



Case study 2: Planning and delivering high-stakes computer-assisted assessment

University of Southampton

What this case study covers

- **Subject, mode and level:** Nursing and midwifery undergraduate first- and second-year modules
- **Assessment topic:** Ensuring quality in large-scale summative computer-assisted assessment
- **Technologies:** QuestionMark™ Perception™ assessment authoring and management system

Background

Students in the School of Health Sciences at the University of Southampton enter higher education with wide-ranging prior experience of learning: the student profile for the school includes a higher proportion of adult returners than is typical in some other disciplines. Creating opportunities for students who would not otherwise have the opportunity to participate in higher education is an important aspect of the School's provision, and enrolment numbers on pre-registration and undergraduate courses are consequently high.

The School experimented with the use of QuestionMark Perception for formative assessment before applying the system to high-stakes summative assessment in 2007–2008. The School has been supported in this initiative by the iSolutions team – a centralised service covering all IT facilities and resources at the University of Southampton. iSolutions issue guidelines for students and provide training and technical support for the tutors, invigilators and examination supervisors involved in the authoring and administration of computer-assisted assessment. All policies and procedures for computer-assisted assessment produced by iSolutions are linked to the university's general regulations for high-stakes summative assessment.

Rationale

In the context of a factually based discipline and large cohorts, computer-assisted summative assessment offers greater speed and efficiency than traditional assessment, reducing the time learners spend in the examination room and easing the burden of marking on tutors. Computer-assisted assessment also provides institutional benefits such as consistently standardised marking and easier management and collation of data for quality assurance and review purposes.

Pedagogic benefits can be experienced too if the computer-assisted assessment forms part of a coherent strategy to enhance learning. Formative computer-assisted assessments – for example multiple-choice questions (MCQs) – offer anytime, anywhere opportunities for learners to regulate their learning and, with skilful design, can do more than test factual knowledge; confidence-based question designs can ensure that lucky guesses do not produce undue reward,¹ and MCQs allied with challenging scenarios can test with some efficacy how far learners have met higher-order learning objectives. Although Nicol (2007) argues that the power of MCQs is derived as much from manipulating the context in which the test is used as from the sophistication of the test design,

¹ For example, see the London Agreed Protocol for Teaching (LAPT), which uses certainty-based marking: www.ucl.ac.uk/lapt

examples that Nicol provides nonetheless illustrate that MCQ tests can be used in ways that enhance rather than merely test learning. Learners with lower levels of achievement, for example, can be more readily identified and supported if computer-marked assessments are staged at key points in the delivery of a module to provide rapid feedback.

JISC's Report on Summative e-Assessment Quality (Gilbert *et al*, 2009) highlights an additional gain: the 'e' factor – aspects of computer-assisted assessment that would be time-consuming or impossible to reproduce in paper-based tests. These include animations and rich media which add authenticity to learners' experience of assessment. Immediate, quality-assured feedback in formative assessment is a further advantage noted in the report.

It is also the case that learners already make extensive use of technology in their learning – for example, accessing resources, taking formative tests and submitting assignments online. As a result, it may seem logical to learners that at least some aspects of the curriculum are assessed by computer. There is also evidence that some learners prefer to use a computer in assessments because their keyboarding skills are superior to their ability to write longhand (Gilbert *et al*, 2009).

For reasons such as these, high-stakes MCQ-based assessments were introduced in the School of Health Sciences to test conceptual understanding on some first and second-year modules.

Transforming assessment practice

Since 2007, the iSolutions team working with tutors in the School of Health Sciences at the University of Southampton has developed considerable experience in ensuring the quality of high-stakes on-screen assessment, addressing issues such as security and reliability of the infrastructure, training of academic staff and the logistical management of large numbers of students using computers in assessments.

The focus on quality commences some time in advance of the test date. Questions are peer reviewed and checked by external examiners to ensure that the assessment effectively targets learning objectives. Post-test analysis from previous years may lead to the removal or rewriting of questions. iSolutions ask academic staff to forward all questions two to three weeks before the assessment. Mechanical checks can then be run in QuestionMark Perception to confirm that individual questions behave as intended and that the assessment is correctly compiled. Once a test is uploaded, iSolutions forwards the link to the academic team to check again that every aspect operates as intended.

Sticking to an agreed sequence of actions is essential for reliability and quality:

'Everyone needs to know their role, and when something needs to happen. In many respects, it is a critical pathway: we have to assume that if something can go wrong, it will! Having milestones not only helps academic staff get questions prepared in time, it also alerts us when something in the chain of communication between the team and the School has gone astray and we can then send out reminders.' Bill Warburton, CAA Officer, iSolutions, University of Southampton

Training sessions in question authoring are offered through iSolutions; these cover the operational and technical aspects of computer-assisted assessment, while the pedagogic issues (such as devising questions to test higher-order learning and evaluating the outcomes of tests) are addressed by the Learning and Teaching Enhancement Unit at the University of Southampton. Nonetheless, question authoring for summative tests involves advanced-level skills that are not easily acquired:

'The clever bit is getting the right balance between the richness of the question, for example, by showing qualitative information, and the objective information needed to focus the able student on the

anticipated correct answer. Helena Knowles, Senior Lecturer, School of Health Sciences, University of Southampton

Monthly meetings with iSolutions help keep all involved in test production and management well briefed, and enable staff training needs to be kept under review.

Students routinely use formative assessments devised in QuestionMark Perception and take at least one assessment in the same design and format as is used in the summative assessment. On the day of the test, technical assistants are available to provide support for invigilators at the test location on technical matters such as log-in difficulties. Policies and procedures for computer-assisted assessment are closely aligned with regulations laid down by the university's examinations office, and staff invigilating tests that are delivered and marked in QuestionMark Perception are expected to be familiar with, and able to enforce, both sets of guidelines. In addition, a senior member of the academic team checks all test locations in case there are any unresolved problems.

During 2008–2009, approximately 450 first-year students and 400 second-year students took high-stakes on-screen tests in the in the School of Health Sciences at the University of Southampton. As the large number of first-year students exceeded the number of workstations available, students took the tests in two consecutive shifts. Procedures were in place to ensure no contact between students taking the same test in different sittings.

The School of Health Sciences has been using computer-assisted assessment for five years and, up to 2009, has not been able to provide sufficient questions of equivalent difficulty to support random selection of questions from an item bank, which would enable testing to occur synchronously. However, over time, more questions will be developed, enabling large-scale testing to take place at one time provided a sufficiently high number of workstations is available:

'The size of the investment needed is greater than people realise. With the best will in the world, it is hard to make time for the development of high-quality assessments that are not vulnerable to appeal from students. At this point in time, high-quality, large-scale synchronous computer-assisted assessment remains a challenge.' Dr Bill Warburton, CAA Officer, iSolutions, University of Southampton

Lessons learnt

Computer-assisted assessment requires as much attention to quality as traditional assessment and initially places unfamiliar demands on academic staff. For example, question authoring for summative assessment is a skill that tutors may need to develop. Tutors may also feel that the assessment process, traditionally under their control, is moving in a new direction: the level of infrastructure and support needed for high-quality, large-scale computer-assisted assessment requires a whole-school, faculty or institutional response and involves close collaboration with examination officers and other administrators. In compensation, however, the burden on tutors of marking large numbers of scripts and collating results is removed.

Issues of candidate authentication and the confidentiality and integrity of systems are often associated with high-stakes e-assessment (Apampa, Wills and Argles, 2009). However, iSolutions has increasing confidence in both its procedural and technical systems. Checks on the identity and status of students along with the use of encryption software are minimising concerns over security and authentication. Technical breakdowns have also become less common as networks mature. However, fail-safe mechanisms and vigilance are always needed: for example, multiple data centres have been set up to ensure that functionality is maintained in the event of a server going down. iSolutions emphasises that the unexpected does happen, and contingency plans need to be in place to ensure the successful and valid completion of high-stakes computer-assisted assessments.

Advantages gained

The School of Health Sciences at the University of Southampton has progressed successfully in five years from using QuestionMark Perception for low-stakes formative assessment to large-scale high-stakes e-testing on some first and second-year modules. Having made the transition to computer-assisted assessment, tutors are reaping the rewards of a more efficient way of assessing undergraduate learning. The consistency of marking and grading is greatly improved; data from tests also yields valuable insights into the effectiveness of curriculum design and delivery.

Although work in advance of an assessment – for example preparing and reviewing questions – makes demands on tutors' time, the drudgery of marking is removed, and many tutors have found question design and authoring an intellectually stimulating and creative process. If computer-assisted assessment is authored and managed with due regard to established principles, students can also benefit – for example from greater frequency of feedback on their academic performance as a result of computer-marked formative exercises. Students also value the prompt delivery of results made possible by on-screen formative and summative assessment.

Key points for effective practice

- **Alignment between methods of formative and summative assessment enables learners to progress with confidence**
- **High-quality summative computer-assisted assessment demands investment in infrastructure and staff expertise**

Tutor perspective

'Have a clear vision about what you are trying to do and why. Computer-assisted assessment is a different way of working and will affect many other aspects of the course, from curriculum design to administrative procedures and staff training. You will need a good reason for making these far-reaching changes and must be able to articulate the vision to others. Having said this, we would not go back to paper-based tests.' Helena Knowles, Senior Lecturer, School of Health Sciences, University of Southampton

References

- Apampa, K.M., Wills, G. & Argles, D. (2009) '[Towards security goals in summative e-assessment security](#)', ICITST-2009, November 9–12, London.
- Gilbert, L., Gale, V., Warburton, B. & Wills, G. (2009) [Report on Summative E-Assessment Quality \(REAQ\)](#), JISC
- Nicol, D. (2007) '[E-assessment by design: using multiple-choice tests to good effect](#)', *Journal of Further and Higher Education*, 31(1), February 2007, pp 53–64
UCL, [LAPT](#)

Key words

Computer-assisted assessment, summative assessment, quality assurance

Links

University of Southampton [iSolutions](#)
University of Southampton [School of Health Sciences](#)

Reflect and discuss

In what ways would computer-assisted assessment benefit a) academic staff and b) students in your context? How can you ensure that summative assessment has a positive impact on learning in your context?

See also: HEA/JISC e-Learning Pathfinder programme, University of Bradford, [Embedding support processes for the reliable and secure large-scale implementation of computer-assisted assessment](#), and a podcast by [Professor Don Mackenzie](#), University of Derby