DOCUMENT RESUME

ED 427 672 IR 019 191

AUTHOR Price, Sarah; McAndrew, Patrick; Rist, Roger; Mayes, Terry; Bonharme, Eric; Land, Ray; Cuttle, Mary; Haywood, Jeff; MacLeod, Hamish

TITLE The MARBLE Project: A Collaborative Framework for Educational Courseware Design.

PUB DATE 1996-10-00

NOTE 8p.; In: WebNet 96 Conference Proceedings (San Francisco, CA, October 15-19, 1996); see IR 019 168.

AVAILABLE FROM Web site: http://aace.virginia.edu/aace/conf/webnet/html/144.htm

PUB TYPE Reports - Descriptive (141) -- Reports - Evaluative (142) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS Computer Mediated Communication; Consortia; Cooperative Programs; *Courseware; Distance Education; Educational Technology; Financial Support; Foreign Countries; Higher Education; Hypermedia; Information Technology; *Instructional Design; *Intercollegiate Cooperation; *Material Development; Online Systems; *World Wide Web

IDENTIFIERS Resource Based Learning; Scotland

ABSTRACT

The MARBLE Project is a collaborative venture that provides on-line resource-based learning materials to students at three higher education institutions in Scotland. As per capita funding from central government decreases without a decline in graduate quality, new methods are sought in universities to cope with this challenge. This paper discusses the collaborative beginnings and implementation of MARBLE and then focuses on one of the 10 components of the range of on-line courseware, the Computers in Teaching and Learning subproject. The extent to which MARBLE's collaborative nature causes efficiency gains while enabling the student to advance in the learning process is assessed. Topics covered include: background, including the use of the Metropolitan Area Networks (MANs) in Scotland for effective courseware design and dissemination across the World Wide Web; the collaborative framework; convincing the teachers; the core problems associated with effective distributed courseware design; maintaining standards on a decreased budget; innovative use of resources; and feedback and analysis, including results of a questionnaire aimed at student and tutor participants. An extract from a HyperNews session is included. (Author/DLS)

The MARBLE Project: A Collaborative Framework for Educational Courseware Design

Sarah Price (sprice@icbl.hw.ac.uk), Heriot Watt University

Patrick McAndrew (patrick@icbl.hw.ac.uk), Heriot Watt University

Roger Rist (roger@icbl.hw.ac.uk), Heriot Watt University

Terry Mayes (jtma@glasgow-caledonian.ac.uk), Glasgow Caledonian University

Eric Bonharme (e.bonharme@dcs.napier.ac.uk), Napier University

Ray Land (r.land@central.napier.ac.uk), Napier University

Mary Cuttle (mcuttle@ed.ac.uk), University of Edinburgh

Jeff Haywood (J.Haywood@ed.ac.uk), University of Edinburgh

Hamish MacLeod (Hamish.Macleod@ed.ac.uk), University of Edinburgh

Abstract: The MARBLE Project is a collaborative venture which provides on-line resource-based learning materials to students at three Higher Education Institutions in Scotland. As *per capita* funding from central government decreases without a decline in graduate quality, new methods are sought in Universities to cope with this challenge. This paper discusses the collaborative beginnings and implementation of MARBLE, and then focuses specifically on one of the ten components of the range of on-line courseware. Since one influential report into Higher Education in the early 90s claimed that "Duplication of effort is wasted effort", we assess to what extent MARBLE's collaborative nature causes efficiency gains and yet, crucially, still enables the student to advance in the learning process.

This paper describes the MARBLE Project, which is an innovative, collaborative attempt to use the power of the Metropolitan Area Networks (MANs) in Scotland for effective courseware design and dissemination across the World Wide Web. The MANs have provided the technical motivation for MARBLE: each offers FDDI at 100 megabits per second and ATM at 155 megabits per second. The four MANs are currently linked via the high speed SuperJANET academic network, which provides internet links, and will shortly be fully interconnected.

The background for the creation of MARBLE is the changing pattern of Higher Education in the UK during the last decade. In brief, the major influences for change are increases in student numbers without *per capita* increases in funding, along with a greater external scrutiny of the quality of teaching and learning with the expectation that graduate quality will be maintained or even improved.

In an attempt to evaluate these changes and steer a way forward through this challenging situation in Higher Education, an influential report written by a committee of Scottish University Principals in 1992, concluded that:

"Computer Based Learning may not offer just another approach to learning, but may, in fact, be crucial to education's ability to meet the needs of the next few years"

[MacFarlane, 1992, p85]

Strategies were proposed and implemented shortly thereafter which led to the creation of the MANs and to a vision of the distribution of computer-based learning materials becoming reality. MARBLE is one project which contributes to this process.

The collaborative nature of the Project is also commensurate with the changed climate. Creating effective multimedia or hypertext courseware can be costly in terms of time and money; it is also extremely easy to do it badly. The notion of individual lecturers preparing their own educational software for their own immediate teaching needs has become increasingly viewed as less than ideal, given the necessity of constraining costs and avoiding duplication of effort wherever possible. MacFarlane foresaw that an "unprecedented degree of collaboration and sharing between different institutions" was required, and noted that "Duplication of effort is wasted effort" [MacFarlane, 1992, p33]. Diana Laurillard suggested further in 1993 that the problem could be addressed by producing educational software by consortia:

"Because of the importance of collaboration for greater efficiency of production of materials, and the greater likelihood of widespread dissemination of them, any central funds made available for development of these materials should be given only to collaborative consortia"

[Laurillard 1993, p230]

The Funding Councils in the UK have moved some way towards adopting such a model, such that the current Teaching and Learning Technology Programme (TLTP) required that all bids for funds to produce coursework software involved at least three institutions as members of a consortium.

The infrastructure for widespread dissemination of web-based courseware is firmly in place in Scotland (the high capacity MANs) and the time is right for such a collaborative venture (the technology-friendly direction taken at the highest level in response to the demands made of Higher Education). With these two essential building blocks in place, the MARBLE Project proposed a matching of suitable academic subject areas with identified university departments who were willing to tread new ground and incorporate some of the most innovative web-based capabilities into their curricula.

A Collaborative Framework

An essential feature of the MARBLE framework is that it is the collaborative product of three universities, and bridges subprojects in several cognate subject areas. A Project Officer is employed at each university to provide the technical and organisational input; a Project Management team of six consists of permanent staff from the three sites; and seconded academics from the university consortium provide the direction for the subprojects, plus the core academic knowledge upon which the system depends.

The 10 subprojects contained within MARBLE cross a range of subject areas. As even the most impressive new technology will not address the problems of the late 90s teaching environment unless the teaching staff are won over by it, MARBLE has attempted to "seed" the use of the MAN for resource-based learning across the following subjects:

Biological Sciences Databases

The Built Environment

Computing in Teaching and Learning

Geotechnical Engineering

Interactive Vision

Introductory Statistics Teaching in Psychology

Library Information Retrieval

Mathematical Assessment

Molecular Sequence Databases

The WWW for Computing Courses

Thus, many academic staff will find resource-based learning materials in fields not too distant from their own, which they can clone and adapt to their own teaching with minimum effort.

Convincing the Teachers

Most of those involved in the process of designing educational software are aware of the potential for distrust, or, at best, unease, on the part of some course tutors towards such work. One of the most effective ways to allay these fears and reiterate that computers can be viewed as a tool to reduce workloads and improve quality is to involve them with the technology and show that it can be beneficial. The MARBLE Project has attempted to demonstrate the new technology to the very people who must be won over by it if the changing ratios in Higher Education are to be coped with effectively. The use of the fastest multimedia communication techniques available, as described above, helps expand the skills of several staff in the universities, and to explore for themselves the potential and usefulness of these techniques in their everyday work.

The Core Problems

The core problems associated with effective distributed courseware design can be subdivided into three essential strands. One strand represents the problem of designing material that is both conceptually demanding enough to be useful in H.E, and yet general enough to allow specific tailoring by tutors to suit individual curricula, levels of student knowledge and methods of delivery. Another strand is concerned with achieving effective collaboration over a distance between disparate institutions and departments with no particular collaborative history. The third strand is concerned with how to make material provided on the Web more than merely expository, or more than a straightforward translation of material from a paper environment to html. In other words, the solution to the problem posed by the third strand requires one to use techniques of course design which engender and facilitate deep learning.

Insights on the first strand of achieving a flexible courseware framework have been provided by the INTERACT Project, a collaborative venture between Heriot Watt and Strathclyde Universities, Scotland, and the University of Cambridge, England, which sought to create a simulation environment in an engineering context. The key re-usability of resources concept was ably demonstrated ably through the generative nature of their *Interact Simulation Environment* which used the same generic simulation in a range of four different educational contexts, by different tutors and with students of different levels of ability. (See References: INTERACT)

MARBLE has approached the need to secure effective collaboration - the second of the three core problems - by employing the most powerful electronic communication tools at our disposal, facilitated by the ample capabilities of the Metropolitan Area Network. We are currently experimenting with such facilities as desk-top video conferencing and HyperNews, a dynamic messaging program that runs within any web browser. The MARBLE Project breaks new ground further in this regard as not just one academic area is broached by the collaborative team, but ten.

Maintaining standards on a decreased budget

The third problem identified in the list of three core problems above, concerns how to build into one's courseware the attribute of enabling students to achieve deep learning. This problem is actively confronted by the MARBLE subproject entitled Computers in Teaching and Learning. We shall focus on this sub-project in greater detail to assess how some of the objectives above have been realised.

Computers in Teaching and Learning (CTL) is a component of an MSc course (Human Computer Interaction) which makes full use of the World Wide Web as a learning resource and encompasses much more than just making lecture notes available on the Web (though notes with suitable hypertext links are indeed there). A Document Type Definition (DTD) specifies an SGML (Standard Generalized Markup Language), which recognises the different components of the course: tasks, articles, bibliographies, on-line exam questions, etc. This means that web materials can be created with the emphasis on content, rather than style, the latter being guaranteed always to be consistent and syntactically correct. It is an especially effective way to achieve clear hierarchical organisation of a large web site, but most importantly the output can be directed in more than one way, thus ensuring that resources are reusable and flexible. The same marked-up material can generate HTML for viewing on the Web, and it can also translate the source material into *Latex* and then on to paper-based materials, if required. The implementation of this MARBLE component has implications for the re-usability of resources issue. It would be possible to empty out the CTL specific contents from the shell structure and to refill it with material from other academic disciplines which could benefit from being presented in a similarly structured way, e.g., Politics, History, Sociology.

The syllabus is task-based and the tasks are clearly explained to students at an appropriate URL, along with the dates upon which the completed assignments are expected to be electronically delivered. This is an appropriate structure in that most educational psychologists would agree that an approach based simply on delivering content - without a framework of tasks in which knowledge is *constructed* as well as passively received - stands a high chance of failing.

Innovative Use of Resources

The shift to mass higher education has meant that valuable, meaningful dialogue between tutor and student has necessarily become a less frequent occurrence, and yet, as Laurillard points out, dialogue remains at the heart of the educational experience, [Laurillard, 1993]. Formerly, the student would be exposed to new concepts in an expository way through lectures or books, and after a reasonable (and possibly unprofitable) time, struggling with the new information, would have the opportunity of engaging in mutual questioning and reflection with a tutor sensitive to the context. With the assignment of relevant tasks to consolidate the material, and the correction of misleading perceptions by the tutor, eventually full understanding would dawn.

One way in which the CTL course breaks new ground is through the resources available to the students in executing these tasks, and specifically in how the computer enables them to achieve the essential dialogue and reflection which current thinking suggests facilitates learning at a deep level. Dialogue can take place in CTL in the time-honoured way with the tutor, with the computer (see below) or in a way which is gaining more and more interest as an effective teaching method: through peer tutoring. As one of the course tutors states:

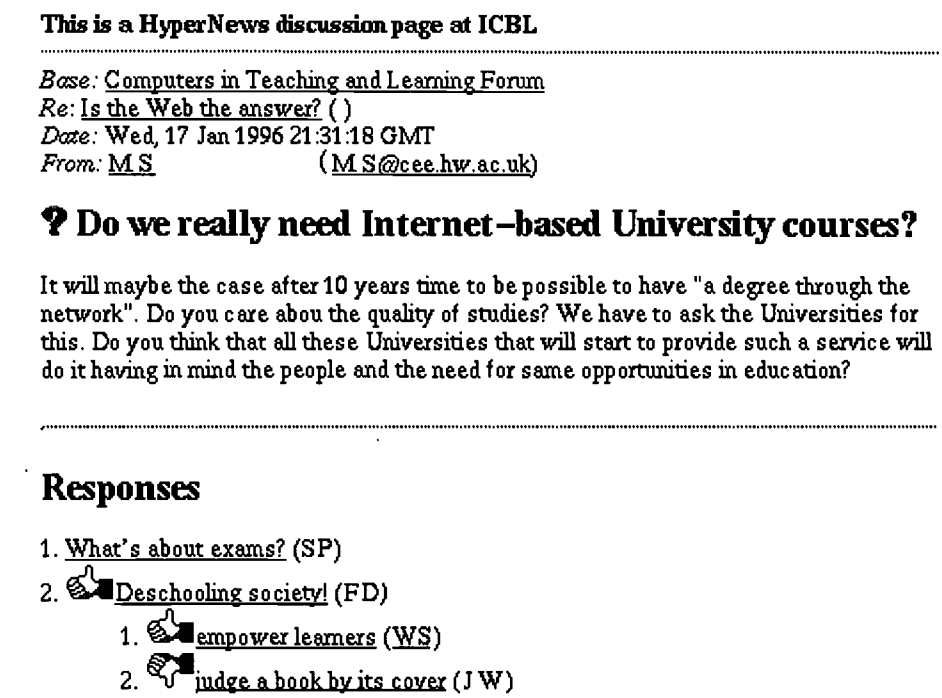
"Learning is often most effective where there is explicit peer tutoring; there is good evidence in favour of co-operative learning from studies comparing teacher-versus-peer mediated instruction. Some of the research has found that one to one peer tutoring is even more effective than supplementary instruction by a teacher in a small group setting. Not surprisingly, studies have also shown peer-tutoring to be highly cost-effective."

[Fowler et al, 1996]

The assigned tasks, mentioned above, are specially designed to encourage relevant group interaction. The means of achieving dialogue with peers can be through HyperNews, Global Chat, or through a system devised at ICBL to allow students to publicly annotate information disseminated as part of the course, as if they had a paper copy of the information and were leaving comments in the margins for others to see. Though electronic mail is also available, the value of the many-to-many group dialogue is that it is a forum for helpful discussion between persons having the same sort of learning experiences, facing potentially the same sorts of problems in comprehension. Peer tutoring is particularly helpful in broadening and deepening the learning experience.

Fig 2 shows an extract from a HyperNews session which runs through Netscape. It resembles a normal bulletin-board type News forum, but operates for class members only. Each assigned task may spark off several threads of related discussion within the group. Most of the input to the forum is initiated by the students themselves, but the occasional thread is authored by one of the course tutors who monitor the discussion in the event that expert help is needed to resolve a problem or simply to offer an alternative explanation. All group discussion which takes place as part of the course is captured for use by future students, or for propagation in the Answer Garden (see below) or for tutors as essential feedback on how course elements are received and understood.

Experiments have also been carried out on this component of the MARBLE Project on putting the *Answer Web* tool in the hands of the learners themselves. The concept of the *Answer Web* grew out of the Answer Garden, an idea first developed by Ackerman and Malone [Ackerman & Malone, 1990] and allows the development of databases of frequently asked questions (FAQs) that grow "organically" as new questions and answers arise. (The extension of the *Answer Garden* into a web-based tool for the INTERACT Project - the *Answer Web* - is discussed in [Smeaton & Neilson, 1995])



This is a HyperNews discussion page at ICBL

Base: Computers in Teaching and Learning Forum
Re: Is the Web the answer? ( )
Date: Wed, 17 Jan 1996 21:31:18 GMT
From: M S (M S@cee.hw.ac.uk)

? Do we really need Internet-based University courses?

It will maybe the case after 10 years time to be possible to have "a degree through the network". Do you care abou the quality of studies? We have to ask the Universities for this. Do you think that all these Universities that will start to provide such a service will do it having in mind the people and the need for same opportunities in education?

Responses

1. What's about exams? (SP)
2. Deschooling society! (FD)
    1. empower learners (WS)
    2. judge a book by its cover (J W)

| **Respond** | **Delete** | **Copy** | **Notify** | **Membership** |

Fig 2: Extract from a HyperNews session

Feedback and Analysis

The Computers in Teaching and Learning component of MARBLE has experimented with some of the most innovative web technologies in pursuit of its educational aims. It has been crucial therefore to evaluate the effectiveness or otherwise of these methods in order that any necessary refinements can be identified to the course and that conclusions may be drawn relevant to the future of distributed computer-based learning. To this end, a detailed questionnaire was aimed at both student and tutor participants. The response rate for each category was almost 60 percent.

We had two means of assessing the popularity of HyperNews, the web-based many-to-many discussion forum: one was by the students' responses to the questionnaire, the other was by the access data collected by our server. All students kept in touch with HyperNews at least once a week, with most accessing it two or three times a week. Whether HyperNews was a good example of a peer tutoring tool is a more

interesting question, however, and more difficult to assess. The students collective response was that they learned a great deal from HyperNews, though they were unable to be too specific about what it was exactly that they learned. Sixty percent of the student responses said that the HyperNews dialogue did help them learn in a general sense by giving them background that was not available through the coursenotes. It certainly demonstrated to them what their peers were doing and thinking and provided powerful motivation for them to take a more active part in the course. Some typical responses:

"Other people were thinking and it prompted me to think more about the stuff. I was more involved in the course because of the discussion."

"Probably did [help] generally, but not in specific answers for passing the exam. Made me think and focused my ideas."

Evidently, the underlying stated aim for HyperNews was that it stimulated dialogue between peers on issues that arose throughout the course. In response to this stated aim, the general feeling expressed by the students was that while HyperNews may not have directly supported the goals of the course, it did create a sort of learning community which provided motivation and possibilities for reflection.

The Answer Web, as described above, was another experimental feature of the CTL on-line course. Not enough students were aware of the distinction between the "ephemeral" nature of the discussions on HyperNews and the more "permanent" nature of the issues raised on the Answer Web, which functioned more as a tailor-made and infinitely expandable FAQ database. The feedback we received both from students and staff indicated that the Web was not quite ready for full-scale propagation: it needed to be "seeded" with more information and the students needed more help in understanding how to use this feature. One problem which arose, and to which we have no ready answer, concerns the comment of one staff member that he simply did not have enough time to respond adequately to questions directed to him through the Answer Web. Clearly, there is more labour involved in stocking and tending the Web in its early days and a more mature set-up should eventually reap benefits in a reduced workload eventually. We feel the Answer Web has exhibited interesting potential and the feature will be revised, re-stocked, and well-publicised to students participating in subsequent course sessions.

Conclusion

The MARBLE Project as a whole has managed in a very short time (7 months) to deliver on all of its 10 subprojects. Many innovative web-based elements have been built into each subproject. It is difficult to itemise succinctly those elements which have worked most successfully due to the disparate nature of the subject areas and techniques involved. However, useful conclusions may be drawn from the methods implemented for the CTL course, considered in some detail above. Here the emphasis for effective courseware distribution and design has been with a task-based, communication-led approach, rather than with content. The Web, through the mechanisms described above, is ideal for many-to-many dialogue between students and/or tutors; it creates a virtual forum which facilitates learning, discussion and reflection; it provides motivation and facilitates a fresh way of looking at things. It enables the presentation of an interactive task-based course structure which encourages students to think deeply about what it is that they know, and how to articulate it. The course structure is a reusable electronic architecture that can be adapted and utilised in a wide range of academic areas. If presented on the Web, the course *content*, on the other hand, is perceived by students to be in a less desirable form than on sheaves of paper. (This conclusion is not necessarily valid, however, for all the MARBLE subprojects. The *Geotechnical Engineering* subproject, for example, has successfully published material with a highly complex and graphical content; this material has found an effective medium in the Web where students may learn easily and interactively from the on-line maps and images.)

Rapid but effective solutions need to be found to the pressures which threaten Higher Education to bursting point with vastly increased student numbers and an expectation that graduate quality will be maintained. MARBLE is an experiment in addressing the three strands of effective educational courseware design: that resources should be reusable, that effort should be collaborative, and that teaching should be effective - and fun.

References

[Ackerman & Malone, 1990] M.S. Ackerman and T.W. Malone (1990). Answer Garden: a Tool for Growing Organizational Memory. Proceedings of the Conference on Office Information Systems '90. ACM Press.

[Duneen, 1996] Finbar Duneen (1996). Summary of students' responses to the role of network tools in the Computers in Teaching and Learning course", MSc Project Paper, Heriot Watt University

[Fowler et al, 1996] C.Fowler, J.T.Mayes, and B.Bowles (1996). Education for Changing Times. British Telecommunications Engineering, vol 15, part I, 1996, pp32-37.

[Laurillard, 1993] Diana Laurillard (1993). Rethinking University Teaching. Routledge

[MacFarlane, 1992] The Working Party of the Committee of Scottish University Principals (1992). Teaching and Learning in an Expanding Higher Education System. Polton House Press.

[Smeaton & Neilson, 1995] Calum Smeaton and Irene Neilson (1995). The Answer Web. Poster presented to the Fourth International Conference of the WWW, Boston. Available from http://www.orbital.co.uk/orbital/www5.html

Information on the conferencing system *HyperNews* is available at:http://union.ncsa.uiuc.edu:80/HyperNews/get/hypernews.html

The INTERACT Project is at http://www.icbl.hw.ac.uk/projects/INTERACT.html

MARBLE is at http://www.marble.ac.uk/marble/

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

NOTICE

REPRODUCTION BASIS

[X] This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

[ ] This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").