ACADEMIC APPROACHES AND ATTITUDES TOWARDS CAA: A QUALITATIVE STUDY

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Introduction

As CAA becomes more widely promoted in UK HE, it is important to gain a critical understanding of how academics view it as an assessment method, what types of learning it is considered capable of assessing, where its use is positioned within the curriculum and what are its perceived strengths and weaknesses. This study attempts to draw together the views of a collection of users and informed non-users of CAA and to articulate a set of mixed attitudes to issues such as learning levels, curricular impact, and support. It also attempts to preserve some of the minority perspectives on CAA which can be lost in the analysis of quantitative data.

This paper is based on data from a qualitative study into the use CAA in UK higher education. The research is part of the CAA Centre National Survey and has built on the findings from phase one of the study, which comprised the analysis of over 750 questionnaires completed by academics, educationalists, staff developers and quality assurance staff (Bull and McKenna 2000). Topics considered here include reasons for and against the use of CAA, question design, the capacity to assess higher order learning, student response, the use of CAA with students with special needs and the role of institutional support.

Methodology

Participants for the study were selected from the pool of respondents to the National Survey questionnaire. They were chosen because they expressed particular views about the use of CAA, and in some cases had implemented innovative testing practices using C & IT. They comprised academics and educational researchers/technologists from old and new universities. Participants included users and non-users of CAA (though the majority had some experience with computerised testing) working in chemistry, pharmacology, engineering, history, philosophy, biology, mathematics, geography, modern languages, computer sciences and learning support units. Data were collected from two focus groups at different institutions and 13 semi-structured interviews with staff from one college of higher education, 2 pre-1992 universities and 2

post-1992 universities. In total, 25 people participated in the qualitative study. The data have been analysed and grouped into themes, some of which are reported here.

Reasons for using CAA

The participants who had direct experience of CAA used OMR, computer-based assessment, and an audience response system which involved students answering centrally projected objective test questions, in a group setting, via handsets. Among the experienced participants, relatively few had used CAA for either diagnostic or self-testing purposes. The majority used CAA for formative (usually scored formative, in which term-time assessments are counted towards an end of module mark, Mackenzie 1999) or summative purposes.

A common reason cited for using CAA was to promote regular learning and, in at least one instance, to improve student progression. In the latter case, a testing programme was introduced into all first-year modules of a maths programme following concerns that the rate of failure was too high, and that students were not mastering the necessary concepts at foundation level. This motivated the appointment of an educational technologist to design, run and analyse CAA tests, and the lecturer in charge of the programme reported a change in student learning behaviour ("There's far more effort over a prolonged period rather than a short intense burst at the end") as well as an improved pass rate. In a related example, in which students attend tutorials at intervals throughout the term with 4-5 lectures occurring in between tutorial sessions, CAA tests are delivered at the start of each tutorial and they cover the material from the previous lectures. The lecturer perceived the tutorial sessions to be more productive, because students did not turn up to them "cold", and the tests contributed 25 per cent to the overall module mark. Similarly, the ability of CAA to test the breadth of a module/unit was mentioned by participants; for one long-term CAA user "the fact that you have short answer methods means that students have to learn more of the course."

The issue of high marking loads and time savings also arose frequently, and while not the main drivers for CAA for most users, these were key motivating factors for several, who mentioned rising student numbers as the main reason for adopting CAA. There were, however, mixed experiences with time savings. One interviewee, when asked why she started using CAA, responded "Why? Numbers. We were running very large groups... Having gone down that road, I use it with smaller groups." Her first test involved 300 students and the lecturer estimated that the extra time taken to develop new questions meant that there was no time savings, but no extra cost of time either. The time savings is now substantial. On the other hand, one participant observed that although CAA eventually saves time, all the time costs are at the beginning, whereas, with essay questions, the setting of the paper is much faster at the start of the process. Another lecturer who has used CAA for over 10 years suggested that he has only recently experienced a time savings: "The class sizes of over 100 mean that there is a

substantial saving in time. However, this is offset by doing more and better things such as diagnostic tests in induction week."

In a case where CAA was used solely for self-assessment, such that no savings in marking time were made, the motivating factor was still large student numbers (and the resultant range of mixed subject experience.) One method of coping with cohort size and heterogeneity was to introduce CAA to offer increased and unlimited opportunities for practice and feedback. Elsewhere, in a related pedagogical move, CAA was introduced as part of a larger paradigmatic shift within a department towards self-directed learning.

In the case of the audience response system, CAA was incorporated to give students experience with objective test formats used in their professional exams. However, the main reason for continuing with the system has been to promote interaction and discussion in teaching sessions and to help tutors modify the course in accordance with student needs: "if they all get it right, we'll move on... We can focus on areas where there is a misunderstanding or confusion."

Why CAA is not used

Several of the interviewees did not use CAA and the reasons given for this were both technological and pedagogical. One participant said, " I don't use it because I'm not terribly technologically au fait. I also have grave reservations about the effects of CAA on student learning." Two other interviewees (from humanities and social sciences departments) felt that the question types demanded by CAA were unsuitable for their subjects . Another user in a humanities department faced resistance to the implementation of CAA because a number of her colleagues considered CAA to be unsuitable for a discursive subject.

Two academics who used CAA widely for formative assessment did not use CAA for final examinations, but for quite different reasons. The first said that he was "nervous about doing anything summative" largely, it would appear, because he felt CAA could not assess problem-solving skills. The other user, who would have liked to use more CAA in his assessment profile, reported that departmental regulations prevented him from using CAA for final examinations. Additional issues surrounding non-use are discussed this section on question design below.

Pedagogic issues

Process

Participants tended to be most critical of CAA when considering question design limitations, particularly in relation to the assessment of higher order learning. (Although, even here there was disagreement over the extent to which this was a strength or

weakness.) Additionally, the changes incurred in the assessment *process* through the introduction of computers also elicited mixed views.

Some lecturers argued that CAA was enabling for students, and that particularly when used for formative assessment, it promoted a more reflective, private type of learning, over which the student had some control:

> "it provides a private area where students can commune with it".
>
> "they [students] don't have to be here. [They are] really continuing their learning outside in an off campus environment they're comfortable in."

However, others regarded to the process as mechanistic. One lecturer, who uses CAA as a self-assessment tool commented that, "it's difficult to stop [CAA] becoming mechanical -that is, you just remember the actual answer rather than actually knowing what it is."

A non-user who works in a faculty where CAA is widely used, made a related observation. He suggested that the use of CAA reinforces in students a reductive view of education which sees learning as "data transfer" rather than the assimilation and manipulation of knowledge: '[Students believe] that higher education is "not about the facilitation of learning; it's about information transfer. CAA confirms this view".While the above represent a minority perspective in terms of process, there were related concerns expressed in the area of CAA and learning levels.

Learning Levels

Most of those taking part in the study felt that CAA was most suitable for testing basic knowledge and comprehension, sometimes characterised as "first year" material:

> "you can test … terminology, but you can't really test synthesis to any great level."
>
> "Most of level 0 and level 1 modules can be tested objectively, especially the skills-orientated topics. However, ideas of proof, synthesis of information and mathematical modelling are not suitable, mainly because you cannot provide meaningful feedback to students who go wrong."
>
> "I think you can only do simple questions; you cannot do more complicated questions, even for the first years, because they demand a chain of calculations that you have to do. Part of what you have to demonstrate in the assessment is that you can come up with this strategy for solving the problem. I don't see how you can assess that with a computer... I don't see how you can replace the bit of

paper where people write down how they got there. I wish you could get computers to assess people's chain of reasoning."

However, others welcomed the focus on basic concepts that much objective testing tends to emphasise. A philosophy lecturer who introduced CAA for self-testing said that while she has reservations about using non-discursive questions to assess philosophy, she feels, nonetheless, that students must understand very basic units of knowledge before they can build more complex philosophical arguments: "it [CAA] enables students to know "facts" about philosophy... If you are going to embark on a logical argument you need some facts to start with".

Similarly, another proponent of using CAA for testing basic knowledge, even in final year modules, suggested, "My view is that if you don't watch out, students have got no grip on even things like terminology, and this [CAA] at least forces them to get a grip on the basics." However, he believes that basic understanding is really all he can test in this way: "I cannot do synthesis or real analysis."

Lastly, a computer scientist who used CAA with final year students took a more positive approach when describing the range of the curriculum which was potentially examinable by CAA: "Everything is probably suitable … It depends how you approach it and what you want to assess..."

For many of the above respondents, the term CAA is almost synonymous with multiple-choice testing. However, three members of the study, who had experience of CAA environments that supported a wider range of question types, including simulations, suggested that they were able to assess higher order learning. One educationalist, who had switched from using MCQs, cited increased flexibility as the reason: "It's very difficult to get at the problem-solving skills and higher levels of ability even after a lot of practice at trying to write these things [MCQs] which is ... why we were wanting to go for a more flexible system where we can have a selection from labels, sequencing steps and experiments and that kind of thing... We're working on simulations, things like Petrie dishes and cultures... and construction questions." There was a general consensus among participants in the study that, in future, the ability of CAA to simulate real world activities, such as scientific experiments, would be its true educational strength.

Question writing and banking

For many participants , writing appropriate CAA questions was time-consuming initially, because it often involved a shift to new question formats. As one lecturer commented, "I had to produce a multiple-choice test which obviously would be easier to mark, and [encountered] difficulty in actually structuring the questions with appropriate answers

without falling into the pitfalls of double negatives, of misleading questions... It is so difficult that you almost have to be a professional at creating these questions." One user who had constructed simulations and sequencing questions spoke of spending three days on a single question and had taught himself programming in order to create test items. (He received substantial financial support from his department and had a small team of postgraduates helping him develop questions.)

Another participant expressed his concern that the time required to update CAA tests resulted in the process being neglected. He argued that time constraints meant that lecturers were reluctant to write new questions and change a module once they had devised a suitable examination: "The time spent on some of these tests tends to ossify our modules... Are the benefits really warranting this amount of time?" This position would appear to be supported in part by the fact that the data revealed little evidence of systematic evaluation and updating of questions.

In a number of sessions, the discussion of the time required to write good test items led directly to conversations about the potential merits of question banks. The majority felt that sector-wide banks were a good idea for reasons of question sharing (and thus time savings) as well as to enable lecturers, particularly those new to CAA, to see alternative ways of framing questions. However, a number of organisational and pedagogical difficulties were raised, including a reluctance by individuals to share questions; a reluctance to use questions written elsewhere; variance in standards; operational concerns; and a possible narrowing of the curriculum. One participant worried that national item banks could conceivably lead to a national HE curriculum.

Student attitudes

Most participants reported that evaluative, observational and anecdotal evidence suggested that students responded positively towards CAA. Those reporting negative responses included a lecturer in veterinary medicine who suggested that his students strongly preferred essay or short-note style questions, because they felt they could talk around an answer, even when they were not entirely certain of its correctness : "When you write an essay, you get 20 facts in and a lot of waffle. CAA is very much to the point; either it is right or wrong." Another found that students became frustrated when they repeatedly received negative feedback in formative assessment.

However, most indicated that students liked CAA. One participant described a three-year evaluation with school-age students, undertaken by researchers working at a national examination syndicate, which found a strong correlation between general computer experience and satisfaction with CAA: "The more that they [students] use computers, the more they like computer-based assessment." They also responded favourably to the "objectivity" of the CAA: "they thought it was much, much fairer."

Another lecturer reported that when students were given a choice of two types of sessions to attend , either a conventional, tutor-led session with questions on paper or a computer-based session with the same questions presented using CAA, none chose to go to the traditional, face to face sessions.

Others suggested that students liked the ability to repeat CAA tests and receive feedback. In the case of CAA with the audience response system, students were said to appreciate the immediacy of the feedback and the "relaxed" way of learning. They also claimed it was "fun": "It's broadened the amount of formative work they do and opened the scope for interactive teaching." The lecturer suggested that students had an improved perception of their learning experience, but he felt that the actual effects of the system upon student performance were difficult to quantify.

This was typical of many participants. One member of a focus group felt that the introduction of CAA (and CAL) meant that fewer students did very badly, but that there was not much change in the rest of the students' scores. Another commented that as CAA was "just one small element of the overall delivery" it was very difficult to ascribe any change in performance to it. Another speaking of the impact of his diagnostic CAA tests said, "our evidence [that CAA affects students' performance], such as it is, is ambiguous. This needs looking at with a proper control group."

One example in which interim results suggest that CAA is having an impact upon student performance is in the first year of a mathematics programme in which a regular programme of invigilated testing (discussed above) was introduced to improve the rate of progression for the first to the second year. Early results indicate that pass rates have improved due to the CAA intervention.

Several lecturers spoke about the relationship between students and machines in the CAA process. One educationalist who was not using CAA said that his past experience was that some mature students were "frightened of" computers. However, he felt that this would be short-lived phenomenon as people increasingly use computers at home and at work. Interestingly, none of those using CAA expressed this concern. One user suggested that his students, who used CAA for diagnostic reasons for don't mind "revealing their ignorance to a PC" as much as to him. Another lecturer, whose students used CAA as part of lab sessions that could last up to four hours, reported that student antagonism or frustration about the assessments was always directed at the machines; the students did not seem to associate him [the lecturer] with the assessments (particularly feedback), even though he was clearly the author of them.

Special needs

Staff at three institutions had direct experience of using CAA with students with special needs. Students who are unable to use computers are given the option of taking the tests on paper. Generally, as with paper-based assessments, students with conditions

such as dyslexia, arthritis and ME are awarded extra time to complete assessments. More inventive, computer-based solutions included

- running an assessment on a flicker-free screen for a student with epilepsy;
- the use of CAA for a student with severe visual impairment who preferred viewing tests online because he was able to make adjustments to the image;
- the introduction of voice-recognition technology for students with physical impairments, and
- integrating three pieces of specialist software for those suffering from dyslexia.

Despite these examples, provision for students with special needs is varied and procedures for supporting students using CAA appear often to be developed on an *ad hoc* basis.

Support

Several related issues arose, as did discussions of the relationship between academics and educational technologists . The need for staff development in question design was mentioned repeatedly, but there were mixed views about the role of support staff in other areas of CAA. It was observed that research commitments take priority for academics, so without time release and technical help, the uptake of CAA would be limited. Areas of technical support desired included advice on screen design, colour, images and overall presentation. One participant commented, "The support that I would really love to have is a member of the team who was good at the authoring and design side of it, so that the rest of us could spend time thinking about the learning processes and the objectives that we're looking at." However , there was some disagreement about the extent to which lecturers should be involved with the technical design and development of CAA tests. Some felt that academics should have experience of the process because this would influence test construction; others felt that academics should only supply questions and feedback and let someone else create the tests. Most felt that support was needed to "kick start" the use of CAA, even if some technical responsibilities were eventually taken over by academics.

In terms of the location of support, there was a preference expressed for educational/technical support to be based in the faculty rather than positioned centrally. Additionally, some antipathy was expressed towards "educational researchers" and several participants perceived a "gulf" to exist between such researchers and academic staff, citing reasons such as culture, jargon and prescriptiveness. However, one participant felt strongly that he would have benefited from more in the way of educational guidance.

Conclusions

The limited scope of this study means that findings are not representative and should be viewed within the context of the sample. Nevertheless, the five thematic categories

identified for discussion (reasons for and against using CAA, suitability for assessing different learning levels, question design and sharing, perceived student attitudes, and support) were of significance to most participants and suggest areas for future research.

CAA was frequently adopted in order to modify student learning patterns - to encourage wider coverage of the course, motivate self-directed learning, and prompt more regular study behaviour. In accordance with general research on the link between assessment and learning (Brown et al 1998, Heywood 2000), lecturers report that such intervention did indeed alter learning behaviour. Although most viewed this as a positive feature, a minority of participants expressed concern that CAA would potentially have a deleterious impact on student learning, promoting a mechanistic approach to education.

In terms of suitability for different learning levels within the curriculum, those who largely used CAA with multiple-choice questions tended to perceive its use as restricted to the assessment of lower order skills, while those who had used extended question types, involving multimedia, simulations, etc. considered CAA to be capable of assessing higher order learning across the entire curriculum. In accordance with Bennett (1998) and Bull (1999), it was felt that the future of CAA lay in the area of simulation and multimedia-based assessments.

In terms of subject discipline, CAA was generally felt (particularly by non-users) to be less appropriate for arts and humanities subjects than for science subjects, and practitioners working in the former reported the most resistance from colleagues. For all subject areas, the evaluation of question and test performance would appear to be neglected areas.

Student response was perceived to be positive, but further research is needed to determine what the real impact of CAA is upon student performance. In terms of those using CAA with students with special needs, it would seem that in many instances the default position is to offer students the same questions on paper. As more sophisticated CAA examinations are developed, it will be increasingly difficult to reproduce versions of tests on paper, and therefore, computer-based solutions (along the lines of those outlined above) will be required.

Finally, on the topic of the location and nature of CAA support, there was a preference expressed for a faculty-based model as opposed to a centralised model of support (Stephens et al. 1998). Although usually addressed only implicitly, it would seem that perceptions about support for CAA (particularly the relationships between academics and educational researchers) were frequently bound up with issues of power and authority within the institution and such an area, like others outlined above, would benefit from further investigation.

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