CERT: a Courseware Evaluation and Review Tool for accounting and business education

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Abstract

This paper describes CERT: a courseware evaluation and review tool which has been developed specifically for accounting and business education but which could be applicable to other disciplines. CERT is used to provide rigorous and comprehensive reviews of courseware and to aid lecturers in making decisions on the suitability of a particular package for their specific courses. CERT focuses in detail on many different aspects of the software, based on educational and instructional design theory and it is this attention to detail that distinguishes CERT from other checklists. CERT has yet to be tested in the selection of software for use on a particular course but it has been proved useful in producing thoughtful published reviews on courseware for accounting education.

Keywords: courseware, evaluation, review

Introduction

CERT was developed for two reasons: (i) there was a recognized need for a means of **evaluating** computer-based learning (CBL) materials for accounting and business education; (ii) existing **reviews** of accounting courseware varied considerably in depth and content and a need for some standardization, in terms of the features considered and reported upon, was recognized. CERT is an evaluation tool which will aid lecturers in judging the quality and suitability of courseware for use on a particular course. When course structure is under review and the introduction of courseware is being considered, lecturers need some means of judging the materials available. CERT provides guidance on this. CERT can also be used to assist in the development of comprehensive and critical evaluation reports for publication and distribution. The reviewer's attention is drawn to the detail of the courseware in a logical and structured manner and the paper-based tool then provides a framework for the review report. Comparative reports can be carried out on software covering the same topic. For clarity the user of CERT, who could be a reviewer or an evaluator, will simply be referred to in this paper as the evaluator.

The cost of developing courseware is high and can only be justified if it adds something to the learning experience which cannot be provided in a book or by other cheaper media. This may be graphical illustration of the consequence of changing variables, some visualization of a process or model, or the facility to test the learner's understanding and to provide feedback where necessary. One of the objectives of CERT is to assess how well these things are done within a package.

CERT takes the form of a checklist of attributes considered to be necessary in quality learning materials and addresses the **potential** of a software package to provide for effective learning. It does not attempt to address the effectiveness of the learning experience which depends on many factors such as the teacher's attitude and delivery, support materials, the

number of computers available and their location for example (Laurillard, 1994). Squires and McDougall (1996) make the distinction between predictive and interpretative evaluation. They describe predictive evaluation as the assessment of the quality and potential of a software application before it is used with students, whereas interpretative evaluation is concerned with assessing the observed use with students. CERT could be described as a predictive evaluation tool.

The structure and use of CERT

The content of CERT

This section focuses on the content of CERT, whether it is appropriate in breadth and depth, although subject-specific issues are not addressed. The learning fostered in the learner is important and CERT concentrates on the skills brought into play in interacting with the courseware and guides the evaluator to consider how learning is tested.

CERT addresses three main concerns: firstly, the background information available on the courseware, secondly, its potential educational suitability and effectiveness and finally the way in which it is designed and presented. Each of these concerns is subdivided into various aspects. The specific aspects addressed are:

(a) *Background information*

- objectives;
- target users;
- prerequisites.

(b) *Educational issues*

- content;
- learning framework;
- learner activities;
- feedback;
- achieved learning.

These design issues are categorized according to the specific issues they address. For example, do they serve to motivate the learner, to engage the attention, or are they concerned with the organization of the material within the package? These three categories are further broken down as follows:

(a) *Motivational issues*

- engaging the learner's interest;
- showing evidence of the user's progress;
- the ways in which the software responds to user input;
- autonomy, i.e. can the learner use the software without help.

These aspects affect the learner's motivation for continued use of the software. The students have to feel that they are progressing, and this can be communicated through encouraging responses to input, by assessing performance and perhaps suggesting further

activities. The learners should feel in control of the software and aware of what to do at each stage, or they will feel discouraged and may abandon the exercise altogether. Autonomy refers to the ease with which a computer novice can use the software without assistance.

(b) *Attention*

- the use of good screen layout;
- use of colour and highlights for emphasis;
- the amount of control the learner has over the software.

This section seeks to determine whether the student's attention is likely to be held and to what extent students will feel in control of the software and their learning.

(c) *Other*

- the structure of the material presented;
- the support materials;
- any facility for tutors to tailor the software or documentation to suit their needs or wishes;
- the adequacy of the documentation.

Using CERT as an evaluation or review tool

CERT consists of a set of questions covering each aspect identified above. Each question can be answered quickly with a 'yes' or 'no': yes being a positive response indicating a desirable characteristic and 'no' being a negative response and indicating the lack of a desirable characteristic. As there are many questions in CERT, it is important that it is easy to complete. A reviewer, as opposed to an evaluator, could be discouraged from using the tool if it is seen to be too lengthy.

The total number of positive and negative responses for each aspect is entered on the question sheet and the relative number of positive or negative responses used as a guide in the preparation of an evaluation report or descriptive review of the product. The scores for the different aspects should not be added together. The numbers simply provide a guide to the attributes of the product and do not have any quantitative significance. The evaluator must decide what the most important attributes are. It may be that an aspect has more 'yes' answers than 'no' answers but the negative responses may be of greater significance in the judgement of the evaluator, and this should be reflected in the descriptive review or evaluation report. Space is provided on the question sheet for the evaluator's own notes or comments. Table 1 shows a sample of the questions asked in CERT. A full copy can be obtained from the author upon request.

Evaluation for use on a specific course

Where CERT is to be used to evaluate a piece of courseware for use on a specific course, then the course designers will have their own criteria for the course and may wish to add specific questions to match these if they are not already covered by the questions in CERT. The list of aspects is not exhaustive but includes those most important to ensure a valuable learning experience. This was ensured by recourse to educational and instructional design theory during the development of the tool and is discussed below.

Implementation issues, such as the type of computer and memory requirements, are not addressed with CERT. While these are important considerations such information is easily

Table 1. Sample of the format of CERT[1]

Background	YES/NO
Are the objectives clearly set out at the beginning of the software?	
Are the objectives relevant to the course for which the learner is studying?	
Does the software check that the objectives have been achieved?	
Is information available on the target users?	
Are the prerequisites made clear?	
Are they tested at the start of the product?	
	Totals

Comments/notes:

Educational Issues	YES/NO
Content	
Is the content pitched at the learner's level?	
Does the content adequately cover the topic?	
Is the content dealt with in sufficient depth?	
Is the material well structured?	
Where a contextual setting is used, is this relevant to the topic?	
	Totals

[1]The format of this evaluation document is derived from 'MEDA: An Evaluation Tool for Training Software' Machell and Saunders (1991).

obtained from the developers or publishers.

Checklists for evaluation

As a means of assessing software, the value of check-lists has been questioned by McDougall and Squires (1995) though these have credibility in other areas. Horsfield (1995) advocates the use of a check-list for the selection of computerized auditing case studies. The problems identified by McDougall & Squires are: (i) It is difficult to indicate relative weighting for questions; (ii) Selection among packages of the same type emphasizes similarities rather than differences; (iii)The focus is on technical rather than educational issues; (iv) It is not possible to cope with the evaluation of innovative software; (v) It is impossible to allow for different teaching strategies; (vi) Off-computer generated uses are not considered; (vii) Evaluation in different subject areas requires different sets of selection criteria.

Weighting of check-list items need not be a problem. With CERT no scores are allocated and the evaluators are allowed to exercise their own judgement in deciding the importance of various aspects. The resulting subjectivity is acceptable and expected where the software is being evaluated for use on a specific course. Where the purpose of the evaluation is to produce a review report, the fact that the report is subjective does not invalidate it, but puts it on a par with any book review.

Item (ii) above is answered by the structured approach prompted by CERT and no problem has been found in evaluation packages of the same type. As is demonstrated by CERT, it is possible to address more than just the technical issues in a check-list: the user is guided to

consider the educational aspects of the courseware. CERT has been tested with innovative software for business education, the BITE/Pandora package, and was not found wanting. This package requires the learner to enter into a game scenario during which the content is arrived at as a result of interaction with the game. It was developed as part of the Teaching and Learning Technology Program (TLTP) funded by the UK Higher Education Funding bodies. While it is true that off-computer generated uses are not considered, some attention is drawn to possible variation in teaching strategies. CERT has been used effectively in different subject areas. An informal and unpublished review of marketing software was undertaken by the author for the Multimedia Marketing Consortium, another TLTP product, and no problems were found with the tool. This evaluation was used internally in the formative evaluation of the product.

Check-lists are easy to use and if carefully constructed can guide evaluators to consider many different aspects which, without a set of prompts, would be difficult to keep in mind. The use of a check-list is advocated by Edwards, Adcock and Bowskill (1995) who provide guidance on the development of a check-list for use in the selection of courseware and cover the same general aspects as CERT, using the categories content, usability, pedagogy and layout which are equivalent to CERT's aspects, content, autonomy and program control, educational issues and design. However, the user is left to prepare his/her own evaluation tool. CERT has the advantage of being ready to use for both the evaluator and the reviewer.

CERT also focuses in more detail on these aspects and can relate all of these to educational and instructional design theory. It is unique among check-lists in addressing the nature of the involvement of the learner with the courseware.

Relating CERT to educational and instructional design theory

In writing on instructional design, Shuell (1993) suggests a set of learning functions which should be incorporated into computer-based learning (CBL) materials. Wager and Gagné (1988) provide a similar list of attributes which they call instructional events, the purpose of which is to support the internal processes associated with learning. In their work on motivation, Keller and Suzuki (1988) developed the ARCS model (attention, relevance, confidence and satisfaction) for use in the design of CBL materials. These sources have been used to guide the selection of aspects and to develop the set of questions relating to each aspect. They all identify the importance of the following:

- informing the learner of the objectives set by the designers;
- ensuring that learners are aware of prerequisite knowledge;
- providing guidance and structure for the learner;
- providing interesting and challenging activities on which feedback is given in a supportive fashion;
- providing the learner with evidence of achievement;
- providing interesting and well-presented material;
- supporting the confidence of the learner.

The questions within CERT are designed to ensure that these features are present in the courseware being evaluated or reviewed.

Good courseware should provide for more engagement from the learner than simply choosing a path through the materials, paging backwards and forwards and accessing 'help'. These are useful attributes for empowering the user, but they do not require learners to think

about the subject matter, to get to grips with new concepts, or to test their understanding. Laurillard (1987) writes that:

> The principal advantage of an interactive medium is that it has the capacity to encourage student activity and this is frequently cited as the most important reason for using it ... The quality of interaction they (the instructional designers) design determines the quality of thinking, and therefore the quality of learning the student will achieve.

This engagement with the courseware is usually referred to as interactivity. The term interactivity has been rejected in the development of CERT as it is often misleading. Many products described as interactive do nothing more than allow the learner to select a route through the package. For software to be truly interactive it must seek input from the learner and react in response to that input. It must, as suggested by Laurillard (1987), engage the learner in thinking and problem solving. Interactivity is replaced in CERT by the terms learner activity, feedback and response analysis which describe more accurately the nature of the interaction between the learner and the software. The freedom for the learners to make their own route through the material is described as program control.

Learners are guided towards activities by the learning framework created by the designers which is based on the expectation that learners will react to the material in a predictable way, but this may not happen. Student reactions may be quite different and totally unexpected. Teachers of accounting are familiar with this in relation to a well-known CBL package, EQL Interactive Book-keeping (DOS Edition). The software was described as interactive and the designers expected that students would work through examples at the computer and have them checked automatically. However, some students limited their interactivity to printing out the examples and taking them home to work on! By doing so they by-passed any feedback within the package, which may have been a comment on the quality of this feedback. Because students can respond unpredictably to the learning framework, the evaluator is guided to consider the framework and the learner activities separately.

A useful classification for learning frameworks is provided by the work of MacDonald *et al.* (1977) which although carried out as long ago as 1977 for the UK National Development Programme for Computer Assisted Learning (NDPCAL) in schools is still seen as relevant and applicable to higher education today (Somekh, 1996; Squires and McDougall, 1996). MacDonald *et al.* (1977) classified computer-based learning materials as instructional, revelatory, conjectural or emancipatory, depending on how the developers conceived the learning task. They went on to describe a typology (Types A–E) for the student-software interaction. This parallels the system just described of a learning framework created by the designers and learner activities engaged in by the students.

These paradigms have been useful in classifying software as it is used for business education (Kaye and Nicholson, 1992) where it was emphasized that accounting and business undergraduates need to be exposed to revelatory and conjectural material, in addition to basic instructional material, in both traditional and computer-based learning. These terms are not mutually exclusive. One piece of software may be described as revelatory or conjectural depending on the use made of it by the teacher.

MacDonald *et al.* (1977) classified student–computer interaction as follows:

Type A recognition
Type B recall

Type C reconstructive understanding or comprehension
Type D global reconstructive or intuitive understanding
Type E constructive understanding.

All accounting and business undergraduates should develop skills of Types A–D and some will go on to develop skills matching the Type E interactions. But, as indicated by Laurillard (1987), these will not be developed unless students are exposed to activities which require the exercise of these skills. CERT provides a means of checking for the existence of such activities in courseware by asking whether the following activities are engaged by the learner: recall; recognition; application of concepts, rules or procedures; application of concepts, rules or procedures to new situations; problem analysis; synthesis; prediction; extrapolation; problem solving; classification; generalization; and other activities.This list is not exhaustive and the opportunity is provided for the evaluators to add activities which they feel should be present. The normal yes/no answer of CERT is avoided as the absence of any one of these activities would result in a 'no' response with negative connotations for the evaluation, whereas that activity might be inappropriate for that piece of courseware.

At the elementary level in accounting education students are expected to be able to apply the rules of double entry bookkeeping, and to appreciate the concept of the accounting equation, applying Type A–C interactions in doing so. As they progress, they are expected to develop problem-solving skills, skills of analysis and interpretation (of published accounts for example) and other Type D skills. It is important therefore to check that learning materials are assisting in the development of these and other skills.

Examples of CERT in use

Several existing CBL materials for accounting and business education have been evaluated by an early version of CERT. Reports are available for the EQL Bookkeeping Tutor (DOS version), the PEER Management Accounting package and IVY Software packages (Nicholson, 1993). Other reviewers have made use of CERT to produce reviews for publication, (Stoner (1996) and Halabi (1996) for example).

Some reviewers provided with CERT reported that they did not use the tool exactly as described but all reported that they found it useful as an *aide-memoire* in carrying out their evaluations. Even used in this way, CERT is fulfilling a role in informing evaluators of the important aspects of educational software.

There has been considerable interest in CERT from commercial book publishers who are faced with considering computer-based materials (CBL or CD-ROM) submitted with texts and making judgements on their quality. There is also evidence that developers of software are paying attention to the aspects ascribed importance in CERT. The criticisms of the EQL Bookkeeping Tutor (DOS version) made in the published review report referred to above (Nicholson, 1993) have been addressed in the later Windows version of the package reviewed with the aid of CERT by Stoner (1996). This is an important consequence of publishing informed evaluations. Developers are made aware of the criticisms of their products and can address these in revisions, thus benefiting themselves (by creating a more marketable product) and the academic community (by providing courseware more suited to their needs).

Conclusion

CERT: A Courseware Evaluation and Review Tool provides a penetrating check-list to aid the predictive evaluation of courseware for accounting and business education and the preparation of rigorous reviews of courseware for accounting and business education. This tool was developed from a sound educational base. Its attention to detail and the depth of questioning provided distinguishes it from other check-lists. CERT is quick and easy to use which is an important factor for reviewers. Lecturers using CERT to evaluate software for their own courses are free to adapt the tool to suit their own concerns and interests.

In summary, CERT facilitates reviews and evaluations based on sound educational principles; ensures coverage of all important aspects in review and evaluation reports; allows for comparison between similar products and informs interested parties of the important issues. In setting out criteria for good educational software, and by publishing reviews based on these criteria, academics can be better informed and developers can be influenced. In future there may be more courseware that matches these criteria and accounting students in higher education will benefit from an enriched learning environment.

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EQL Interactive Book-keeping Tutor (Windows Edition)[2]

EQL International Ltd., 1995

This computer-based training package is an interactive book-keeping tutor. The content of the course is based on the earlier DOS package with the same name. The main content changes are noted below. Significant changes have been made to the way in which the material has been presented, taking advantage of the Windows GUI (graphical user interface).

For me the lack of excitement in book-keeping arises primarily from the fact that book-keeping is basically a procedural system which (in part) just has to be learnt and also from the fact that I hope I will never again have to do book-keeping. However, the lack of excitement in book-keeping has significant implications for our teaching of the material for two related reasons, our enthusiasm in teaching it and student motivation. If our enthusiasm is low this is likely to be perceived by our students, with consequent depressing effects on our students' motivation to learn. It is this latter factor, student motivation, that is likely to play an important part in the success or otherwise of any use of EQL's interactive book-keeping tutor.

The course content is split into three modules: Introduction to Book-keeping, Advanced Book-keeping and Practical Book-keeping. In addition to the three-module tutor itself the package can be acquired with two additional modules: Reporter, which provides a system for tutors to monitor student usage; and Book-keeping Tutor Assessments, which is an objective testing module.

Changes from the DOS version are: new material on stock and cost of sales; additional material on VAT accounting; additional material on computerized wages systems; additional examples on computerized ledgers; and additional material on company accounts. Additionally the Windows edition includes extensive on-line help, including a comprehensive glossary of accounting terms, and access to the Windows on-line calculator. As with the DOS edition the content has been validated by the Institute of Chartered Accountants of Scotland.

[2] A longer version of this review first appeared in ACCOUNT Vol. 8 No. 1 Spring 1996 pp. 22-27.