
Editorial

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Biographical notes: Patrick McAndrew is a Senior Lecturer in the Institute of Educational Technology at The Open University where he teaches and researches in the use of technology in support of learning. His work examines ways to design for active engagement by learners working together. This has involved studies in task-based approaches to learning and their representation as learning designs within knowledge sharing environments. In 2001, he co-founded the UserLab research team, which works along with the CALRG to undertake projects in e-learning.

Ann Jones is a Senior Lecturer in the Institute of Educational Technology and is a founder member of the CALRG – having been its Director and Deputy Director at various times. Currently, she is Director of the group and she teaches on the Institute's Masters in Research Methods for Educational Technology Programme. Her research interests include affective and social factors in the use of information technologies for both adults and children and the use of mobile technologies for learning and she also has a long-standing interest in evaluating information and communication technologies in education.

1 Introduction: 25 years of CALRG

This special issue is associated with the 25th anniversary of the Open University (OU) Computers and Learning Research Group (CALRG), which was formed in 1979. In those days, the OU had a number of courses that used computers to support learning through Computer Assisted Learning Tutorials and simulations, computer-marked assessment (sent in the post!), and residential schools. The CALRG aimed to provide a forum for all those who shared an interest in the use of computers to support teaching and learning. At the time, the university employed a considerable number of programmers who developed software for OU courses and the CALRG brought together academics (including regional staff with responsibility for tutors) from a number of disciplines, as well as software developers. Activities in the group included an annual conference, seminars and supporting research students. CALRG has always been interdisciplinary and the original 'core' group included psychologists, educational technologists, computer scientists, educationalists, scientists and mathematicians.

One early group project focused on evaluating the software that was developed for the OU's courses, especially in the Science faculty, and this led to long standing work and interest in evaluating technologies for learning – which is represented in the paper by Scanlon, Tosunoglu, Issroff and Lewin. Researchers involved in these evaluation activities drew on their work to provide advice and guidelines for courses wishing to use computers; but feeding the group's work into university policy came later. For example, between 1989 and 1992, researchers in the Institute of Educational technology carried out in-depth evaluation of courses in the university's new home computing policy, which required students on certain courses to have access to home computers. This series of evaluations investigated student and tutor access, support and teaching and included members of the CALRG. The work fed into university policy and was published by Jones et al. (1993).

Other key areas of research in the early years included learning programming languages, representations and Intelligent Tutoring Systems. Much of the group's early work was represented in another book: *The Computer Revolution in Education: New Technologies for Distance Teaching*, published in 1987 (Jones et al., 1987) and the book's contents clearly reflect the work and concerns of the group at that time. The book is divided into five parts: programming environments, delivery systems, interactive video, student modelling and evaluating applications. A few of these chapters are concerned with the educational uses of technology prevalent at the time – such as interactive video. (Today's equivalent concerns are echoed in the papers in this issue on digital libraries and learning objects for example). There was also an emphasis on building innovative interactive environments for OU student use – and researching their use. Thus, the book includes chapters on a programming environment for elementary Artificial Intelligence (AI) programming for cognitive psychology students, the CYCLOPS system which allowed students to use a device much like an overhead projector for tele-conferencing via their terminals and early systems which included communicative facilities for students using CAL. Student modelling was another area and included production rule models of students learning mathematics and physics. As we stated earlier, the research represented in the final part of the book – evaluating applications – is still a major area of research today. The book's introductory chapter concludes that the book has two main themes; one of which is still reflected in the group's work today and that is: "a commitment to the careful and detailed study of real students in real settings". The second theme, which considered AI as a key area from which to draw approaches for implementing computer models, has little currency these days. Nevertheless, this early focus has also influenced the group's work, as modelling with a view for developing an account that can be programmed also requires a commitment to detail and precision.

In the past 25 years, the group has provided continuity across many changes in the university and now has a new research base in the recently established Centre for Research in Education and Educational Technology (CREET). The CALRG is still an inter-faculty research group characterised by its diversity and by interdisciplinary research. It aims to maintain inter-faculty links and also has members who are based in Learning and Teaching Solutions (LTS) and who are directly involved in the development of innovative applications of learning technologies at The Open University.

The primary aim of the CALRG remains that of investigating ways in which computers can be used to improve the quality of education. This objective has been interpreted broadly, giving the Group a wide range of research areas, which currently

include: computer-supported collaborative learning, evaluation, mobile computing, social processes of learning with computers and web-based learning.

For this special issue a call was issued alongside the announcement of the 25th anniversary conference. The aim was not to represent the content of the conference but to allow some of those associated with the history of CALRG to provide detailed papers representing their current working and some of the background they bring from a common root in CALRG. Many members of the CALRG have teamed up with colleagues elsewhere in writing these papers to reflect different perspectives on their research. As part of its 25th anniversary the CALRG incorporated an anniversary day into its annual conference and invited past members to give talks about their current work: these included Professors Sharples and O'Malley (mobile learning), Professor Preece (online communities) and Dr. Blandford (digital libraries). They have also contributed to this issue, either as single author or as co-authors with members of the CALRG.

Another special issue is also associated with the CALRG's 2004 conference. Members of the CALRG who gave presentations at the conference were invited to submit papers based on their presentations to a special issue of *Learning Media and Technology* (Scanlon and Jones, 2005).

2 The special issue

2.1 Interactions

The interactions theme in this special issue is represented by four papers: Aczel's paper on interacting with software; Taylor, Sharples, O'Malley, Vavoula and Waycott's paper on interactions between learners, and between learners and technology in a 'mobile learning' context; Jones and Preece's paper on interactions between communities of learners; and, Blandford's paper on interacting with digital libraries. The first two of these papers have a theoretical essence: Aczel takes a theoretical approach to evaluating software based on Popperian analysis and Taylor et al's paper presenting a task model for mobile learning that draws both on Activity and Conversation Theory; whereas Jones and Preece describe a principled framework to inform the analysis and development of blended online communities and Blandford considers what roles digital libraries may play in supporting learning.

In all four papers the learner occupies a major role. In Aczel's paper, no assumptions are made in general about whether the learner is working alone with the software or with one or more other learners in a collaborative situation, although some of the examples he uses to illustrate his proposed analysis, such as simulations of negotiations, involve learners working together. However, the following three papers have a particular focus on the learner in a social context. Taylor and colleagues and Jones and Preece's papers reflect the current emphasis in education on supporting the learner, in collaboration with peers and teachers, in lifelong learning – which may take place both inside and outside educational institutions. Blandford's paper of course by its nature is concerned with learners in different contexts.

The socio-cognitive design method is described by Taylor and colleagues as a

“coherent approach to describing and analysing the complex interactions between people and computer-based technology, so as to form the design of socio-technical systems (technology in its social and organisational context).”

The aim of the Preece framework, described in the Jones and Preece paper is similar, but whereas the focus in Taylor's paper is on how learners use and can be supported to use technologies as they move between different locations; the focus in Jones and Preece's paper is on the interactions between communities of learners and technologies when the learners are operating as an online or a blended community. Both papers consider informal learning that occurs outside educational institutions and that is personally initiated – on supporting learners' lifelong learning. Also, both embody the principle that communication (between learners; between learners and technologies and increasingly between technologies or devices) and collaboration are central to effective learning in whatever context it occurs.

Aczel's paper introduces a method of analysing learning situations with educational software. In the case studies that he uses, the learner is not mobile but using the software from a particular location, whether at home or in a school or in a university. He argues that his method of analysing learning situations can enable educationalists or learning technologists to devise and evaluate suggested enhancements for educational technologies. This method has Popper's problem solving schema at its core – and this approach to learning is analysed with reference to software that is used to teach students about the Galapagos islands. The method of analysing learning situations and learning technologies is then illustrated through a number of case studies of educational software – where their use has already been evaluated using other approaches. Aczel proposes evaluations can then be extended to give more consideration to (and provide more evidence about) the reasons that the software is effective or not in supporting students' learning.

Taylor, Sharples, O'Malley, Vavoulla and Waycott's paper introduces the socio-cognitive design method – and this in turn highlights the role of the task model in systems design. This model is informed by general requirements, theory and field studies and this paper describes the initial approach to gathering requirements which pointed to the need for a theoretical analysis of mobile learning. This subsequent analysis is informed by and also brings together theoretical approaches from socio-cultural and activity theory, viewing learning as conversation. This model can be viewed as an attempt to capture the complexity of existing practices:

“to provide a coherent account of how the activities are performed, the people involved, their contexts, the tools and technologies they employ, the structure of the tasks and an account of their cognitive processes, management of knowledge, and social interactions.”

This focus on practice is echoed by Blandford's concerns with how learners manage information in both physical and digital libraries. Taylor and colleagues explain how this model needs to focus on *interactions*: “to describe the interactions between the people and their tools and resources” and how it includes how people externalise and represent their work in diverse ways.

Jones and Preece are also concerned with lifelong learning: in this case learners who are members of a community. Their discussion of online and blended communities is set in the context of lifelong and informal learning and they present a framework that supports the development, analysis and maintenance of such communities which they apply to two very different case studies. The first case study is an informal community learning about knee-injuries and the second one is a professional community of teachers. The paper expands on Preece's sociability and usability framework focusing on these two

dimensions in analysing online communities. *Sociability* is concerned with community members' social interactions whereas *usability* is concerned with the features and functions that enable community members to interact successfully with the technology.

One view in *Blandford's* paper on digital libraries is that to understand the potential of new technologies it is important to understand existing established practices. So taking this approach, we need to understand how learners use conventional libraries and other information resources as well as how they use digital resources. Blandford discusses a number of studies that have investigated both information retrieval and broader information seeking tasks. Such studies suggest that physical libraries may support learners' activities in ways that digital libraries do not. Blandford's research revealed, for example, that learners use features in physical libraries to cue them in their information searches such as scanning the spines of texts where books are grouped by theme and also scanning within books. So, physical library users have a range of strategies for assessing the relevance of the documents they find, but there are no clear digital counterparts. Moreover, for an effective use of digital resources, learners require some skills in information searching and handling, yet the evidence suggests that compared with experts such as librarians, novices use limited, less effective strategies in searching for information. However, digital libraries also offer new possibilities; in particular collaboration and personalisation (although, as yet, the latter appears to have a low take-up).

2.2 Objects

Working with objects, in particular learning objects, forms the second theme for this special issue and is represented by two papers. Mason presents a holistic view of what might be classed as learning objects, while McAndrew et al. consider the developing ways in which an overall design can be represented as patterns, activities or structured learning designs. In each of these papers, an attempt is made to bypass problems of the definition of quite what is a 'learning object' to move on to how to find ways to work that are useful and sharable.

Mason has founded her paper on practical experience in building courses using a division into separate components that can usefully be called 'learning objects' as they allow separate development by different people within a small team and can be interchanged with other units. This interchange can occur when the course developers choose which objects to incorporate, but also it allows the learners to make their own choice about what they access and use in their learning. The paper demonstrates that seeking reuse can make sense in terms of the value to the learners as well as value to the developers and organisation. Its approach is to present a case where there is evidence of success and leave it for others to develop ways for implementing a similar system at scale. The paper does not address issues of trading, searching or metadata descriptions of learning objects. Such problems have been considered in other papers referenced by *Mason* but they are not relevant until there are practical solutions.

Therefore, *Mason* leads us to a view of the holistic learning object as producing a unit of learning that has many attributes of a traditional learning course in miniature. The holistic object gives the learner sufficient context, narrative and rationale to motivate the learner working with the object. This counters the objection to a learning object approach as dividing a course into disparate sections and so losing the direction given to learners that has proved so valuable in developing distance education courses. *Mason's* work

provides a demonstration of how to draw on broad experience of computers and learning and spot the way to make sense of new opportunities from the new technology. The evidence contained in this paper can only illustrate what works in a particular case, however, the broad arguments may lead to a believable case for a sound set of guidelines for holistic learning objects that are likely to be workable in practice: independent but prepared to refer to context, of a reasonable size (a single evening's activity), involving collaboration and sharing of results, within a supported environment, assessed and accumulated. This feels like the right sort of structure to be implemented and that feeling is backed up by evaluation evidence from the courses that have used the approach. This is not at large scale but is a contrast to many purely theoretical positions on the use of learning objects in offering real examples of success.

The paper by *McAndrew, Goodyear and Dalziel* draws together three aspects concerned with how objects can be used to help the learning process. These are patterns, activities and learning design. As with Mason's paper, an attempt is made to move beyond the definitions and details of working with electronic representations of learning objects to find ways to share approaches. The focus in this paper is less on the resources that are delivered to learners and more on the way that positive experiences can be captured as designs and ideas. The three approaches have different characteristics from the detailed descriptions suggested by learning design, through a more constructive process of working with activities to the deliberately open approach of patterns. Each of these has merits and the suggested way forward seeks to build on the best elements of each in suggesting a system with different levels of representation. However, the paper also does reveal a bias in suggesting that the patterns approach is valuable in challenging the teacher to understand a method before reuse – in other words, that making it too easy to pick up a previously prepared design and reuse could be the wrong approach.

2.3 Outcomes

The final theme for the issue is outcomes. This is represented by two papers, the first by Scanlon et al. reviews approaches to evaluation – how we can be sure that we achieve the outcomes that are intended when we use computers to assist learning? The second by Whitelock looks at ways to support assessment and how to apply analysis of students' answers, and the comments that tutors make on them, to help in improving the quality of feedback to learners.

The discussion of evaluation in *Scanlon, Tosunoglu, Issroff and Lewin* demonstrates the breadth of experience within the CALRG group by reporting on three separate case studies where learning technology has been implemented and then evaluated. The approaches taken for each of the case studies are related both to established frameworks and an emerging view of evaluation that draws on activity theory. The paper proves to be a very valuable demonstration of how to apply evaluation techniques together with an indication of ways to link evaluation with the theoretical framework that is given by activity theory. The conclusions from this paper show how to apply proven methods and show how the use of a broader theory can help to interpret the result of looking at particular aspects of technology in terms of the more complex interactions that form the overall learning experience. The paper does not give us an easy answer but provides in itself an illustration of the increased sophistication which is needed when analysing technology-based interventions. This paper shows the work of the CALRG group in first

looking at and documenting evaluation methods around 10 years ago and now applying and refining those methods in relation to modern theories of activity.

The final paper by *Whitelock* addresses computer-aided assessment. The paper gives an useful overview of some of the work in the area before moving on to some novel applications of the approach. The main implementations discussed in this paper are not around direct assessment of learners but rather how techniques of text analysis and established banks of work can be used to support the process by which students get feedback. The developing system outlined in this paper is a 'mentoring' tool to help markers understand and evaluate the way they have marked and commented text. This approach deals nicely with some of the ethical and practical issues of computer analysis of texts by keeping the human in the loop while offering new ways to understand their actions and relate them to the actions of others.

3 Conclusion

Developing a special issue that draws on an existing history has shown a rich interconnection between those who work in the area of learning technology. These connections are not always documented and we hope this particular sample of those connected through the Open University's Computers and Learning Research Group (OU's CALRG) has helped to address this. The process of building the collection of papers has been a thought provoking and valuable experience for us as editors. We would like to acknowledge the contribution of the many reviewers who have helped to shape the final papers. We would also like to thank the main editor of *IJLT*, Lorna Uden, for her initial suggestions for the special issue and thank her for allowing us the flexibility to progress to this final version.

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