



Case study 5: Making the most of a computer-assisted assessment system

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What this case study covers

- **Subject, mode and level:** Cross-disciplinary with a focus on English language diagnostic assessment
- **Assessment topic:** Online assessment management; use of assessment data for quality assurance and enhancement of curriculum design and delivery
- **Technologies:** Assess By Computer (ABC) assessment delivery and marking system (Assessment21)

Background

Assess By Computer (ABC) is an assessment delivery and marking system designed by academics in the Computer Science Department at the University of Manchester, where it has been in use in different faculties since 2002. The system is now used more widely under a site licence and is marketed by Assessment21 Ltd. Through the example of ABC, this case study illustrates some of the advantages of computer-based assessment systems.

ABC offers faster and more consistent marking plus a wide variety of formats for question design, including short, free-text entry. However, the greatest benefit offered by ABC may be the flexibility of the system. Although ABC is often deployed as an automatic marking system, human markers are able to apply their expert judgement when required.

For example, the ABC sorting facility enables the human marker to cluster candidates' answers by keyword or similar phrasing to identify significant patterns in the responses and make changes to the mark scheme in the light of questions that have performed in an unexpected way. The human marker can also set up the system to assess responses to a question as either right or wrong against a pre-determined model, then, by sampling the incorrect answers, search for acceptable alternatives and award a mark retrospectively to any other answers with the same text string.

Rationale

There are a number of other direct and indirect ways in which effective use of a computer-assisted assessment system can enhance the quality of learning.

As indicated in the Code of Practice for the Assurance of Academic Quality and Standards in Higher Education (Quality Assurance Agency for Higher Education, 2006), institutions are responsible for the academic standards of the awards made in their name. Accurate data from medium- to high-stakes assessments is an increasingly valuable asset for quality assurance and curriculum planning and review processes. An archive of evidence derived from an online assessment management system, for example, can help curriculum managers and academic teams to:

- Conduct reliable checks on the outcomes of particular assessments
- Monitor differences in learners' achievement before and after curriculum redesign

- Compare data from the same assessment over time to identify factors affecting the success of a programme of learning, such as the impact of a change to the entry qualifications
- Assess the support needs of learners

Efficient marking and assessment management can have pedagogic advantages as well, not least because the reduction in workload makes it feasible for tutors to assess learners' understanding more frequently – for example, at key points in a long and complex span of learning such as a module or unit of learning with a high level of conceptual difficulty. Quicker formative assessments enable tutors to identify gaps in learners' knowledge and understanding so that remedial action can be swiftly taken and, in the longer term, information held in assessment systems can help shape delivery of the curriculum by providing accessible and reliable evidence of the success of particular pedagogic approaches.

While the automatic marking and collation of results is clearly beneficial to tutors, the time and effort saved can also translate into advantages for learners – for example, through the development of more varied and innovative ways of assessing the curriculum, and more rapid delivery of feedback.

Transforming assessment practice

An innovative application of the ABC system is described in *Question Types in English Language Diagnostic Testing* (Wood & Morley, 2008). The ABC system was used at the University of Manchester to improve the accuracy of testing English proficiency.

The University of Manchester Language Centre (UoM ULC) tests over 1,000 overseas students for proficiency in English language in an academic year, with the majority of tests taken within the first few weeks of term. Although computer-marked assessment is a natural choice given the large number of tests administered, the test adopted by the Centre using multiple-choice questions (MCQs) had limitations as a determinant of the grammatical and lexical ability of students: MCQs ask candidates to select from pre-determined options rather than construct their own answers and so can produce false-positive results.

The researchers argued that if students were able to answer freely, albeit within narrow parameters, the true level of their proficiency would become apparent. The support needs of students on the borderline of pass and fail (ie those achieving in the region of 40% on the MCQ test) could then be assessed with greater accuracy:

'The UoM ULC tests consist mainly of MCQs... However, selected-answer questions tightly constrain the extent to which a candidate can give evidence of incompetence, even in this intellectually limited domain. Our hypothesis was that, given the chance to answer freely, the weakest candidates would give evidence of greater weakness than could be seen from MCQ results.' Mary McGee Wood and John Morley, University of Manchester

With the permission of the test author, the original MCQ-based test used in the diagnostic assessment of non-native users of English was uploaded into the ABC system, where it was supplemented with an additional layer of free-text entry questions. The new questions were designed in gap-fill format in order to test students' ability to place words in the right order and complete sentences with the correct grammatical elements – for example, a preposition or form of a verb. This more searching approach to testing ensured that appropriate levels of support would be given to the students who needed it most.

Results of the trial showed that the gap-fill questions were in fact able to give a more accurate picture of students' linguistic weaknesses than the original MCQ-based test and provided evidence that, in some cases, students were unable to understand the questions at all. Use of the ABC system had

improved the discriminatory power of the language proficiency test without adding to the time and effort expended by academic tutors.

Lessons learnt

ABC does not claim to be a sophisticated e-assessment tool but one that enables tutors to assess their students in more searching and creative ways and to mark and manage assessments at scale. Curriculum or module teams still need to align the delivery and assessment of the curriculum with the intended learning outcomes; no computerised system, however much it improves the speed and efficiency of marking, can compensate for a poorly designed or inappropriately targeted assessment. However, data held in the ABC system, coupled with the interpretative capacity of human experts, has provided a valuable evidence base from which to evaluate the quality and effectiveness of curriculum design and delivery.

In very large groups, delivery of an assessment via ABC can be hampered by the availability of computers – an issue that affects any computer-assisted assessment system. It should also be noted that tests or individual questions transferred into the ABC system from other sources require the permission of the original question setter.

Advantages gained

What distinguishes the ABC system is that it enables people and computers to work in tandem; people make the important judgements supported by a suite of tools which handle the more routine tasks – for example, sorting and displaying answers, highlighting keywords and totalling marks. The system can be applied to summative or formative assessment and has especial value in contexts where speed and accuracy are of prime importance, as in the assessment of large cohorts.

ABC, like any computer-assisted assessment system, is significantly faster than human marking, but still enables the application of human judgement without loss of time or efficiency. Even an allowable misspelling, for example, can be identified at moderation and corrected throughout all responses within seconds. Consistency, speed and accuracy in the marking of short free-text and essay questions are also improved, as are administrative processes: marks can be rapidly compiled into a spreadsheet, totalled and evaluated both in the short and longer term. Test data held within the ABC system can be mined to identify common student misconceptions, leading to a prompt response in a tutorial or seminar the following week or even the redesign of particular elements in subsequent years.

While longer textual answers still require the judgement of the subject expert, marking of answers of this type can be made faster by working on screen. Trials have shown that use of ABC can reduce the time tutors spend on marking textual answers by a factor of two to three times – perfect legibility of the typescripts, grouping of similar answers, speed of on-screen marking, and the automatic totalling of marks bring about a significant reduction in the time and workload associated with assessment (JISC, 2009).

As a consequence of the efficiency gains from using a computer-based assessment system, tutors can create more opportunities for formative assessments even in large-group contexts; assessments demanding short free-text answers, for example, can be used with groups of 200+ students. Time saved by more efficient management of assessment can also be used to support individual students or improve the design of the curriculum for subsequent years.

Although computerised marking of longer free-text answers is still widely distrusted in the UK, a system such as ABC that combines the efficiency of computer-assisted assessment with the possibility for human interaction offers some flexibility in this controversial area.

Key points for effective practice

- **Computer-assisted assessment systems can improve the appropriateness, effectiveness and consistency of assessments**
- **Efficient assessment processes produce pedagogic as well as institutional benefits**

Tutor perspective

'Quite apart from assessing skills or understanding, this is a great tool for giving teachers feedback. You can mine the data to expose issues such as widespread conceptual misunderstanding of a particular part of the curriculum, or use a copy of all students' answers from one year to remind yourself of what to focus on in the next.' Mary McGee Wood

References

Quality Assurance Agency for Higher Education (2006) *Code of Practice for the Assurance of Academic Quality and Standards in Higher Education*, [Section 6: Assessment of students](#)
Wood, M. & Morley, J. (2008) [Question Types in English Language Diagnostic Testing](#)

Further reading

JISC (2009) [Human Computer Collaborative Assessment – Assess by Computer \(ABC\)](#) – University of Manchester
JISC (2009) [Review of Advanced e-Assessment Techniques \(RAeAT\) Final Report](#)

Key words

Human–computer collaboration, computer-assisted assessment, diagnostic assessment

Links

[Assessment21](#)
[University of Manchester Language Centre](#)

Further information

ABC requires no specialist technical or programming skills and can be used on any computer. Basic training in the use of the ABC system involves typically three one-hour sessions on marking, setting, and invigilation, and the system is compatible with Microsoft® Windows®, Apple® and Linux® operating systems.

Reflect and discuss

How might you use data from computer-based assessment systems to shape your teaching and inform curriculum review?

See also **Engaging Students via Student-Unique Weekly Assessed Tutorial Sheets**: <http://fie-conference.org/fie2008/papers/1397.pdf> and the podcast by [Dr Peter Findlay](#)