

## **SCOTTISH QUALIFICATIONS AUTHORITY**

### **Moving towards computer assisted assessment**

#### **1 Introduction**

Over recent years SQA has become increasingly involved in a number of E-Learning and E-Assessment initiatives. To ensure a strategic approach to this work a dedicated Computer Assisted Assessment (CAA) Team has been established and SQA has established a strategy for the development of CAA.

#### **2 SQA's Computer Assisted Assessment Strategy**

In an indication of its strategic commitment to CAA, in May 2003 SQA established a dedicated CAA Team. This team, drawn principally from those staff already involved in CAA-related work, sits within SQA's Policy and Research area and will form the focus for future development of CAA.

SQA defines CAA as assessment activities which are supported by the use of information and communications technology (ICT). CAA can include:

- ◆ Delivery of assessment tasks and results to students and tutors.
- ◆ Assessments which are taken using computers for all, or an element, of the assessment.
- ◆ Computer marking of assessments.
- ◆ Electronic collation and transfer of grades and assessment data.
- ◆ Electronic delivery of training and support materials.

During the remainder of 2003 one of the CAA team's key tasks was to develop a coherent strategy for the development of CAA. This strategy, which was approved by SQA's Qualifications Committee in October 2003, relates to internal assessment initially and, eventually, to external assessment. It was developed through a process of collaboration and consultation, evolving in line with SQA's broad corporate vision and its existing e-learning and assessment initiatives. It also took account of national initiatives, such as the National Grid for Learning, the strategies of major external stakeholders and the needs of SQA's customers.

SQA's work based on its CAA strategy will aim to improve assessment and quality assurance and to bring about:

- ◆ more flexibility in when and where assessments are taken
- ◆ improved access, especially for candidates with additional assessment needs
- ◆ enhanced validity and reliability of assessment
- ◆ more cost-effective processes & enhanced practicability
- ◆ enhanced reporting & feedback to students and centres

There are many ways in which technology can be used to modernise SQA's assessment and quality assurance processes. Work is already underway in the areas of:

- ◆ developing assessments online (internal)
- ◆ item-banking of assessments
- ◆ E-Moderation of internal evidence
- ◆ development of online training for markers

The remainder of this update describes this work and other projects which form the basis for SQA's new CAA strategy. There will be on-going consultation with key stakeholders as the CAA strategy and the programme of work that is based on it evolves.

A particular focus in the coming period will be strengthening SQA's links with other organisations in Scotland, the wider UK, and internationally, that are also seeking to develop programmes of CAA work. SQA sees collaboration and sharing knowledge and practice as essential to the effective development and roll-out of CAA.

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### **3 Itembanking**

A number of computer assisted assessment projects, which SQA is either participating in or is responsible for developing, involve the itembanking of questions to facilitate storage, quality assurance and reuse. A review of current itembanking developments within SQA was carried out earlier this year. This review looked at issues such as the use of the banks, the software that the banks are using, what data the banks hold on the items, any analysis that takes place on the items as well as how the banks are populated and items selected from them. The review highlighted a variety of practice across the organisation, and produced recommendations for future development to ensure that all itembanks are well designed and robust.

The projects which aim to use itembanking are described below.

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### **4 SQA and COLA**

COLA (COLEG On-Lline Assessment) is an example of an *external* itembanking project involving SQA. COLEG (Colleges Open Learning Exchange Group) is currently developing a bank of high-quality, online assessment instruments for use in formative assessment in Scottish colleges. The project is funded by the Scottish Further Education Funding Council. Assessment items range across 17 curricular areas, and all levels, and are matched to outcomes of SQA qualifications.

The first phase of development work was completed by June 2003. Fifty-four writers completed 89 assessments (between 1,500 and 2,000 questions). A second phase of development work was established over the summer with 24 writers from nine colleges taking part. Workshops were provided for new writers. Feedback was extremely positive with all writers finding the workshops worthwhile and several expressing a great deal of enthusiasm for the project. By September, 55 assessments had been submitted for phase two (1,000 questions).

Three quality assurance staff have carried out checks on the assessments. Quality assurance checklists for each question type were produced and a further checklist was produced to confirm that related assessment information (metadata) had been provided. Briefing sessions were held for the quality assurance staff. Quality assurance staff provided feedback on the quality assurance process and on the templates used to create the assessments. They have identified improvements that could be made to the templates.

Since the aim of the project is to encourage colleges to make better use of their Virtual Learning Environments (VLEs), care has been taken to ensure that the assessment items produced can be delivered in the four main VLEs used by colleges in Scotland. Some VLEs are limited in terms of the question 'templates' they can incorporate therefore the project is using four question types only (multiple choice; multiple response; fill in the blank; and matching).

A Technical Advisory Group (TAG) has been responsible for looking at the technical issues related to the project. The conversion tool — to convert the assessments in the templates to a standards compliant format — is currently being tested by 'volunteers' from the Technical Advisory Group who use the four major VLEs. Two quality-assured assessments which include all the different question types and graphics have been used as exemplars for this process.

It is likely that, in time, a central receptacle will be made available for storing the itembank. The dissemination strategy is currently under debate, and not yet agreed, although a central access point is seen as desirable.

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## **5 Online Delivery of Higher National Qualifications**

SQA is intending to undertake work to develop online summative assessments to support delivery of Higher National qualifications. This initiative will involve SQA working very closely with the COLEG On-line Assessment project (COLA), building on the achievements of that project so far, with the further education sector generally and with a commercial software supplier. The aim of the project, which is at a very early stage, is to create a robust, user-friendly computer assisted assessment system which will host a wide range of quality assured assessment materials. Training and development will also be provided to support writers who help to prepare the assessments and

implementation within those Scottish colleges which wish to access the assessments.

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## **6 Online Assessment in Intermediate 1 Computing**

A small team, which includes the Qualifications Manager for Computing and the Principal Assessor for Computing Intermediate 1, as well as staff from SQA Policy and Research, have prepared three electronic Nabs for each of the five Units in the Computing Intermediate 1 qualification. There are also plans to produce an online examination.

SQA Policy and Research are currently working with SQA Assessment Materials Team, who will carry on this work in the future. Policy and Research staff are also liaising with SQA Quality Assurance staff to seek their guidance on both content and quality assurance. It has generally been agreed that the approach taken in this project is acceptable and could provide suitable evidence of achievement, however, the final decision on this will be made shortly, and in the meantime the research team has released some of the materials to allow both staff and pupils to practise.

The NABs will be tried out online initially with the support of the SCROLLA team at Heriot Watt University but in the longer term the intention is for SQA to maintain a server for this type of piloting and research work.

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## **7 Qualifications Online**

SQA has developed, or is in the process of developing, a number of qualifications which support online learning and assessment.

### **7.1 PDA in Online Learning**

A new Professional Development Award (PDA) in Online Learning was launched in June of this year. The PDA is designed to provide learning professionals with the skills and competences required to use technology to promote learning.

The qualification offers breadth, depth and flexibility. It contains a range of Units at HN level (SCQF levels 7, 8 and 9). The Units are grouped into three themes: assessment; communication; and materials. The Units also follow the classic training cycle of theory, practice and review, allowing candidates to engage with different topics in different ways.

To complete the PDA, candidates must attain seven credits, including a double credit consolidation Unit that draws together the various themes. However, since there are only two compulsory Units, candidates can construct pathways

through the award to meet their professional development needs. The range of topics makes the award applicable to staff in a wide variety of roles — including online tutor, materials developer, and those providing support to learners.

The modular framework is also ideal for candidates combining professional development with work. The Units are self-contained and can be taken individually or as part of the PDA. This offers opportunities for those who require development in particular areas, such as delivering online assessment or offering guidance online.

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## 7.2 E-Qualifications

A further range of qualifications is available/under development in this area. It consists of four awards:

- ◆ Diploma in E-Learning: Production
- ◆ Diploma in E-Learning: Delivery
- ◆ Diploma in E-Assessment
- ◆ Advanced Diploma in E-Learning

The Diploma in E-Learning: Production is now available to centres. The three remaining awards will be available to centres in the first half of 2004. SQA is presently liaising with a Higher Education institution with the aim of providing an M.Sc. in E-Learning for candidates who wish to progress beyond the Advanced Diploma.

The Diploma in E-Assessment is the first national qualification of its kind in the world.

More information about these developments can be found at:

- ◆ <http://www.smartgroups.com/groups/e-qualifications>

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### 7.3 PC Passport

PC Passport is a new suite of IT qualifications. It is currently being piloted in a number of centres and will be available to all centres from January 2004.

There are three levels:

- ◆ Introductory SCQF level 4
- ◆ Intermediate SCQF level 5
- ◆ Advanced SCQF level 6

Centres will have the option of assessing candidates' knowledge and understanding through online assessment from early 2004 and practical skills will be assessed through an e-portfolio from the second half of 2004.

More details here:

- ◆ <http://www.smartgroups.com/groups/pcpassport>

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### 7.4 Scottish Progression Award in Building Crafts (SPABC)

Scottish Progression Awards (SPAs) were originally designed to provide vocationally-orientated school students with knowledge and skills relevant to further work or training. Following their initial introduction in 1998 SPAs were not widely taken up. However, Glasgow City Council and a number of other local authorities have recently decided to allow S3 and S4 pupils to substitute a vocational subject for a non-core Standard Grade. SPAs are being re-launched to meet the needs of this type of initiative along with the recommendations on flexibility in the curriculum, as detailed in the Scottish Executive document *Determined to Succeed*.

It is anticipated that many candidates taking SPAs may dislike traditional paper and pencil tests. To address this, SQA is piloting online assessment for the knowledge elements of the Construction SPA (SPAC). The SPAC is being developed as a very basic multiple choice test, primarily based around health and safety. The idea is to have an itembank containing a series of questions on particular aspects of the course. The pass-mark will be high, but it will only contain questions which are readily attainable, thus providing a positive motivational effect on candidates and at the same time ensuring coverage of the curriculum.

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## 8 Research and Development

There are a number of important research initiatives underway. Some of these are wholly internal but most involve collaboration with external agencies.

### 8.1 PASS-IT Online Assessment Project

PASS-IT is a collaborative project involving SQA; the Scottish Centre for Research into Online Learning and Assessment (SCROLLA); Learning and Teaching Scotland; BBC Education; and the Scottish Further Education Unit (SFEU). The project builds on previous research between Heriot-Watt University and SQA to explore the potential of ICT-based assessments for internal summative purposes, which could also be used in a formative assessment capacity.

The aim of the project is to create, pilot and evaluate different online assessment approaches to support teaching and learning, support candidates with additional needs and investigate quality assurance issues.

The project is divided into two phases: Phase 1 ran from August 2002 until Oct 2003. During this phase the research team developed and piloted online assessments for NC Mathematics NABs at Higher and Advanced Higher; NC Chemistry NABs at Higher and Advanced Higher; and HN Computing Unit assessments. The objective test element of the HN Integrative Assessment was also converted into an online format. Seven schools, three colleges and over 400 candidates took part in the pilots. The results have been analysed and the findings will be made available on the project website before the end of the year ([www.pass-it.org.uk](http://www.pass-it.org.uk)).

As part of Phase 1 the research team piloted the use of software which can automatically mark short free-text responses. Software simulations were also used to develop online Chemistry activities which can be used to practise the Prescribed Practical Activities for Higher and Advanced Higher Chemistry. The intention is to try these approaches out again in Phase 2 of the project.

Pass-IT is now entering Phase 2 which will run until October 2004. During this phase the research team will develop online NAB assessments from Access 2 to Intermediate 2 in Mathematics; Higher French (Listening and Reading); Higher Music (Listening); and Intermediate 1 English. These will be piloted in a number of centres between December 2003 and May 2004.

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## **8.2 Online marking guidelines and marker training**

There are two distinct strands to this work: firstly the Invest to Save Project which is currently concentrating on English and Mathematics and, secondly, the Understanding Standards project which has been funded through the National Qualifications Review and brings in other subjects. While the funding is separate both follow a very similar approach.

### **(a) Invest to Save Project**

Invest to Save Budget (ISB) is a Treasury-funded initiative to support the development of innovative ways of delivering public services and thereby reducing costs and/or improving quality. Partnership is key to the initiative and in 2001 SQA joined with the three regulatory bodies in the UK — ACCAC, CEA and QCA — to run a programme looking at ways in which tests and examinations could be delivered more efficiently. The context in the rest of the UK is the statutory Key Stage tests while here in Scotland we are focussing on National Qualifications. While others have looked at the organisation of marking (central or distributed), the mode of marking (scanning and electronically marking) or the use of computer-assisted assessment, SQA's interest has been online training and support for markers.

The first pilots using the new web-based training and assessment materials were run with the Higher English and Higher Mathematics marking teams earlier this year. The reaction was generally very positive, with most participants agreeing that this would be a useful resource for marker training. The research team is now beginning a phased roll-out of the website with the examining teams in around a dozen subjects at Higher level.

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### **(b) Understanding Standards — NQR funded developments**

Since it is anticipated that the approach being used for the Invest to Save Project would be helpful to other teaching professionals SQA is also developing online guidelines and training for a number of other subjects through the project entitled 'Understanding Standards Website: Marking Guidelines'. There are two stated objectives of this project. Firstly, to develop definitive and comprehensive marking guidelines for selected subjects and, secondly, to develop interactive training materials to exemplify these guidelines.

In all of the subjects the same approach applies — using practice in the application of general principles to promote a consistency in marking a subject at a certain level. The subjects involved are: Biology, Business Management, Care, Chemistry, Computing, History, Home Economics, Modern Languages, Modern Studies, Physics, RMPS and Technological Studies.

Once again, a phased roll-out of the website is just beginning. Ongoing necessary amendments to content will be made and the research team will try to ensure that technical issues are addressed at an early stage.

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### **8.3 5–14 Pilot Project in Dumfries and Galloway**

In partnership with ALTA Systems (Queens University, Belfast) and Dumfries and Galloway Education Authority, SQA is piloting online assessment at 5-14 level in Numeracy using a tool developed by ALTA. The tests being delivered are adaptive, delivered on-screen and have been designed principally for formative purposes. They are being carried out in five primary schools and one secondary school. The pilot also includes Units in Language, although in this area the ALTA system is used to provide marking guidance for teachers rather than automatic marking.

The pilot project has provided SQA with valuable information on the potential for wider use of such a system and has been enthusiastically received by teachers and pupils. Based on the success of the pilot to-date, planning has begun for a new phase of work. The partners have developed a proposal for a longer term project which will require significant funding. This proposal was recently considered by the Assessment Action Group, which is coordinated by the Scottish Executive, and a meeting with the project partners has been arranged for late November.

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### **8.4 The E-Moderation Project**

This project (jointly funded by the Scottish Further Education Funding Council (SFEFC) and SQA) covers either online moderation of electronically-held evidence or moderation of online assessment. The purpose of the project is to scotch myths around online moderation. It aims to:

- ◆ undertake research into the effect on moderation of online assessment
- ◆ develop guidelines for colleges on moderation (internal and external) in the E-Learning environment, and pilot these in a small number of centers
- ◆ develop guidelines for moderators
- ◆ assess how E-Moderation can be used to assist the cost effective delivery and assessment of qualifications
- ◆ develop a specification for an electronic portfolio
- ◆ generate case studies of good practice

The project is led by the full-time external moderator for Computing and Information Systems, supported by an Operational Group of three colleagues from further education. He will consult with a number of colleges and organisations such as SFEU and COLEG. Some colleges have agreed to

participate in a small pilot of summative assessment and e-moderation. The project is scheduled for completion by January 2004.

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## 8.5 MARVEL

MARVEL is a European funded project which aims to develop online learning and assessment material in the field of mechatronics. The main target groups are students in vocational education and training and colleges which lack high tech facilities. In addition to allowing remote and mobile access to physical workshop and laboratory facilities MARVEL will offer assessment solutions for practical work and skills.

The project partners come from a range of European organisations including industry, universities and colleges. The countries involved include Scotland, Greece, Germany, Portugal, Cyprus, and Switzerland. SQA's role in the project is to advise on assessment and quality assurance aspects of the project as it relates to SQA qualifications.

The Scottish college involved in the partnership is West Lothian College. They have established that the principle of remote access and control between Scotland and Germany is possible. At present they are establishing whether or not the average student has their own machine, capable of connecting to and operating the system, or has access to the appropriate equipment elsewhere to allow them to take part in the experiments. A meeting is about to take place between SQA and the college regarding the assessment side of the project and how to implement the safeguards required to carry out online assessment. The college is also hopeful that they will soon have a candidate who is undertaking a Unit, who may participate in a trial for the system. The next full partnership meeting is due to take place in March 2004, where everyone will add their contribution.

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## 9 Publication(s)

There is an SQA publication which is relevant to the E-Learning and E-Assessment area.

### ♦ **SQA Guidelines on Online Assessment for Further Education**

The PASS-IT project will generate guidance on online assessment for all centres by October 2004. However guidance for the further education sector was needed sooner rather than later therefore, in 2002, SFEFC supported a project to produce Guidelines on Online Assessment for Further Education.

The project was directed by a steering group of further education representatives and the guidance was produced by a consultant. The guidance contains advice on:

- ◆ why to use online assessment — and when not to use it
- ◆ what you need for online assessment — including staff development and technical support
- ◆ software and hardware issues
- ◆ developing online assessments — deciding on question types
- ◆ ensuring technical quality of items
- ◆ deciding on delivery methods
- ◆ security and authentication features — including invigilated test sessions
- ◆ supporting candidates and designing feedback

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The publication is available from the SQA's Customer Contact Centre (telephone: 0845 279 1000, or e-mail: [customer@sqa.org.uk](mailto:customer@sqa.org.uk)), publication code AA1641, March 2003, or can be downloaded from the SQA website (**[www.sqa.org.uk](http://www.sqa.org.uk)**).

### **10 E-Assessment online community**

An online forum has been established to provide support for individuals who want to keep up-to-date with CAA-related developments within Scottish centres. More details can be found here:

- ◆ <http://www.smartgroups.com/groups/e-assessment>

There are currently over 300 members of this online community making it the largest CAA-related online forum in the UK.

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