions (e.g. figure 4).

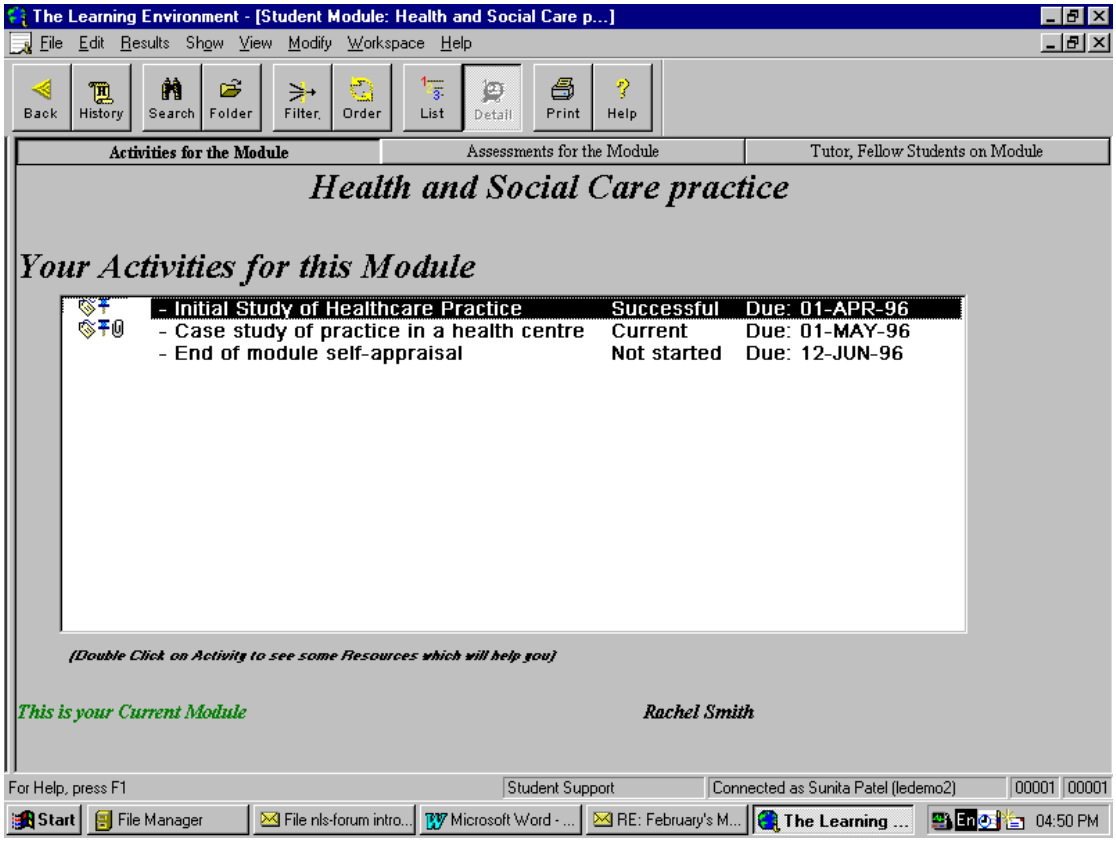

Figure 3: "Structured mode" - typical initial view of a learner's workspace

- Online communication in context. Online communication is achieved through integrated third party applications (e.g. e-mail, video conferencing) which are launched by a single mouse click in context.

Resources can be located within or outside the LE database. For example, they can be:

- Word-processed documents - either in read-only or (for activities) in updateable mode.

- Adobe Acrobat documents. These allow the embedding of multimedia components, and hyperlinks. (As indeed - though to an arguably lesser extent to most modern word-processors.)
- Multimedia learning resources - which may have been authored using a variety of packages.
- World Wide Web pages anywhere on the Internet. The same considerations that apply to any educational use of the Web obviously apply here, and must be addressed in determining an institution's Internet policy.
- Web pages on the institution's internal intranet (some of which may be copies of pages obtained from the global Internet - but held locally to save on the phone bill, and to avoid the perceived dangers to innocent students lurking out there on the Internet.
- Etc. etc.

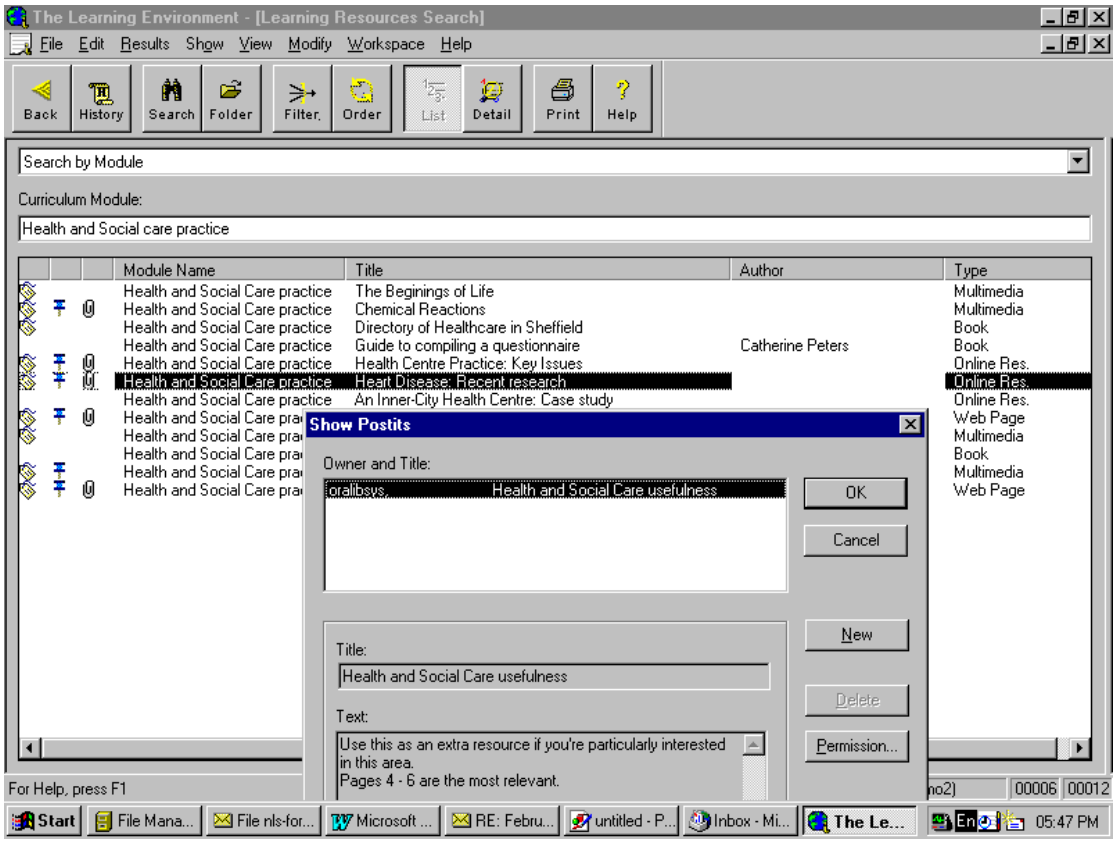

Figure 4: "Unstructured or Research mode" - a query of the database. (For all learning resources that are currently used on the "Health and Social Care Practice" module.)

In terms of physical location, resources may be held, for example:

- Within the LE database
- On a local area network server (which could be a dedicated document server). This may provide advantages in speed of access, but may limit the visibility of the resources (e.g. to users connected over a local area as opposed to wide area network.)
- On the Internet or intranet - referenced in standard Web fashion via a URL (Universal Resource Locator)

- On a CD-ROM, distributed to the students enrolled on a particular programme, and inserted into their own CD-ROM drive. This provides advantages of fast loading for multimedia resources without the expense of high bandwidth network connections. The obvious disadvantage is the inability to update resources without sending out new copies of the CD-ROM, but this may not matter.
- On CD-ROMs mounted on the local network on a CD-ROM jukebox.

The choice of the mixture of strategies to be adopted for mounting resources is one of the major strategic questions an institution faces in developing online learning.

The provision for online **communication / discussion** with tutors and with fellow learners may depend on learning style, educational model, confidence of students, degree of support required, etc. Examples of a structure would be:

- At the end of each module of delivery - e.g. e-mailing the tutor(s) to comment on the learning which has taken place in the module being the final activity in the module.
- Ad hoc - when problems or inspirations arise. Almost certainly, this will be important.
- Once a week (This is traditional but perhaps rarely appropriate!)

Incorporating discussion with fellow learners in the process may be as important as (or more important than!) discussion with tutors.

Within the related Rennaisance[5] project the integration of online communication with the LE client has been extended to allow the user to:

- check which modes of communication are currently available for each potentail correspondent.
- initiate a dialogue or discussion in the selected mode (e.g. e-mail, video-conferencing, whitebording, online chat and newsgroups) in their current learning context - e.g. automatically referencing the tutor for a particular module or the current assignment.

Which style of communication (e.g. one to one or many to many; synchronous or asynchronous) is best for which situation is an interesting question which would repay more research. The pedagogic reasons for the traditional format - lectures and tutorial are probably lost in the mists of time - there is a case for re-inventing best practice.

There is a degree of automation of **process** - at a prototype level, although this could readily be extended, using the procedural capabilities of Oracle 7. The current main areas or process automation focus on student progression:

- Updating of the status of a student's activity to "completed" (by student) or "successful" (by tutor) using the action menu evoked by the right mouse button. The former automatically converts the next activity within the module to "current" for this student. The latter automatically updates the status of apporpraitely linked chunks of assessment.
- The flagging of units of assessment as potentially achieved when (for example) all their sub-units are achieved.

[5] Renaissance is a project under the E.U. ACTS programme

The Learning Environment was **implemented** in a client - server environment, supporting access over local of wide area networks (tcp-ip). An Oracle database on the central server(s) holds the information. The client runs on Windows PCs. In principle, the application could equally run over the World Wide Web, with a web browser providing the client, and (for example) Oracle Web Server providing access to the database. Extension to this environment is under consideration.

Typical use of the Learning Environment

1) By a Student

Tony is enrolled on a course in Health and Social Care, leading to a Level 3 GNVQ qualification (although the system supports other qualifications). He generally works from home - in the evenings or whilst the children are at nursery. However, fellow students on the course who have no computer at home work at a number of open learning centres or "Electronic Village Halls" near their homes.

Before starting the course, Tony had a number of meetings with tutors to:

- Identify his learning needs.
- Decide on his learning goals .
- Formulate an action plan for his learning, and decide on the programme / modules on which he is going to enrol.

This process of "action planning" is felt to be very important both in ensuring that the student's learning is actually meeting his or her needs, and in helping the student take responsibility for his or her own learning, and reflect on the progress of that learning (FEU, 1994)

This information is maintained (as word-processed documents) within the learning environment, and is immediately accessible for reference and update from both Tony's and his tutor's workspaces. This initial process is not a one-off, but is periodically revisited as Tony reflects on his learning, and as a result his aspirations and needs evolve. The action plan is regularly re-assessed in tutorial sessions, and a record of its evolution is maintained, as new versions are created and held. Different institutions will employ different terminology for this process, but the principle is the same. Note that each part of this process could be either on-line[6] or face to face. The general feeling is that some degree of face to face contact is invaluable, but the possible mixes that are appropriate for different types of learner is an area that requires more research.

In a typical learning session, Tony may connect in, and initially check his mail, for example picking up a reply from his tutor about a problem he had yesterday, and a couple of responses to points he made in group discussion. He then looks at his learning environment workspace, where the list of activities for the module he is currently working on are shown to him (fig. 3). He has just finished one activity, and starts on the next, which is marked as current. It may be, for example, a word processed activity sheet, which Tony completes with help from the list of learning resources attached. These could be, for example, a web page, a multimedia Acrobat

[6] A variety of software is available to support learning needs assessment - eg IBM's competency advisor (Arnsten and Sheddick, 1996)

document, and a video. Postits, supplied by the module tutor, and visible just to all the students in this group, explain how each resource might best be used in this context.

In this case, his tutor has added an additional learning resource to help him with the statistical analysis of the activity results, which he has been finding difficult. A "postit" against the resource explains how to use it. (His tutor found it in the college resource bank held on the Learning Environment. This resource bank could, indeed be shared with other institutions, increasing the resources available to all of them at little extra cost. The extension of this kind of the Learning Environment to allow integrated searching (by learners and tutors) of heterogeneous resource bases anywhere in the world has been investigated and implemented in the DALI[7] and Rennaisance[8] projects. DALI and Rennaisance also investigated and implemented charging mechanisms for document delivery from remote sites - a crucial component if this kind of flexible remote access to resources is to become widespread.)

When Tony has a problem, he can instantly e-mail his tutor. To do this, he clicks on the right mouse button over the activity, which brings up the action menu. He selects "e-mail tutor" which brings up his e-mail application, with the "To" box automatically populated with the address of the tutor for this module, and the "About" box populated with the name of the activity.

When the activity is completed, Tony clicks on "Completed" on the action menu, and the next activity automatically becomes current, whilst this one appears in the tutor's folder of activities for marking.

Tony can also freely research the resource base to explore other items that might be relevant.

In this example, Tony is pursuing a fairly standard college course, although there may be a good deal of variation between course members in which optional modules they choose. However, learning programmes may equally be totally individual, on a "pick and mix" basis.
There are many possible variations between the extremes of standard college courses and total individuality. For example, many colleges give students diagnostic tests in key skills when they enrol. These can be presented as activities, marked on-line, and based on the results, supplementary chunks of work can be dropped into the student's programme, to catch up on areas of deficiency.

From time to time Tony (and his tutors) will wish to see how he is progressing with the assessment side of things. When activities are marked as successful by the tutor, the chunks of assessment (units / elements / learning outcomes / performance criteria or whatever) for which they provide evidence are automatically marked as achieved. It is important that an activity may be linked to any number of pieces of assessment. So, for example, a survey of patient needs could provide evidence for the achievement of elements in a mandatory Health and Social Care unit, but also for elements of key skills units in number and communication and IT. Note that evidence will not always be

[7] DALI is a project under the E.U.Telematics in Libraries programme
[8] Renaissance is a project under the E.U. ACTS programme

electronic. For example, it could be on paper, and referenced by the learning environment, or, in competency-based qualifications, it could simply be a record that the assessor was seen the student perform the relevant activity satisfactorily.

Also, some pieces of assessment can be achieved via accreditation of prior learning (APL). In this case, if the APL evidence is electronic, it is stored with an APL record linked to the relevant piece(es) of assessment. Otherwise, the APL record may simply reference evidence on paper.

2) By tutors (and other learning support staff)

The student's support team monitors progress via

- direct communication with the student (and each other) - e.g. via integrated e-mail.
- via a window onto each student's progress and work presented in their own workspaces. This may, for example, provide an automatically updated list of overdue assignments, allowing the tutor to home in immediately on problems as they arise, and respond and resolve the problem before the student become disillusioned, drops out etc.

3) By resource / curriculum managers

Creation and adaptation of chunks of curriculum and resources is supported by:

- A wide range of search types, with access via date, subject headings, full text retrieval, subject headings, curriculum area, author, etc..
- Cross-referencing and browsing capabilities.
- Resource sharing via static and dynamic folders.
- Drag and drop authoring and structuring for creating chunks of curriculum, and linking resources together to facilitate research.

Key Issues for the future

These are largely organisational and cultural rather than technical, for example:

The sourcing, management and sharing of learning resources. Some things that may help are:

- Arrangements for sharing between institutions. (The South Yorkshire Networking for Enterprises (SYNE) project provides an example of this in FE.)
- A "component architecture" for resources to facilitate their re-use.
- A clear analysis of the economics of buying in materials versus developing them internally, the investment required and the potential returns.

How to build effective teams, secure buy-in, and spread best practice through an institution. "How to get there from here". Some things that may help are:

- A well-designed staff development programme

- A well thought out migration path, so that change is brought about in manageable steps, each of which is worthwhile in itself, and also adds effectively to the whole.
- A small-scale initial pilot within the institution which demonstrates clear benefits in the eyes of potential stakeholders.
- An effective high-level champion.
- A culture where individuals are rewarded for innovating and working together.

The nature of the different "markets" to which learning programmes are being addressed, and the kind of online solutions that are appropriate for each of those markets. For example, for pure distance learning, the ability to do most of one's work offline - without needing to be connected by phone. For this a solution based on a technology like Lotus Notes may be ideal.
In other cases - e.g. selling workplace based training to "Learning Organisations" which are strongly commited to staff development, learning needs assessment may be the most crucial part of the process.
For "mass-produced" courses, the CD-ROM may be the most appropriate delivery vehicle - with e-mail providing the vehicle for communication and discussion.
Etc.etc.

Forthcoming evaluation of the pilot use of the Learning Environment in colleges will provide further insights.

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