Courseware in academic library user education: a literature review from the GAELS Joint Electronic Library Project

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The use of courseware for information skills teaching in academic libraries has been growing for a number of years. In order to create effective courseware packages to support joint electronic library activity at Glasgow and Strathclyde Universities, the GAELS project conducted a literature review of the subject. This review discovered a range of factors common to successful library courseware implementations, such as the need for practitioners to feel a sense of ownership of the medium, a need for courseware customization to local information environments, and an emphasis on training packages for large bodies of undergraduates. However, we also noted underdeveloped aspects worthy of further attention, such as treatment of pedagogic issues in library computer-aided learning (CAL) implementations and use of hypertextual learning materials for more advanced information skills training. We describe how these findings shaped the packages produced by the project and suggest ways forward for similar types of implementation.

Introduction

The GAELS project (Glasgow Allied Electronically with Strathclyde) is a library-based project intended to promote a culture shift among engineering researchers at Glasgow and Strathclyde Universities. Our intention is to decrease researchers' dependence on separately held local print collections in favour of collaboratively held networked electronic resources. To support this aim, GAELS (1999) has created a courseware package to teach researchers the different information retrieval skills required to use such networked resources.

In the course of this work, we undertook a review of the literature relating to the use of computer-aided learning materials in academic libraries. We wanted to create a hypermedia-based package delivered over a Web platform, but we knew that writers on

courseware development and educational theory (Laurillard, 1993; Benyon and Woodruffe, 1997) had expressed caution about the effectiveness of hypermedia as a way of supporting genuine educational outcomes. Moreover, well-regarded library user education programmes using both traditional and CAL-based approaches had hitherto failed to disseminate the necessary level of networked information skills amongst academic staff. There appeared to be no consensus on how to offer effective networked information skills training, nor on the larger issues of modifying existing patterns of research information use. Before we committed ourselves to a particular approach, we wished to examine what previous projects had discovered in using a variety of learning technologies for library user education.

User education in libraries

Librarians interested in exploring a courseware-based approach to library user education have available to them a well-developed tradition of thinking about information skills teaching. This has been summarized elsewhere (Tiefel, 1995), and it is not the intention of this paper to re-present this material. However, it is worth noting how this tradition has shaped applications of educational technology to information skills teaching.

User education in libraries evolved at the end of the nineteenth century. It appeared that library users were failing to make best use of library and other information resources because of a number of factors (Salony, 1995). Firstly, users did not possess the practical skills needed to exploit libraries. But beyond this, an intelligent information user needed a more complex set of intellectual skills, habits and attitudes. Tucker (1979) summarizes these as 'the art of discrimination', together with independent or life-long learning skills. These higher level skills have been codified under the banner of 'information literacy' (Snavely and Cooper, 1997).

This thinking has developed along a dual path. There is a tradition of theoretical deliberation about the pedagogy of information skills teaching, and alongside it there is a practitioner tradition of documenting practice which shows how far library professionals have been able to embody good instructional models in their teaching. Thus, to cite one example from many, the practitioner Hanson (1985) took instructional models from Bruner and Gagné and applied them within the sphere of library user education. Such models emphasized important facets of the learning process. Hanson's work took from Bruner (1966) the need to acknowledge the nature of the learner and the way in which the learner obtains knowledge. Drawing on Gagné (1977), Hanson also tried to give learners opportunities to demonstrate how they have understood the rules of information systems while receiving feedback on their performance during practice in 'spaced reviews'.

One commentator (Piette, 1995) noted that such educationally well-founded work tends to be frustrated by the shortcomings of the library instruction environment. Since user education takes place outside the regular instructional schedule, it takes place in a vacuum, leaving teacher librarians with few opportunities to create an enriching process of on-going review, drill or practice. Academics or course tutors, in support of whose teaching library user education is offered, are far better placed to create such a learning experience. It is the academic who sees how information is used to inform a student's essay, and who is best positioned to give feedback and advice to the student on improving such use. Librarian-

tutors can only really describe the mechanics of library use in occasional decontextualized 'information skills' sessions. Moreover, it is only rarely that lecturers, together with library staff, share the role of examining and improving patterns of information exploitation within a course, although the literature does recognize the existence and importance of such collaborations (Carlson and Miller, 1984).

Nevertheless, there is a long history in user education practice of elaborating the concept of 'information literacy' as a subject in its own right, that is, as a subject which can be taught as a part of the standard academic curriculum outside the courses which information skills teaching normally supports (Rader, 1990). The conceiving of user education as more than a simple set of practical skills, rather as a larger philosophy of information use, is an important attempt to overcome the shortcomings of the library instruction environment and has had a significant impact on the content of user education programmes.

Broadly speaking, this ambitious user education syllabus has moved away from teaching skills that are based on simple, mechanical tools, in favour of generic and rather abstract searching principles that apply equally to any information tool (on-line catalogue, bibliographic database, Internet search engine). Tiefel (1995) points out that this syllabus is comprehensive and broadly applicable, and it also facilitates the larger ambition of leading the student towards the development of critical thinking skills.

However, in response to this, there is a practitioner school of thought which is hostile to the over-elaboration of the information skills programme. This school argues that the content of the user education syllabus should be essentially practical and modest, and that the very existence of user education as an activity in its own right may be more a reflection of the inability of librarians to make their libraries and database services usable (Eadie, 1990; Pacey, 1995). If libraries and information systems were made easier to use, then the practical skills component of information literacy courses would effectively disappear, leaving an inflated array of philosophical teaching aims that could only make sense within the framework of proper, mainstream academic subject teaching. The potential of information technology to make libraries much easier to use suggests that the elimination of the practical skills barrier to information use may be nearer than ever before, and with it the need for most library user education (Savenije, 1999).

The GAELS project

The courseware development aspect of the GAELS project, in common with most library user education activity, was brought into existence by the perception of an information skills training need (Salony, 1995). It is the established practice of most academics and researchers to depend on well-resourced library provision of hard copy journals in science, technology and medicine for current awareness and updating purposes rather than electronic sources. User education programmes have failed to modify this pattern of information use (Hallmark, 1994). This restricts scientific research communities to the physical environs of a university campus library and is extremely resource-intensive. Where similar research communities exist in close proximity to each other, for example within a metropolitan area such as the City of Glasgow, there is inevitably a highly expensive duplication of printed library materials across a small geographical area. More

importantly, it seemed likely that failure to exploit networked information resources was in itself an undesirable state of affairs. Given the well developed nature of modern electronic library services, and the potential for data-sharing across the West of Scotland metropolitan area network, it seemed that a courseware-based attempt to re-educate the distributed engineering research communities of the Universities of Glasgow and Strathclyde into using networked access to library resources might be effective.

However, library skills courseware implementations at Glasgow University such as the TILT project (Creanor, Durndell and Primrose, 1996) had had little real impact on user education practice despite being acknowledged as successful examples of educational technology. Thus, they seemed to show that a courseware-based approach to modifying user behaviour would have little effect in practice in re-educating research engineers in their pattern of library use, unless the reasons behind the lack of adoption of these previous packages were understood.

The fact that we were aiming at a sophisticated, research-level group of library users meant that the package should aspire to more than simple skills-based learning if it was to gain acceptance. Since our intended users were highly intelligent and well-motivated, they were hardly incapable of grasping the basic search techniques required by a number of well-produced database services. It was at least arguable that the reasons for their failure to adopt networked information retrieval practices might be a higher-level educational issue, possibly one that could be understood within the framework of information literacy (Joint, Kemp and Ashworth, 2000). It would be important to find case studies which genuinely managed to teach the core skills of information retrieval and achieve meaningful levels of effective implementation in practice. But also, bearing in mind critics of the concept of information literacy, it would be valuable for us to find library skills courseware case studies which managed to create enriching learning experiences without falling prey to charges of irrelevant educational pretension.

Non-Web case studies

(a) Computer-aided instruction via hypermedia

Early courseware development successes

The first well-documented uses of Computer-Aided Instruction (CAI) technologies in academic library user education occurred in North American libraries during the mid-1980s. The technologies used may be presumed to be 'hypermedia' only in a loose sense, since these studies used now obsolete packages to produce results more readily achievable by modern software. A number of successful outcomes were noted, with the courseware approach emerging favourably in comparison with traditional teaching methods (Nipp and Straub, 1986; Lawson, 1989).

Developing a more ambitious library skills teaching package

These optimistic early pre-Web case studies were picked up by a later case study conducted between 1994 and 1996 (Kaplowitz and Contini, 1998). This study noted the work mentioned above (Lawson, 1989; Nipp and Straub, 1986) together with other optimistic studies of CAI in libraries (Pask, 1988; Piette and Smith, 1991; Cherry, 1991). However, the authors were cautious about the existing CAI evaluations in the literature, noting, for example, that neither Pask nor Piette and Smith assessed students' skills levels after taking

the CAI. Moreover, Kaplowitz and Contini cite other writers (Harrington, 1989; Kulik, 1989; Welsch and Loomis, 1990) who criticized the potential of CAI for real interactivity with students. Kaplowitz and Contini used their insight into the literature of library CAI to conduct their own methodologically sound and very well-resourced CAI case study, successfully creating a library skills package for undergraduate biologists at UCLA which aimed at teaching more than simple information skills. Despite their initial pessimism, their study did create a courseware package capable of producing results at least equivalent to those of traditional user education methods.

Resource-intensive nature of sophisticated library skills teaching
Although this study was optimistic about learning outcomes for library CAI, it was pessimistic about resourcing. The package was very expensive and labour-intensive to develop, so that it was unclear whether it would be revised and used in future. A pattern was developing. In the 1980s, library courseware seemed to work well in teaching simple tasks where drill is required for mastery (Turner, 1990). Effective packages were created with simple interactive activities and sustainable resourcing which could be maintained in future. Resourcing the development of more sophisticated learning materials was problematic (Kaplowitz and Contini, 1998).

Thus, if more ambitious outcomes are achievable in library skills training, the resourcing required to create such packages appears to be excessive. However, the limited emphasis on sophisticated learning in simple library skills training means that hypermedia packages have a valuable, sustainable role in basic library instruction. Subsequent pre-Web studies (Dixon, Garrett and Smith, 1995; Van der Meer and Galen, 1996) confirm this, teaching basic library skills with sound evaluations and good learning outcomes.

(b) Computer-mediated communication methods

A number of interesting CMC-based distance-learning course case studies were documented in the 1990s. These studies described teaching innovations based on email communication with dispersed groups of students. They often taught the technologies that were delivering the teaching – the Internet, usenet, listservs, and the like – and were delivered as correspondence courses (Burke, 1996; Vishwanatham, Wilkins and Jevec, 1997). More library-specific courses focused on simple information tools, such as a database interface (Kelsey, 1999; Jensen and Sih, 1995; Butros, 1997).

Initially, hypertext courseware technologies were not used with CMC. This was inevitable, given the incompatibility of the technologies at that time. Interactive pre-Web stand-alone hypermedia courseware was offered to students by in-person workshops while distance learning was synonymous with CMC-based courseware. By contrast, once Web platforms became available to libraries, networking of hypertextual packages became easier and courseware developers could allow themselves more flexibility of approach (Mazoue, 1999).

The drive to combine a CMC-approach to courseware with other technologies derives from perceived limitations of the medium. Exposition of material via CMC technologies such as email is deemed to be labour-intensive, and so is the subsequent interaction and feedback (Herther, 1997). The labour-saving automated exercises and feedback of the non-CMC-dependent hypermedia-based library packages are a great practical benefit. The

activity and feedback functions of such packages require less support from tutors, even though their drill-based exercises could be seen as simplistic.

Later CMC case studies
Later successful case studies based on synchronous rather than asynchronous CMC technologies such as conferencing packages and chat rooms confirm the resource-intensive nature of this medium (Pival and Tunon, 1998; Simoneaux, D'Angelo and Jung, 1999).

As previously, problems of distance were dealt with, but staffing resources remained an issue. Moreover, the idea of replicating contact lecturing via conferencing software for library skills teaching raises general questions about the suitability of the contact lecture for basic library education. Because the lecture is a narrative educational format, it suits some topics well, for example, chronological historical subjects, or the step-by-step building of philosophical argument, whereas simple information skills teaching tends to consist of self-contained descriptions of tools, concepts or processes, none of which combine together in a linear sequence of cumulative argument or incremental drama.

Pival and Tunon (1998) advise keeping the training segment relatively short because of the difficulty of sustaining lecture-type expositions. However, subsequent studies indicate that CMC-based solutions are suitable for more ambitious types of information-related teaching, such as teaching students of information management or postgraduate information scientists, either when used on their own (McMurdo and Meadows, 1996) or with other approaches (Van Brakel, 1999).

Resource-intensive nature of sophisticated library skills teaching
In summary, there is an impressive body of library CMC case studies with adequate evaluative data which show that this is a valuable technology with positive learning outcomes. If used to the exclusion of other technologies, it requires good staff resourcing to succeed. It displays no resourcing advantages over non-Web-based hypermedia in delivering more advanced skills training. Library skills tutors with the requisite support who feel that this is a suitable approach may choose it for their CAL implementations with a fair degree of confidence.

Case studies of Web-based courseware

The move from packages using software such as *Hypercard* and *Toolbook* to HTML-generated hypermedia resources delivered via the Web is marked by one simple but powerful trade-off. The more rigorous analytic approaches of earlier computer-aided instruction projects are relaxed as courseware implementations become more prevalent in everyday library teaching practice.

Practitioners' sense of ownership of the courseware medium

In the United States, the widespread adoption of HTML/Web technologies democratized the courseware development process. The mystique was removed from package authoring, and in some cases librarian teachers were empowered to become courseware developers themselves (Laverty, 1997; Murphy, 1998). This is less true of the United Kingdom, where there is a longer-lived tendency for courseware development to remain the preserve of supra-institutional showcase projects outside the practitioner mainstream.

The Glasgow University-based TILT library CAL project (Creanor *et al.*, 1996) created a *Toolbook* package (later moved to a Web platform). As with pre-Web American

implementations, the pedagogy is rigorous and the evaluation exemplary. But the TILT remit required that the package had to be generic, not site-specific. However, this generic quality did not lead to the package being extensively adopted at other sites. This generic approach is typical of UK library courseware projects, and may explain why courseware approaches have spread less widely in UK libraries (SCONUL, 1998) as opposed to US libraries (Bevilacqua, 1993). If generic British packages, such as Glasgow's, or the INTO INFO learning materials created by the EDUCATE project (Thomasson and Fjällbrant, 1996; Fjällbrant, 1996), have had little documented impact in the UK outside the institutions which created them, perhaps UK courseware implementations will grow by following the American model of locally authored CAL packages.

Informing versus educating

(a) Web hypertextual publishing as effective teaching

As learning technologies have become increasingly the tool of the practitioner, a loss of focus on certain principles has brought disadvantages. Firstly, the distinction between an information resource and an educational resource has become blurred. This can be seen in the second half of the 1990s in articles about direct Web conversions of 'user education' handouts or in articles which explore the Web as a 'passive' hypertext publishing medium without using drill-based interactive routines (Halvorsen, 1997; Mosley, 1998). As noted previously, Benyon and Woodruffe dispute that there is educational benefit from simply hypertextualizing existing material as Web/HTML resources. Halvorsen's and Mosley's hypertext Web publications certainly succeed as information resources, but it is not clear in what sense this success has an instructional outcome. This is unfortunate, because case studies which demonstrate the educational value of hypertext learning resources without drill-based routines do offer a way of escaping from simplistic multiple-choice-style on-line activities.

There are, however, examples where 'passive' hypertext pages are claimed by the developer to be bibliographic instruction. The EDUCATE project has been viewed as an Internet publishing case study (O'Riordan, 1996) and as an interactive educational project (Fjällbrant, 1995). This case is made more clearly in the teaching of legislative processes as an aid to retrieving legal information (Hoffman, 1997). For Hoffman, 'simply hypertextualizing the material' (Benyon's phrase) is educationally beneficial because the resultant overview of the legislative Web on a hypertext map brings the student fully into the mechanism of creating new laws. As Laurillard points out (1993: 130), hypertext learning occurs readily 'when the world is itself textual'.

To summarize, the blurring of the distinction between passive Web/HTML publishing and genuine educational resources can sometimes be seen as a category error. On the other hand, a resource can genuinely work as a set of teaching materials while remaining largely a form of hypertext publishing without simplistic, drill-based exercises. A direct HTML conversion of a high-quality correspondence course textbook, or a richly hyperlinked learning environment (Hoffman, 1997) are both good examples.

(b) Virtual library tours as educational activities

The claims for the instructional value of virtual library tours are similarly complex, since these Web resources are essentially informative, comprising exposition of material without activity and feedback. Mosley (1996) describes a rich Web user education resource

presented as a tour through a library. Other UK Web-based courseware investigations (Gorman and Lees, 1995; Biddiscombe, Knowles and Upton, 1997) also prefer informational rather than educational outcomes, as do similar US case studies (Borah, 1997; Murphy, 1998). All these papers describe excellent library Web pages, but their usefulness may be informational not educational. Descriptions of them do not emphasize interactive teaching and learning achieved by drill-based routines, nor by hypermedia features.

Educating rather than informing: true Web/HTML library learning materials

Library Web resources become more demonstrably learning materials when they leave behind the metaphor of the instructional handout and the library tour. Both metaphors imply a user-librarian relationship, where the user passively receives information from an information provider. Once user education Web resources are created within the framework of the taught class, the interactive relationship of the tutor-student supplants the passive user-librarian relationship. The level of educational interactivity often remains elementary, however.

A pattern for Web/HTML library learning materials

A typical pattern emerges. A package is created to support a subject-specific class (Orians and Sabol, 1996); or alternatively, a course in communications, professional or study skills provides a curriculum context for the library skills training (Parise, 1998; Cribb and Woodall, 1997). The academic level is undergraduate not research. Occasionally courseware focuses on a free-standing library information retrieval tool, such as a single database or database host, but this is rare (Prestamo, 1998; Hawkins, 1997). More often a range of external networked services and local library facilities are described.

Such library courseware consists of one or more modules, which offer a linear path through a set of Web pages. The student follows a primarily textual exposition of material, enriched with graphics, screenshots and/or hyperlinks to information resources. A drill-based quiz often concludes each module; and a more ambitious final assignment based on the whole package may be given. Satisfactory completion of the quizzes and/or larger piece of work is integrated into passing the departmental course supported by the package. Email interaction with library staff, peers or faculty often occurs, but is not the only means of interactivity and feedback. Occasionally a particular feature of these packages is highlighted, for example the automation of assessment (Niemeyer, 1999). However, Scholz, Kerr and Brown (1996), Greenwood and Frisbie (1998), Lehner and Jacobson (1997) and Nozero, Whitton and Heaton (1998) are more typical, giving equal emphasis to most features of this model.

Evaluation of Web/HTML library learning materials

If interactive features are prominent here, the interest in learning outcome evaluation is less pronounced. Occasionally evaluation of learning outcomes becomes as prominent as in pre-Web case studies. Sabol (1998) expands earlier work (Orians and Sabol, 1999) into a separate paper on evaluation. This is not typical. Later studies also abandon evaluated comparisons of learning outcomes between traditional methods and courseware approaches. One purpose of such comparative evaluation is to convince a sceptical audience of the merits of learning technologies in library training, and its decline is regrettable.

Web/HTML library learning materials: learning styles and interface issues

Two other aspects of courseware implementation without significant treatment are the effective accommodation of differing learning styles and interface issues. Although adjusting teaching content to learning styles formed an important strand in the UK EDULIB project (1999), we found little emphasis on this approach in the literature (Wood, Ford and Miller, 1996).

To be usable, learning materials need to have a good interface, and they need to be found easily within a Web environment. Laverty (1997), describes the effective use of HTML tables as interfaces to individual sets of materials, while Fjällbrant, Boström and Ekman (1997) describe Pathfinders, a task-based interface. However, there appears to be no published work dealing with the integration of library learning materials into surrounding local Web pages.

Conclusions about Web/HTML case studies

The wider adoption of courseware approaches to library skills teaching in the US is an encouraging trend, though wider adoption has been accompanied by less rigorous attention to pedagogic issues. This can cause problems. More recent library courseware projects have failed due to confusions in educational design untypical of earlier projects (Sonntag, 1999). However, lack of rigour in using pedagogic techniques such as evaluation in library teaching practice may be caused by lack of resources rather than a lack of awareness (Bober, Poulin and Vileno, 1995).

These later case studies also show that the true Web/HTML on-line library skills class resembles earlier case studies. Information skills are taught by simple but effective interactive exercise-and-feedback models, but generally at undergraduate level. Using a generic package for research students can be problematic (Creanor *et al.*, 1996).

Thus, despite successes with simpler skills training for undergraduate populations, the use of Web/HTML technologies in libraries has not yet demonstrated simple, resource-friendly ways of creating more ambitious learning outcomes.

(3) Non-case study literature and analyses of library courseware collaboration

Expert reviews and practitioner advice literature

There is a recent trend not to document library courseware implementations, presumably because there is little incentive to report what appears increasingly to be accepted practice. Expert reviews of courseware, which look at packages themselves rather than at literature about them, thus have a role in creating an overview of otherwise undocumented activity (Cox, 1997). Dewald (1999a and 1999b) provides a combination of expert review, pedagogical theory and advice on how to create good courseware.

Dewald's papers show that, when a new technology comes into professional practice, there is a role, not just for expert review, but also for 'how-to-do-it' literature. Certain early case studies are sometimes used as general exemplars (Pask, 1988; Kaplowitz and Contini, 1998), while others (Burke, 1996; Jensen and Sih, 1995) are used as exemplars for CMC-based approaches. Practitioner librarians also look to the intelligent magazine-style advice article (Ardis, 1998; Bell, 1998), or a synthesis of expert review and theory (Nipp, 1998).

Practitioner librarians may sometimes refer to non-library material, ranging from the introductory (Mazoue, 1999; Driscoll, 1998) to the more theoretical (Benyon and Woodruffe, 1997; Laurillard, 1993). It is striking however, that much of the best general writing on courseware development and instructional research is not cited by most case studies. Thus, the work of influential organizations such as the CTI Centre for Library and Information Studies (*CTILIS*, 2000; Hopkins, 1996; Hopkins, 1999), and projects such as *NetLinkS* (1998) at the University of Sheffield (Levy, Bowskill and Worsfold, 1998) have yet to be fully exploited by the information practitioner. It is likely that the quality of current information skills courseware is compromised by failure to exploit such educational research.

Studies of collaboration in library courseware development

There is little discussion in the literature of collaboration between different institutions in producing library courseware. While collaboration between dispersed campuses of a single institution is common (Pival and Tunon, 1998, and Vishwanatham *et al.*, 1997), there is little cross-institutional collaboration reported. As noted above, the establishment of a sense of ownership of a package limits most courseware implementations to single institutions.

Early optimistic reports of collaborative economies of scale in creating library learning materials (Clark, 1981) should be viewed cautiously. Wood and Agogino (1996) have described cross-institutional engineering courseware but Faulhaber (1996) notes that, although networking learning materials creates economies of scale in multi-site language teaching, it does not do so in its library aspects.

Statements that libraries can import generic packages without alteration are problematic (Legge and Reid, 1998). US practice shows how packages tend to be local, not bought in. Higher education information environments are often highly individualized, generating site-specific information skills syllabuses. This is not the case with courseware for many mainstream academic subjects, where the undergraduate science and engineering syllabus is broadly similar between institutions. Legge and Reid may be assuming similarities between library skills and mainstream subjects that do not exist. Moreover, barriers to library collaboration may also lie in the organizational context, as analysis of an Internet/library instruction course for the Utah Western Governors Virtual University has shown (Hansen and Lombardo, 1997).

Summary and conclusions

The American literature shows that library computer-aided learning packages have entered mainstream practice to a greater extent than in the United Kingdom, and that they have done so due to an emphasis on certain factors:

- the practitioner sense of ownership of the courseware medium and materials;
- sustainable resourcing in terms of skills levels to maximize maintainability;
- tailoring to a local information environment rather than generic solutions;
- concentrating on simple skills training for large bodies of undergraduates.

Recommendations for library user education (in practice)

- US library courseware projects can afford to create learning packages purely for local use. Because British projects need to spread costs over many sites, we recommend creating institutional courseware packages that can then be reduced to generic Web/HTML templates. Such templates can be shared with other UK sites who, in turn, tailor them to local requirements. This combines the economies of scale of generic multi-site courseware with the need for local institutional identity.
- Early library courseware implementations combined a thoughtful approach based on wide background reading with a strong emphasis on evaluation of learning outcomes. Courseware development today would benefit from adopting similar approaches, drawing on equivalent contemporary research (*CTILIS*, 2000; *NetLinkS*, 1998).

Implications for the GAELS Project

Our response in the GAELS project has been to make evaluation a central part of the project and to follow the template idea through, obtaining a solution that can be copied and transferred between institutions. Although such template-based approaches have found little favour in non-library applications, librarian practitioners at Glasgow and Strathclyde have independently authored a biomedical courseware information skills package (GAELS Biomedical, 2000) using templates generated from the original engineering package created by a specialist courseware designer. This package has been successful in evaluated workshops with life scientists. Because there is little evidence that drill-based interactive packages are suitable for research-level information skills students, we have adopted a hypertextual approach to interactive learning (Hutchings, Hall and Briggs, 1992; McKendree, Reader and Hammond, 1995).

This hypertextual approach has a number of benefits:

- Templates derived from hypertextual resources are open, flexible and easily reconfigured, avoiding the inhibiting constraints of other template-based approaches. This approach avoids the technical complications of heavily scripted routines, thus facilitating practitioner authoring of courseware.
- Practitioners feel that they have ownership of the courseware-authoring medium and can make their packages institution-specific.
- The need for expensive technical support is also dispensed with, thus avoiding the resourcing problems of otherwise successful library courseware implementations which ultimately prevent the packages being widely adopted once project funding is withdrawn.
- A rich hypertextual learning environment is suitable for engaging the learner in the higher-level information usage issues that underpin researchers' information-gathering practice. The mechanistic scripted routines pervading most information skills courseware are not suited to this, and if adopted by us, would not offer an effective means for modifying researchers' dependence on browsing local hard copy research collections.

We believe that at the time of writing this is the first example in the UK of librarian practitioners with no previous background in courseware design successfully authoring

their own information skills courseware packages along the lines of US case studies. We thus believe that GAELS offers a good model of courseware implementation for other UK libraries to emulate, and suggest that our strategies for involving practitioners directly in the process of courseware development may be useful in other non-library subjects where practitioner involvement is required.

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