Getting started with Computer-assisted assessment

Using computers to design and deliver objective tests

The Higher Education Academy Physical Sciences Centre

What is Computer Assisted Assessment?

Computer-assisted assessment (CAA) refers to the use of computers in assessment. The term encompasses the use of computers to design, deliver, mark and analyse assignments or examinations. It also includes the collation and analysis of data gathered from optical mark readers (OMRs). CAA is often referred to as Computer-Based Assessment (CBA).

Objective testing

Objective questions are those where the judgement of the marker does not affect the assessment. Objective testing is largely, but not exclusively, used in CAA.

CAA can be used for…

Diagnostic testing – to determine prior knowledge
Self-assessment – to check one's understanding
Formative assessment – to assist in learning through feedback
Summative assessment – to undertake quantitative grading

Question types

There are many possible types of question but the main examples are…
Multiple choice questions (MCQs) are the traditional *choose one from a list* of possible answers. Special types of multiple choice questions include *Assertion-Reason*, *True/False* and *Yes/No* questions.
Multiple response questions (MRQs) are similar to MCQs, but involve the selection of more than one answer from a list.
Graphical hotspot questions involve selecting areas of the screen, by moving a marker to the required position, or, in the case of OMR questions, by filling in a block in a particular position linked to a graphic illustration on a specially designed paper answer sheet.
Text/Numerical questions involve the input of text or numbers at the keyboard.

Why consider using CAA?

- A wide range of topics can be tested very quickly.
- Can monitor the progress of students through more frequent assessments.
- Graphics and multimedia can widen the scope of questions.
- Computerised marking of tests saves time.
- Large groups can be assessed quickly.
- Diagnostic reports and analyses can be generated.
- Results can be automatically entered into administration systems.
- Students can monitor their own progress through self-assessment.
- Students acquire information technology (IT) skills.
- Formative assessments can be used to aid learning.
- Students can be provided with clues and marked accordingly.
- Adaptive testing can be used to match the test to the student's ability.
- Feedback is available to students during and after a test.

What are some of the limitations of CAA?

- Construction of good objective tests requires skill and practice and so is initially time-consuming.
- Testing of higher order skills is difficult.
- Possible to reinforce misconceptions.
- Implementation of a CAA system can be costly and time-consuming.
- Good system maintenance is required to avoid downtime during examinations.
- Difficult to reproduce *freedom* of paper examination - eg scanning questions to choose which to answer.
- Students require adequate IT skills and experience of the assessment type.
- Assessors and invigilators need training in assessment design, IT skills and examinations management.
- A high level of organisation is required across all parties involved in assessment
- Overuse may promote surface learning.
- Large bank of questions required to prevent banding and hence loss of discrimination.

Resources

General information

CAA Centre (http://www.caacentre.ac.uk/). No longer maintained but very useful.
University of Hertfordshire **Learning and Teaching Development Unit**. (http://www.herts.ac.uk/ltdu/)
Loughborough University **Learning and Teaching Development**. (http://www.lboro.ac.uk/service/pd/caa/index.htm).
Effective Practice in Objective Assessment Practice Guide. (http://www.physsci.heacademy.ac.uk/Publications/PracticeGuide/EffectivePracticeInObjectiveAssessment.pdf).
OMRs. See information at CAA Centre and at University of Hertfordshire.

Products

The **CASTLE** project is JISC funded and has developed an easy to use web-based tool for authoring on-line tests. The toolkit is free to UK higher education users and can be found at http://www.le.ac.uk/castle.
Question Mark Computing Ltd - software for authoring tests. (http://www.questionmark.com/uk/home.htm).
TRIADS is a collaborative project between the University of Liverpool, the University of Derby and the Open University. (http://www.derby.ac.uk/assess/newdemo/mainmenu.html).
Clyde Virtual University Assessment Engine - CVU offers free tools, which enable the delivery of online assessments and evaluation forms. (http://cvu.strath.ac.uk/ae/index.html).
Examine is a multiple-choice authoring and delivery system for use either as an adjunct to courseware or as a standalone means of on-line self-assessment. (http://ibis.nott.ac.uk/software/).
WWWAssign - A free tool for delivery of tests. (http://emc2.acu.edu/~schulzep/wwwassign/).
WebTest: this system, from Heriot-Watt University, features the randomisation of questions, ability to display maths and scientific formulae and the creation of diagrams and graphs. (http://test.hw.ac.uk/).
WinAsks Professional - Software for the development of secure tests and questionnaires delivered using Windows. (http://www.smartlitesoftware.com/e_prods.htm).
WebMCQ - Allows creation and publishing of interactive questions. (http://www.webmcq.com/ and http://www.mcqi.com.au/mcqi/shwaa2/eim2/website/).
EQL - Interactive Assessor - A Windows-based system for creating question banks, generating customised tests, running tests and providing automatic results analysis. (http://www.eql.co.uk/).
NetQuest TML - A project at Bristol University using Tutorial Markup Language to create searchable questionbanks for online delivery of tutorials and assessment. (http://www.ilrt.bris.ac.uk/netquest/).

Examples of CAA in the Physical Sciences

VIZQUIZ is an authoring system for quizzes available from *Journal of Chemistry Education: Software* together with a set of chemistry quizzes, **WISCQUIZ**. (http://jchemed.chem.wisc.edu).
Developed at Liverpool University, the **Chemistry Quiz** is a set of numeric quizzes covering a number of topics in chemistry. (http://www.liv.ac.uk/ctichem/c3intro.html).
The University of Sunderland has a number of **web-based quizzes** developed using Question Mark Perception. (http://www.sunderland.ac.uk/~hs0dad/student.htm).
Wizard Test Maker - a database of geology, physics, biology and chemistry MCQs. (http://www.eduware.com).
Graduate Record Examinations at Princeton University. (http://www.gre.org/codelst.html - select *Tests* then *Subject Tests*.).
Chemistry MCQ database housed at University of Bristol (http://www.tal.bris.ac.uk/Chem.htm)
Organic Chemistry Quiz, Bath University. (http://www.bath.ac.uk/chemistry/chemistryquiz.html).
Computer-aided Assessment in Chemistry, University of Ulster. (http://www.physsci.heacademy.ac.uk/Resources/DownloadsDetail.aspx?id=1).