JOINED UP? OR JUST LUCKY? IMPLEMENTING CAA IN SCOTLAND

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Abstract

Scotland, with 1/10th of the UK population, has its own and distinct education system. It is funded through the Scottish Executive, based in Edinburgh, where the new Scottish parliament now sits. Each education sector is largely autonomous with separate funding and support agencies. The primary qualifications authority for the secondary and further education sectors is the Scottish Qualifications Authority (**SQA**). They hold a near monopolistic dominance of the qualifications framework in use in Scotland's schools and colleges. There is a significant overlap in the provision of the schools and Further Education (**FE**) sectors who share a common unitised framework which spans both vocational and academic qualifications. Therefore, developments in one sector, has implications for the other.

There are 46 Scottish FE colleges which have operated, since the early 1990s as self governing autonomous institutions centrally funded by the Scottish Further Education Funding Council (**SFEFC**). Approximately 1/3rd of HE in Scotland is delivered by the FE sector 60% of first entrants to HE do so at a FE college. In UK terms we have the highest HE participation rates. In the early years of the incorporated status of colleges an element of competition was apparent, although more recently there has been a return to a spirit collaboration to enhance the effectiveness of the sector.

In late 2000, SFEFC awarded funding to Glenrothes College, along with a number of partner colleges, to investigate and develop a knowledge base in Computer Assisted Assessment (**CAA**). The authors were co-managers of the project titled 'Best Practice in OnLine Assessment' (**BPOL**), and have since become involved in a number of initiatives in Scotland developing Computer Assisted Assessment approaches. This paper outlines the activity of the project and its influence on subsequent developments in Scotland.

Objective testing is rarely used for summative assessment within the Scottish FE system, or indeed, within the SQA qualifications framework at all. It is most often used in open or flexible learning materials as formative, self-assessment tasks. Historically, it has been effectively disallowed by the emphasis on assessment of vocational competence based upon criterion referenced, range based standards. Therefore, it was no surprise that there was very little existing practice in the use of CAA. Also, the capacity of college network infrastructures to support CAA was only then being realised. However, the BPOL project coincided with a shift by the SQA towards a more holistic approach to assessment which allowed sampling of learning outcome criteria and

therefore objective testing with cut-off scores became a valid option for consideration. However, much work needs to be done by both the SQA and the FE sector to ensure that objective testing and its delivery by CAA approaches is a valid and robust methodology.

It became clear that there were fundamental issues with regard to the way individual unit specifications (notional discrete 'modules' of learning within a subject), had been written. There was no shared understanding of a taxonomy of educational objectives to provide a theoretical underpinning of the description of a learning outcome. This did not present as a problem under the old assessment regime as an effective moderation system is in place which ensures national standards are achieved by all colleges. It is, however, a significant problem for those colleges pioneering CAA and the development of objective approaches.

As interest in CAA gathered pace during the year 2002, a number of other projects were funded within Scotland. A multi-agency approach has evolved and includes the SFEFC, the SQA, the Scottish Executive, HEIs, the colleges, schools and other stakeholders. It has not been a planned and co-ordinated national approach but may yet result with joined-up processes of CAA development, and who knows – a model for future progress? This paper should be viewed as a 'snap-shot' of this progress achieved by Mid 2003.

Introduction

This paper outlines a series of initiatives undertaken within the Scottish FE sector to increase the use of ICT in teaching and learning and in particular, the development of CAA approaches.

The SQA hold a near monopolistic dominance of the qualifications framework in use in Scotland's schools and colleges. There is a significant overlap in the provision of the schools and FE sectors who share a common modular framework which spans both vocational and academic qualifications. Therefore, developments in either sector has implications for the other.

Significant investment has been made by the SFEFC in the ICT infrastructure of colleges to achieve a strategic objective of ICT 'pervasiveness' in teaching and learning. This has, without doubt, provided the scalable backbone for future e-learning developments and provides the operational framework for colleges to deliver 'e-learning' and 'e-assessment'. The purchase of a Virtual Learning Environment (VLE) by most institutions allows assessment facilities to integrate with online learning, communication and other features. While the online assessment facilities available with these systems is generally inferior to that of dedicated assessment systems the capacity to use CAA is now readily available.

The 'Best Practice' project - BPOL

The primary objective of the project was to develop an operational model and exemplar resources to promote the development and uptake of on-line assessment within the Scottish FE sector. The specific aims were:

- Promote the development of college wide CAA strategies with appropriate staff development and delivery proposals

- Inform the development process of CAA through an evaluation of commercial and Higher Education (**HE**) products

- Research the pedagogical issues concerning the appropriateness, reliability and validity of CAA approaches within the scope of the Scottish Qualifications Authority framework

- Attempt to ensure that its proposals cover a range of options allowing individual colleges flexibility within their own ICT infrastructure

- Enable early implementation of CAA in some curriculum areas through the provision of exemplar assessment materials

- Undertake sector wide dissemination through national events, publication of reports and a web site

Project Activity

Initially, we undertook a literature review and found very little specific research devoted to the FE sector, and almost nothing on the implementation of CAA within a competence based continuously assessed qualifications system. The general research base very much supports a plethora of reasons why the FE sector should develop CAA approaches, not least of which was the possibility of improved student achievement with the use of good formative assessment linked to clear learning targets. The evidence also suggested that good formative assessment produces proportionally greater improvement affects in lower ability learners compared with those of higher ability. For summative assessment use, the major benefit is reported to be the reduced marking time required of teaching staff so that they can concentrate on the learning process. Overall, a promise of significant 'added value' – so far so good. However, the issue for Scottish FE and development of CAA is whether this research base translates from:

School age children and typical university learners	►	Typical learners in an FE context
Face-to-face formative feedback and action	►	The context of online learning and CAA approaches
Preparation for an end examination	►	The context of a competence based, vocational system, continuously assessed

The available research which supports 'added value' provides only anecdotal evidence to support the link to improved achievement in the context of the Scottish FE system. It could be argued that the FE sector already has an effective assessment model which supports the research. Continuous summative assessment based upon clearly defined learning outcomes with allowed multiple attempts using multiple assessment banks is the norm. The question remains then as to what 'added value' may be achieved by adapting traditional assessment approaches (essentially, adopting more objective testing) for delivery by CAA.

A survey was undertaken to establish the extent to which there was any practice using CAA amongst the partner colleges in the project. It was an easy survey as, not surprisingly, there was no activity of any significance. This is easily explained in terms of the qualification and assessment systems – vocational competence, assessed through learning outcomes, defined by performance criteria and range statements, all of which

were required to be assessed for achievement of a pass. There was no explicit separation of knowledge and skills and as such, passing 'scores', even of written work, was not acceptable. This precluded the use of objective testing, unless, of course, a passing score of 100% was specified. A common complaint from FE practitioners is the amount of summative assessment which must be carried out as a percentage of the available teaching time. The teaching focus often concentrates on the minimum criteria necessary for achievement, i.e. that all performance criteria and range items are covered. This is made a more difficult task when traditional written responses have to be analysed for particular mention of a name, a definition, a list, a statement and so on. A common complaint is that a student has submitted an assessment demonstrating good understanding and comprehension of a topic, only for it to be rejected because it failed to mention a particular point required by the performance criteria or range.

To carry out the Evaluation of CAA software we created a requirements specification and sought to compare a few products against it. This included a number of outputs from previous HE projects e.g. MIRANDA from Strathclyde University. An original project concern was the interoperability issues between assessment authoring products – important for Scottish colleges since any larger scale implementation would almost certainly require a collaborative approach and ease of exchange would ensure wide participation. During the life of the project, SFEFC provided funding to all colleges to implement a M/VLE, and the issue then became more one of interoperability between M/VLEs since colleges were allowed to choose which product best suited their needs.

All partners colleges were provided with CAA software (QM Perception) to undertake some pilot activity in one or more subject areas. Training and technical/writer support was provided by Glenrothes College and feedback obtained, using questionnaires, from students, teaching staff and technical/administrative support.

Project Findings

The limited evidence of the Best Practice project supports a view that CAA, in some subject areas, improves student motivation, and that there are longer term benefits in reducing the administrative burden on both staff and students. It can also be used to improve access to assessment opportunity through 'assessment on demand' arrangements.

We found that many college staff would be reluctant to use objective testing without firm guidelines from the SQA – a historical 'fear' that deviating from 'standards' practice would lead to moderation acceptance issues. We found that an implicit understanding of a taxonomy of education objectives existed (Blooms), but that this had been inconsistently applied in the specification of learning outcomes. With current practice this is not an issue, because there is an effective and robust national system of moderation which ensures standards are agreed and applied consistently across all schools and colleges.

Due to the lack of existing practice, there was little awareness of the range of question types available in authoring software, or indeed the range of features which can be used to enhance the assessment process. We also encountered a range of concerns about CAA, although in reality many of these were issues common to all forms of assessment. This lack of practice was also manifest in the extent to which staff were aware of quality assurance parameters e.g. item analysis, facility, discrimination etc. However, when staff became more informed, they quickly realised that the major issues were question use and design and the pedagogical context, rather than those of the technology. As reported widely elsewhere, the development of good, well designed objective questions

can be time consuming. This is particularly true when the questions are to be used formatively with appropriate feedback. We found that staff were prepared to accept this overhead on their time when they were clear about the pedagogical benefits and the longer term saving of time which would accrue.

The potential for technical failure is greater than with traditional paper-based approaches, either during an assessment, or, in other post-assessment failures, leading to the loss of results data. This raises, rightly, some concern on the practicality of CAA, especially for summative assessment. The loss of electronic results data with no hard-copy record of them, is obviously a situation colleges would want to avoid. As previously stated, the quality and quantity of college ICT infrastructure and support has improved significantly, and for most colleges does not present a significant barrier to the introduction of CAA. However, we found that the lack of a support structure for *learning systems* significantly affected the achievement of some colleges to implement CAA for other than small-scale trials. Where there were appointed staff with a specific remit for learning systems developments, e.g. M/VLE, colleges were more successful in implementing CAA and were more likely to sustain the development after the project completion. Where subject specialists alone had attempted to introduce CAA, there was limited success, and there was no significant effect on the college as a whole.

The feedback from students was very positive. They liked both the formative practice, and its use for summative assessment. There were some concerns, even from students of computing, about the presentation of the questions and whether they would be able to review all their answers before final submission.

We did not conduct a detailed cost benefit analysis. However, we feel that the relative cost of staff development, software support and delivery costs is sustainable when seen as part of the wider deployment of ICT resources.

Our investigation into the assessment authoring product base was limited. Early promise from some suppliers did not materialise, and we were restricted in the products trialled. This was not significant for the project outcomes since the purchase of VLEs by most colleges meant that colleges were less likely, in the short term, to purchase dedicated assessment authoring software. We did feel that reliable, standards-based (or promises of it), interoperable products were essential for the sector since collaborative developments would most likely be a requirement for future projects. If interoperability was ignored, this could lead to substantial duplication of development across the sector and create significant future problems as learning systems develop or are replaced, or changes made to meet the legal requirements of accessibility. We were also asked to evaluate the suitability of some HE project outputs in the area of CAA. However, we did not identify a product which we felt could be recommended to the FE sector. There was no one product could deliver exactly what all colleges in Scotland would look for in an assessment management system. There are a few products which deliver the majority of college priorities but with obvious gaps such as portfolio-based assessment and the automatic marking of short and extended response questions.

Project Outputs

A Best Practice Guide has been produced which supports a shift towards greater use of objective assessment approaches across the Scottish FE curriculum on both pedagogical and efficiency grounds. It supports a view that objective assessment can readily and efficiently be delivered using CAA approaches and that there are no significant barriers. This should, at least, lead to the wider use of computer assisted formative assessment approaches. The guide contains advice for both practitioners and

senior managers of colleges. It also includes descriptions of the range and use of the common question types supported by the major authoring tools.

There is a project web site at www.onlineassessment.org.

Project Recommendations

The widespread adoption of the use of computers to deliver assessment remains the primary challenge. The Best Practice project has demonstrated that it can be successfully implemented, particularly now that college network infrastructures are much improved. The early adoption of CAA approaches is now largely dependent on the success of colleges in implementing their M/VLEs, and the ability of senior managers to focus on assessment as a strategy to encourage wider participation by teaching staff. This would be supported by ensuring that college ICT strategies have a particular focus on the development of CAA approaches within the context of e-learning development. It would also be appropriate to develop mechanisms that support consortia for the exchange and production of national question banks in all subject areas. Item bank development should initially concentrate on standard, easy to generate questions.

The interoperability of software formats remains an issue. In some respects it is a greater issue now, than before the project began, because of the range of M/VLEs in use across the sector. The stability of this position (some colleges are already considering changing their VLE) only adds to the uncertainty. Collaborative developments in producing assessment items should therefore try to ensure that their distribution is in standards based formats. The only sustainable solution is to ensure that the product base in use will be compliant with the emerging interoperability standards as far as is currently possible.

The position of the SQA has developed during the life of the project. There are still some barriers to utilising CAA resulting from their lack of experience in applying the technology with consequent reluctance to provide guidance on features which have no corresponding traditional basis for comparison e.g. random selection from an item bank. Development should still proceed, but collaboration should be encouraged to ensure that the sector is adequately positioned to influence the operational models which SQA will eventually dictate.

There is now a trend towards more holistic approaches and the sampling of knowledge and skills, e.g. the new SQA Higher National design principles. The use of objective testing is more easily incorporated as part of a wider range of assessment strategies. It would be wrong to see this simply as a separation of different forms of assessment to match different levels of cognitive ability. In our view, it presents as an opportunity for FE practitioners to regain a degree of professional judgement in assessing the performance of their students. The mix of objective questions with other traditional written responses or methods could achieve this. It could be viewed as a mix of 'hard' and 'soft' assessment criteria, objective and subjective – blended assessment for blended learning!

Recent Developments

The SFEFC have accepted that a first step to more widespread deployment of CAA is the construction of national question banks, and has funded a new project under the management of the Colleges Open-Learning Exchange Group (COLEG) to produce it. The question bank will initially attempt to cover as a wide range of the Scottish FE curriculum as possible. The project is attempting to involve as many colleges and staff in an attempt to increase the capacity of the sector to become involved with CAA. They are

on target to produce, in the first phase, some 3000+ questions, which will be available to the whole sector upon completion.

The recommendation that SQA produce their own guidelines was also followed up. The SFEFC provided funding to the SQA to produce a set of guidelines for the Scottish FE sector for implementing CAA. The SQA have restructured and now have a CAA research group actively involved in a number of projects including one on e-moderation. They are also major contributors to a Scottish Executive funded project called "Project on Assessment in Scotland using Information Technology" (PASS-IT). Other contributors are the Scottish Centre for Research into Online Learning and Assessment (SCROLLA), based at Heriot Watt University, the BBC and Scottish Further Education Unit (SFEU). This 2 year, £1 million project has specific practical and pedagogical research themes across both the schools and FE sectors, including automated marking of short text response items. Other developments in progress by SQA now include an advanced diploma in e-learning with a major component on e-assessment, and an internal project looking at the process of moderation in the 'e-environment'

The JISC have funded a project "Technologies for Online Interactive Assessment" (TOIA), led by Strathclyde University, to produce an assessment authoring and delivery engine based upon the emerging specifications. The tool will be free to both FE and HE sectors. We will shortly be entering the product evaluation phase of this project.