

## **Guest Editorial: Aspects of courseware authoring**

*I.P.F. De Diana*

University of Twente, The Netherlands\*

In this Special Issue of the *Journal of Computer Assisted Learning*, attention is given to the new image of 'courseware'. A collection of contributions originating from the University of Twente discusses aspects of this changing image. Now what is changing? From the contributions some strong impressions can be derived. Courseware, the generic term used for educational software and related paper materials, is no longer to be seen as fixed, local, unifunctional and unimedial.

The evolution of courseware from being a unimedial product (say of an ASCII-based type) in the direction of becoming a multimedia product has, of course, been going on for some years already. Multimedia products, especially in the sphere of entertainment, combining popular music, video clips, and arcade type games, are fast becoming a large selling products. Boosting a market among young people, one can nevertheless ask if from an educational point of view, such CD-Rom, and CD-I based entertainment products contribute much to educational practice. But, of course, the technology can be used quite well for educational purposes, and there can be no doubt that it will be.

The form that multimedia products for education will take is not yet well established. Maybe the dominant metaphor will be 'explorable worlds' perhaps contained in 'virtual reality space', or the dominant metaphor maybe 'electronic books' coming in various forms such as 'moving picture books', 'electronic study books', 'talking books' and so on. A considerable number of publications indicate that the electronic book metaphor will become very powerful in the coming decades.

The technical format of such books has not yet been settled; some authors perceive a definite future for hypermedia structures whilst others opt for the database approach and its various lines of successors. The technical format, no doubt again, will be discussed further and may not ever be established in definitive form. This should not bother us too much as long as the 'courseware' products, that will be obtainable and carried by such formats, are of good educational value and thus effective for teaching and learning purposes.

At the moment, we are confronted with some other aspects of the 'new image' of courseware. It is no longer to be (only) a 'fixed' product, designed

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The Guest Editor is a member of the Faculty of Educational Science and Technology, University of Twente, P.O. Box 217, 7500 AE Enschede, Netherlands. E-mail: [diana@edte.utwente.nl](mailto:diana@edte.utwente.nl)

for a specific purpose and a given target audience. Rather, products should be 'adaptable', being of a more or less generic nature and adaptable to changing conditions of use and changing target audiences. Closely linked with the idea of adaptable products is the idea of 'portable' products, being products that can be easily modified for use in a different cultural context than the one for which the product has originally been developed. In line with the spirit of time, courseware products should be suitable for use in 'networked learning environments', preferably in cooperative learning approaches.

Preferably this 'soft and networked' type of product will have yet another characteristic: 'multifunctionality'. In our frame of discussion, multifunctional refers to the possibility that a courseware product can be used in different teaching modes, for example in tutoring, learner directed, and simulation oriented modes. Multifunctionality of courseware products is not a simple issue; most courseware products today are not of such a nature. But one might say the same for adaptability, portability, and 'multimediability'. So, in fact, we are challenged by the development of products that offer more 'soft' characteristics and yet are much 'harder' to create.

As an inroad to making the development of courseware less complex, authoring tools have been hailed for a long time, and they have probably contributed to the reduction of complexity and costs of development work.

Several authors expect that making information (such as design and development information) visually inspectable will strongly influence the complexity of design and development work. Visual tools and modes of programming could reduce cognitive complexity and thus make it more easy to develop 'hard' products. In fact, the visualization of information is a burning issue in programming, man-machine communication, and Graphical User Interfaces (GUIs) (see, for example, the Special Issue of the *Communications of the ACM* in April 1993).

This issue is taken up in *Lanzing and Stanchev's* paper. The authors discuss advantages and disadvantages of visualization for learning and education. Emphasis is given to visual aids for courseware engineering and visualization in authoring tools. They conclude that visualization of program structure and program elements can improve the efficiency of development work.

*Verhagen and Bestebreurtje's* contribution elucidates the concept and architecture of an instructional multimedia database. With a strong accent on optical information to be included in this database, and instructional multifunctionality as one of the main characteristics, they adhere to the database line of product structure formatting. Their database is to allow for various types of educational use, such as classroom presentations, individual or small group instruction and encyclopedic use. It is interesting to note that multifunctionality is clearly reflected in the architecture they propose.

*De Diana and White's* paper addresses some of the organisational issues involved when an educational institution considers the use of a networked infrastructure as its main carrier of educational information, and electronic books as syllabi. Such a combination of technical and organisational

infrastructure, combined with electronic, adaptable, and group-oriented learning products they have called a 'SuperInterface'.

*De Diana and van der Heiden* propose to make electronic (study) books adaptable in accordance with learning style. After discussing some aspects of learning style, they offer a small instrument for assessing it (to some degree) and thus to obtain practical options for information gathering for flexible purposes.

*Hoede* analyses possibilities for translating the textual information contained or containable in electronic (study) books into a knowledge representation formalism, called 'knowledge graphs'.

*Collis and De Diana's* paper attempts to relate the issue of portability of courseware, to networked learning environments, and to electronic books. They present an overview of factors contributing to the portability of educational software and learning resources. They indicate how portability issues weave into the networked use of courseware if one expands the scope of use of the network.

From different points of view, the contributors have discussed the new image of courseware. A point that has been left out of the discussion so far is whether all these characteristics of 'soft and networked' courseware are to appear together in courseware products; would that be desirable, useful, make sense? From our present point of view, we expect multimediality and multifunctionality to be linked together quite often. The same holds for adaptability and portability. Adaptable and multimedial or adaptable and multifunctional seem to be 'difficult' combinations, either from a commercial point of view (adaptable and multimedial) or from a practical point of view (adaptable and multifunctional). That we will see a considerable amount of courseware tuned for networked use and being of a multimedial nature should not come as a surprise. Neither will it be surprising to find networked products that show multifunctional use options. Multimedial development however is not always easy from a portability point of view; usually it will be strongly culturally coded, this stemming from economical and marketing considerations.

Such a line of reasoning seems to indicate that the desirable characteristics of the new image of courseware might split up in two clusters of not strongly related characteristics. On the one side we see multimedia, multifunction and networked products; on the other side we see adaptable and portable products. The interlinking of these clusters does not seem easy to achieve; even though we would probably rather see a single cluster of desirable characteristics. However, we have not enough empirical data today to decide whether we have to cope with one or two clusters of 'soft' characteristics for future 'hard' courseware development.

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