ASSESSMENT FOR E-LEARNING: WHAT ARE THE FEATURES OF AN IDEAL E-ASSESSMENT SYSTEM?

Don MacKenzie

Assessment for E-Learning: What are the Features of an Ideal E-Assessment System?

Don Mackenzie
Centre for Interactive Assessment Development
University of Derby
Kedleston Rd.
Derby
DE22 1GB
D.Mackenzie@derby.ac.uk

Abstract

Computing technology has now reached the stage where it would be possible to deliver very sophisticated assessments by computer and score them automatically given a suitable design brief. No assessment system currently available delivers all the features that are likely to be required by tutors wishing to deliver assessments on line. Development of e-learning courses is now advancing rapidly in a number of universities but serious e-assessment has yet to become an integral part of many of them. This artificial distinction between e-learning and e-assessment may relate to a number of factors including the reluctance of some tutors to relinquish traditional modes of assessment, the straightjacket of commercial VLEs, the fact that many systems currently available do not support the pedagogical requirements for assessment in Higher Education.

Clearly, e-assessment should be an integral part of e-learning. So what are the features of an ideal e-assessment system for e-learning? In this paper, the author suggests a checklist of features of an ideal assessment system from a pedagogical standpoint and in the presentation will invite the delegates to add their own checkpoints and engage in discussion of the value of each feature.

Introduction

In the early 1990s, UK Government funding initiatives such as Phase 1 of the Higher Education Funding Councils Teaching and Learning Technology Programme gave a kick-start to the wider development of interactive courseware within UK universities. However, a combination of the inherent conservatism of the UK academic community, the power of the 'Not Invented Here Syndrome' and the rise of the development of static resources on the World Wide Web resulted in the under-utilization of many excellent interactive learning resources during the mid 1990s.

There is, of course, substantial value in building banks of static web resources as reference materials, but the concentration of effort in this area slowed the development of interactive learning materials and there seemed to be a

general view that 'if it wasn't Web-deliverable, it wasn't worth having'. The hiatus in the development of interactive courseware has meant that recent explosion in the development of e-learning courses is supported largely by static Web resources. In the Author's view, a course that consists entirely of static materials should more properly be regarded as 'e-distribution' rather than e-learning and an opportunity to use the power of the computer to really engage students in their learning has been missed.

Now, highly interactive web-delivered learning has become a possibility with the advent of technologies such as Java, Flash, Director, Authorware and others. Many of the interactive products generated by the early courseware development projects could now be delivered over the Internet given suitable currency of their content. However, in some cases, tutors are still restricted in their application by institutional decisions to implement commercial Virtual Learning Environments (VLEs) or to deliver via commercial e-university consortia using similar platforms. Some of these can act as significant straitjackets to the delivery of interactive materials and provide only minimal support for learning by formative assessment in the form of simple 'quiz' type question formats.

These issues, together with a general reluctance to relinquish traditional methods of assessment, have lead until recently to an artificial separation between e-learning and e-assessment development. In the Author's view, e-learning should be a very rich and engaging experience which, at its best becomes an online dialog between the student, the tutor and other students on the course. It is not just the distribution of static resources. Even though the tutor will not actually be online in most cases, such an engaging experience may be facilitated by a number of mechanisms including courseware style tutorials, formative assessments with context sensitive feedback, discussion boards, web-conferencing etc. In other words formative and even summative assessment in some cases should be integrated into the e-learning process. If e-learning does not include rich interactivity then major opportunities for using computers to enhance learning an test new skills will be missed.

In this discussion paper, I wish to focus on just one of these mechanisms to enrich e-learning, that is the use of formative assessment and to ask the question, 'what are the features of an ideal assessment system for e-learning?'. A checklist to evaluate the suitability of any online assessment system for e-learning is proposed at the end. Clearly an ideal system is much more than a simple MCQ rendering engine.

Formative assessment and feedback to students

In face-to-face teaching typically there will be a cycle of interaction between the tutor and the student that includes the:

- tutor imparting information,
- students asking questions of the tutor,
- tutor replying to the student questions,
- tutor asking questions of the student
- student answering the questions
- tutor responding to student answers with confirmation or correction and maybe adding additional background information or evidence for the answer.

Additionally there may be similar face-to-face interactions between students themselves in some cases and the sequence of interactivity listed above may vary. Away from the face to face contact, students may be given assignments to complete that are marked and graded by the tutor then returned to the student with appropriate informative feedback.

What then are the features of a computer-based assessment system that will allow this sort of interactivity to be delivered and optionally scored online? Clearly the system must be extremely flexible both in the range of question types that can be used and in the level and timing of feedback. The ability to deliver a wide range of question types with the functionality to give partial credit and context/score related feedback is essential in order to be able to deliver and assess scenarios, simulations that test higher order skills. As far as is possible the pedagogic approach of the tutor should not be restricted by the functionality of the assessment system.

One of the benefits of a computer-based formative assessment is that the feedback can be immediate and equally detailed for all students. This mirrors the face-to-face situation illustrated above but more importantly, the quality, parity and immediacy of the feedback can be substantially higher than is given for many hand-marked written assignments.

An ideal system must also be able to deliver information at all stages of the dialog, i.e. deliver interactive tutorial material prior to asking questions, giving hints while students are answering questions and giving context sensitive feedback or tutorials in response to a student answer. Given the range of resources now available on the Internet, the system should be capable of linking to Web-based resources or to other relevant external packages or learning objects for feedback and tutorial material. Such links could include discussion groups to enable students to work collaboratively where appropriate.

Satisfying the requirement to allow the student to ask questions of the tutor and receive an immediate response as would occur in the face-to-face situation is more difficult. However the inclusion of a Frequently Asked Questions (FAQ) help button or an e.mail link to the tutor might suffice if the problem was not included in the FAQ section. Clearly this is one area that might be considered less satisfactory than face-to-face contact unless most questions can be predicted by the tutor and included in the original design of the course. However with larger student groups, how many traditionally taught students now get this level of individual attention in the face to face environment?

Importance of feedback to tutors

Ideally, even pure e-learning courses should be tutor moderated to some degree and given the functionality indicated above it is critical that the system can record student responses and score their answers even in formative mode. It is even better if this can be done in real time so that at any stage the tutor may view continuously refreshed web pages that give details down to the level of individual student performance on individual questions. By this means, students who are having difficulty with the course may be contacted and individual support provided where needed. Such detailed information can be reviewed at the end of the course and the Quality Assurance loop closed by feeding back into modifications of the course materials for later runs of the module.

Inclusion of summative assessments

Many e-learning courses will require the inclusion of summative assessments at one or more stages of the course. It is, of course, possible to include an element of the scoring of formative assessments in the final module score. However, for summative assessments delivered in an open environment, some strategy to combat plagiarism and collaborative working will be necessary. One strategy might include some element of randomisation of question selection or question content and, given a suitably flexible assessment system, the effects of plagiarism and collaborative working should be no more problematical than for a written coursework exercise. Care is needed to ensure equanimity for all candidates in the topic balance and level of difficulty of questions selected. It goes without saying that the ideal assessment system should have the capability to record detailed results reliably and securely via a range of methods and include failsafe, continuous recording of data to combat the event of machine or network failure.

Where the assessment system is accessed from within a Virtual Learning Environment, it may not be adequate to send the data back to the VLE results database at runtime unless that database is capable of handling question performance data and facilitates item analysis. For summative assessment, tutor moderation of item performance and final scores is essential to maintain quality unless all questions have been rigorously pre-tested and their performance characteristics are known. Even in this instance some questions may not perform as expected because of changes in course delivery and the final scores may need to be modified accordingly. Some sort of results

analysis package would be an advantageous to making informed decisions on assessment validity.

Conclusions

The principal attributes required of a computer-based assessment system suitable for e-learning are that it can:

- deliver pre-test and pre-question learning materials if required
- provide the widest possible range of question styles so that assessment design is not compromised by the limitations of the system
- deliver informative, detailed and context/score sensitive feedback to the student
- provide informative feedback on student and question performance to the tutor so that tutorial help may be targeted and improvements may be made for future runs.
- provide a wide variety of question selection and sequencing options to facilitate deployment of assessments in a wide variety of delivery environments and modes of operation.
- deliver summative assessment in a reliable and secure manner.

A Checklist for the Ideal Assessment System for E-Learning

This checklist is designed to allow the evaluation of competing assessment systems for e-learning in the light of your specific requirements.

Suggested mode of use:
Score each feature on a scale of **0** to **3** as indicated in each column
Column A represents your estimation of the relative importance of each feature for e-learning in general.
0=not important **1**= useful but not essential **2**=very useful **3**=essential for e-learning applications in general
Column B represents the effectiveness of the system under evaluation with respect to each feature.
0=feature not supported **1**= feature partially supported **2**=feature supported **3**=feature well supported
Column C represents the importance of each feature with respect to the range of applications for which you require it.
0=not important **1**= useful but not essential **2**=very useful **3**=essential for my application
Column D represents the score for the system under evaluation.
Suggest **A * B** for general system evaluation or **A * C** to evaluate for your specific application. Include a weighting ***E** if required.
Other features can be added and scored in a similar manner.

	A General importance e-learning	**B General effectiveness of system**	**C Importance for my application**	**D Score for system**	**E Wt**
INTEGRATION OF LEARNING RESOURCES & FEEDBACK					
Pre-assessment resources					
Static pre-assessment resources (text-graphics)					
Video clips in pre-assessment resources					
Sound clips in pre-assessment resources					
Pre-assessment interactive tutorials					
Embed questions within tutorials and track responses/scores.					
Links to external web pages or programs					
Can link to / present third-party learning objects as resources					

Within-test feedback to students Pre-question tutorials Sound clips in questions Video clips in questions Hints/feedback within questions Text feedback at the end of question Graphical feedback at the end of question Interactive tutorial feedback at the end of question Link to external programs/web resources as feedback Branch feedback on the basis of question score Context-sensitive feedback at end of question Can link to / present third-party learning objects as feedback **End of test feedback to students** Feedback at the end of the assessment Branch feedback on the basis of assessment score Context-sensitive feedback at end of assessment **Feedback to tutors** Real-time feedback/display of student performance Full data on all attempts at questions/items Data in a format suitable for item analysis Inbuilt results analysis and comparison package					
ASSESSMENT DELIVERY MODES **Assessment delivery environment** Switchable between summative and formative modes Summative/formative switching is possible after compilation Summative/formative switching is automatic date-controlled Adaptive chaining of assessments is possible Assessments can be accessed through a VLE/MLE/LMS Results can be recorded in a VLE/MLE/LMS					

Question/item delivery modes Allow user-paging between questions Force sequential delivery of questions with no return Allow return to incorrectly answered questions only Show previous answer on return to question Single level adaptive testing possible Multiple level adaptive testing possible Deliver of all questions in a random sequence Deliver a subset of questions randomly selected from a bank Deliver a subset of questions from each of a number of groups of questions Deliver benchmark questions to all students in an otherwise randomised test Randomize data, images, options or positioning within questions Automatic screen design for questions/items Some customisation of screen design possible for questions/items Free format screen design for questions/items					
VARIETY OF QUESTION TYPES **Point & click types** multiple choice/response/matrix/true-false multiple hot-spot, rectangle multiple hot-spot, any shape multiple select graphic object assertion-reason plot point - check X-Y extended matching item/label selection matching pairs text/graphic multiple-matching item multiple checkbox/radio button checkbox/radiobutton matrix line/word/paragraph clicked select and insert line(s) in script					

Move-object types (or drop-down combo selection in some cases) fill the gap (Cloze) label diagram random sequential label diagram/match text random image + label diagram build diagram classification simple sequencing classification of multiple sequences single/multiple-sliders on scale(s) multiple-sliders with calculated graphic responses **Text entry types** single & multiple text entry single & multiple numeric entry mixed text & numeric entry allow error limits on numeric entry partial credit possible on text/numeric entries fill a table - text/numeric **Draw object types** multiple draw straight line / arrow draw box draw circle draw curve draw multiple curves **Graph plotting** Graph setup XY point ABC point ternary draw line, test line params draw curve, test curve params allow user input of data and test plotting						

	A General importance e-learning	B General effectiveness of system	C Importance for my application	D Score for system	E Wt
Scenarios and simulations Deliver, track and score interactive scenario/simulation type questions Multiple interaction types within question/item					
SCORING OF QUESTIONS/ITEMS Simple (tick/cross) scoring Tutor defined scoring with partial credit facility Item score weighting possible					
COMPATIBILITY WITH OTHER SYSTEMS **Assessment - question/item I/O** Import of questions/items in QTI format Export of questions/items in QTI format Import of assessments in QTI format Export of assessments in QTI format Import of questions/items from a database/item bank Import and display IMS content					
ASSESSMENT FOR E-LEARNING DEVELOPMENT MODEL Easily used by tutors to create simple quizzes only Useable by tutors to create simple to complex question types & feedback Assessment design by tutor but programmed by multidisciplinary support team					
TOTALS: .					