EVALUATING THE INTRODUCTION OF CBA INTO THE LEARNING, TEACHING AND ASSESSMENT STRATEGY OF THE DIAGNOSTIC RADIOGRAPHY COURSE AT SHEFFIELD HALLAM UNIVERSITY

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Abstract

Summative Computer Based Assessments (CBAs) with associated formative feedback have been introduced into the BSc (Hons) Diagnostic Radiography course at Sheffield Hallam University (SHU).

CBA was selected for a number of reasons: it is a natural progression of the current use of information technology (IT) in learning and teaching; it further develops essential IT skills; it allows real medical images to be viewed; it tests students prior to placement, therefore helping to ensure appropriate levels of knowledge and understanding, and consequently reducing the burden of supervising radiographers; students requiring additional tutor support will be identified at this stage; it is thought to be an efficient use of lecturer time; it is anticipated that there will be a reduction in potential biases surrounding the marking process; an 'easy' to use CBA system is readily available in SHU's adopted virtual learning environment, Blackboard 5.5; SHUS's IT infrastructure is more robust than ever before.

Although CBA is only one method within a diverse overall learning, teaching and assessment strategy, it is new and innovative and is therefore being evaluated to assess the appropriateness and effectiveness of implementation

Summary to Date

Five assessments have been delivered successfully using CBA. Initially progress was slow, however the module leaders are now all reasonably confident in using Blackboard and its assessment package. Investment in staff time has been high but student feedback is positive.

There have been some technical difficulties that need resolving.
This paper presents an overview of both the formative and summative evaluations that have taken place to date and highlights the main issues raised. Recommendations for future practice, in this context, are made.

Introduction

Opportunity arose during course planning to modernise the Learning Teaching and Assessment (LTA) strategy of the BSc (Hons) Diagnostic Radiography course and to examine and question current practises. During this process the course team committed themselves to developing a series of summative Computer Based Assessments (CBAs) with formative feedback prior to students attending practice placement as part of the assessment strategy of the newly validated course. This strategy was introduced in September 2001. Although CBA is only one method within a diverse overall LTA strategy, it is new and innovative and needed to be evaluated. Evaluation will give vital feedback about the assessment using various methods and involving a number of key perspectives.

Context

The course runs throughout an extended year as students have to develop clinical competence. Consequently the LTA strategy has to support the integration of theory and practice in the most effective way so that students are able to maximise the potential of any learning experience. The primary strategy to do this is by the pattern of student attendance at University and practice placement. Students attend the University for 5 or 6 weeks followed by 5 or 6 weeks on practice placement.

In coming to a decision about which form of assessment is right and 'fit for purpose' the course team considered what was valid, reliable, fair, equitable, formative, timely, incremental, redeemable, demanding and efficient as suggested by Brown et al (1996). That is, the best and most appropriate methods of assessment of each module and the overall assessment strategy were discussed and selected.

As part of this strategy, CBA has been introduced in 5 discipline specific modules, which are delivered in years 1 and 2 prior to student placement. A weighted component of 20% was applied to this part of the module assessment.

A variety of terms are used to define assessment with the aid of computers, the one that most accurately describes the assessment in this context is;

Computer Based Assessment (CBA).

"Questions or tasks are delivered to a student via a computer terminal. In most cases, the student's answers are typed in at the computer keyboard and recorded and marked electronically. Computer-based assessments can be delivered in the following ways: using stand-alone machines: using a local area network of machines; using an intranet or Internet."

CAA centre - http://www.caacentre.ac.uk/fqgen1.shtml (accessed Oct 2001)

Why Assess?

There is currently a national shortage of radiographers and at the same time the workload has increased in response to changing Government Policy and targets, particularly the NHS Plan. The outcome may result in a decrease in the amount of time a qualified member of staff can spend with students. As an education provider, we must consider how practitioners might be alleviated of some of the

straightforward supervision and support roles. Assessing students at this stage will highlight students who require additional academic tutor support prior to placement, thus keeping the level of student support provided by practitioners manageable, realistic and acceptable.

Why CBA?

Within radiography education, CBA as part of the assessment strategy is new and innovative. It is also a relatively new development when compared to the use of computers in teaching throughout the education sector (Stephens et al, 1998), that is computers are used extensively for teaching and learning purposes, but less so for assessment. Using computers and associated software packages to support learning and teaching is commonplace throughout the curriculum at SHU and the move towards CBA was a natural progression.

The reasons for introducing CBA in this context are perhaps different compared to much of the literature. This tends to state that large class sizes, impersonality of courses, difficulty in providing much pedagogical support for students are all reasons for introducing CBA (Leonard, 1997, Croft, 2001). Course numbers are around 30 students per annum, consequently students are known to all staff and pedagogical support is high.

The radiography profession is directly affected by changes and developments in technology. Imaging departments are moving towards the use of digital imaging and Picture Archive and Communication Systems. Medical images are viewed and manipulated on a computer monitor, sent and received by other networked machines, and archived in a digital format. This means that CIT skills required of radiographers are high. Using CBA may go some way in helping students develop these skills.

CBA enables the use of actual medical images in the assessment as opposed to line drawings used previously in paper based examinations.

CBA would be marked automatically, to some extent, reducing any potential marker biases and making efficient use of staff time.

Why Summative Assessment with Formative Feedback?

The introduction of summative assessment with formative feedback prior to placement was agreed upon. Other options regarding the type of assessment and its timing were considered, such as keeping a purely formative focus, giving multiple attempts to pass, completing the assessment during a defined period of time rather than under timed and invigilated examination conditions. The course team, however, felt it to be most appropriate to have a summative assessment with a formative element as:

- it is incremental and part of the overarching assessment strategy that staggers assessment throughout the year
- early assessment and formative feedback helps students plan for their own development, making the most of their practice placement experience
- students need help in recognising the importance of the learning that informs placement experience, helping to integrate theory and practice

- it provides a suitable stimulus for students to review their learning prior to placement
- it provides a numerical mark which will indicate the students actual performance
- it identifies those who need further academic support by tutors
- it indicates to tutors what students have learnt and how effective the learning process has been.

The terms formative and summative refer to the purpose or intention of the assessment rather than to the methods used (Brown and Knight, 1994). With formative assessment the tests themselves are designed predominantly to contribute to student learning while summative tests are designed predominantly to contribute to student grades (Brown and Knight, 1994). The Quality Assurance Agency in their Code of Practice (2001), suggest that assessment is usually diagnostic, formative or summative, however go on to say that assessment can 'involve more than one of these elements eg coursework, summative contribution to grade with formative feedback.' (QAA 2001), which further supports the chosen assessment mode.

The confidence to implement this strategy has evolved through advances in and accessibility to technology, which is further supported through SHU's recent adoption of the virtual learning environment, Blackboard 5.5.

This proved to be a timely and realistic starting point for the development of the CBAs. Staff involved in CBA development have no need to understand the technology of Blackboard, thus leaving them free to concentrate on question and feedback generation. Access to the expertise of Courseware Designers in the Learning and Teaching Institute (LTI) at SHU and to Blackboard support personnel in Computer and Information Services (CIS) is available. Additionally, funding to support the implementation of this initiative for staff development, replacement hours for developer time and dissemination of evaluation findings is available through funding from the Schools LTA Committee.

SHU's IT infrastructure is now much more robust than it has been before which means that CBA should be a reliable form of assessment.

Aims

This project aims to consider both the specific and wider issues following implementation of CBA, albeit using a relatively small sample size.

The aims of this project are to use staff and student experiences to

a) document the formative evaluation of the process of implementing CBA
b) determine the appropriateness and effectiveness of assessment at this stage in the course
c) determine the appropriateness and effectiveness of CBA in this context
d) evaluate the appropriateness and effectiveness of the assessment package of Blackboard 5.5.

This project focuses its evaluation on 3 main aspects in order to determine whether the aims have been met

1. the timing and nature of the assessment - summative assessment with formative feedback
2. modernisation of the LTA strategy - computer based assessment
3. the technology used in delivering the assessment - the assessment package of Blackboard 5.5.

Method

The main stakeholders are students, staff team and CBA developer.

The sample was 1st and 2nd year undergraduate radiography students during 2001-02 and the staff group of 8 (including the developer).

Formative evaluation

Formative evaluation was used to capture thoughts and feelings as events happened, to inform the development of the assessment. An informal approach was taken.

1. The main developer (staff member 'A')

Staff member 'A' documented the implementation process, identified and recorded issues throughout and took on a monitoring role.

2. Feedback from students

Students were asked to send their thoughts and feelings via an email.

3. Feedback from staff

Staff were invited to comment via email, staff meetings, away days and following invigilation of a CBA.

Summative Evaluation

1. Questionnaires, students and staff.

Questionnaires were used to collect data from students (maximum 51) and staff (maximum 7, excluding staff member 'A'). The questionnaire was a mix of quantitative and qualitative approaches. Different questionnaires were used for each group, however some questions were matched.

The questionnaire was delivered online using the survey facility in Blackboard. This meant, however, that student perceptions could not be matched to their achievement in the CBAs due to the anonymous way that the survey system operates.

Group interviews are planned to explore issues arising from the questionnaires, however due to the timescale, they are outside the scope of this paper. Student perceptions and achievements can be matched at this stage

Overview of Formative Evaluation

Issues - staff member ‘A’ – to May 2002

Implementation process

1999-2000

- Ongoing course planning committee meetings
- Digital archiving of images in a digital format

2000-01

- Pilot of the summative assessment as hard copy in 2 modules
- Staff member ‘A’ (primary developer) completed an ‘on-line learning’ course, using Blackboard
- Staff member ‘A’ bid for and was allocated funding through the School’s LTA Committee
- Linked in with Courseware Designer from SHU’s LTI
- 5 Blackboard ‘courses’ set up
- Set up teams within staff group to work on each course
- Time allocated during subject group away-days to the development of CBA
- University offered a wide range of staff development opportunities in support of the introduction of Blackboard
- Staff member ‘A’ attended Computer Assisted Assessment Conference at Loughborough, July 2001

2001-02

- Specific staff development on using Blackboard for subject group
- CBAs set
- Students introduced to Blackboard early in semester 1
- Mock CBAs set up for each year cohort
- Delivered 9 CBAs (5 first attempts, 4 resits), October and March (year 1) and November and February (year 2) under timed, invigilated, standard examination conditions
- Summative evaluation May/June 2002

Staff member ‘A’ initiated the implementation process, however the expectation was that the work would be shared across the course team and strategies were adopted to enable this, see implementation process.

The implementation of CBA has created a steep learning curve for all.

It has been difficult to use the funding gained through the School’s LTA Committee on replacement teaching hours, consequently, the developmental work has been over and above staff member ‘A’s workload.

There was some staff resistance following the initial commitment to CBA. Staff development opportunities were not exploited by all. Generally staff were too busy and did not view CBA development as a priority, agreed staff teams did not meet until the start of the academic year 2001-02.

There have been some technical difficulties that have ranged from trivial to major.

The current size of the question pools will not be sustainable from one year to the next. Tutors need to continue to add to the pools.

Not all questions could be marked automatically, on-line marking became onerous. Those that were marked automatically were also checked for spelling in order to be fair to the students.

Anonymous marking was not initially adhered to as student names come up on Blackboard against the mark achieved. A method was subsequently determined but this involved printing all the answers to each question and deciding on mark allocation at that stage and matching up to the student later.

Assessment boards had to be convened. The assessment regulations proved problematic but recent amendments to SHU regulations means that this will no longer be an issue.

Issues and Observations - Students

Issues and observations of students following their experience of CBA were positive and constructive. Students generally preferred the CBA to written examinations. Some technical difficulties were experienced which put the students off; the time allowed to take the assessment was enough, although some ran out of time; some found it difficult to concentrate due to the noise of the keyboards around them; specific layout of the assessment was commented on with suggestions for improvement; some found word processing difficult, others found it an advantage to be able to edit their responses; the sun glare on the screen made it difficult to view the images; most commented on their dislike of having to scroll around the screen in order to see the whole assessment and found this wasted time; finding out the answers straight away was appreciated; the images used provided a ‘good’ test and were very clear in what was being asked.

Issues and Observations - Staff

The staff team observations were in line with staff member 'A', however they were more critical of the technology, network, server and Blackboard. Inconsistencies in the way the CBA appeared on different monitors was an issue of concern.

Overview of Summative Evaluation

Student survey

75% response rate to date.

Appropriateness and effectiveness of assessment at this stage in the course. The timing and nature of the assessment - summative assessment with formative feedback

Students generally felt that the assessments help improve their knowledge and understanding (67%), and the timing of the assessment motivated them to learn (95%). It helped them plan their professional development (95%), and knowing their mark was helpful (85%).

It was interesting to note that the first year students did not appreciate the immediate feedback following submission of the CBA compared to the second years, 33% preference compared to 83% respectively. However both groups of students found the feedback helpful when reviewing it at a later date, 83% in both years. The majority of students used the feedback to inform their practice placement action plan.

Appropriateness and effectiveness of CBA. Modernisation of the LTA strategy - computer based assessment.

A few students had no preference whether they viewed actual images, but the large majority much preferred actual images (compared to line diagrams). Around 70% preferred CBA compared with paper based examinations as ‘it is easier to answer questions in order of preference’, ‘the images are clear’, ‘less stress’, ‘easy to edit answer’, ‘typing for long periods is easier than writing’.

No student in either year considered themselves to have low level skills or very low level skills in keyboarding, which conflicts with the formative evaluation, however this may be that students’ skills had developed over the period of time between the summative and formative evaluation.

About 70% of students experienced technical problems. This is a high percentage and needs careful consideration when assessing the appropriateness of the CBA.

Some aspects of the physical environment were said to be distracting. Keyboarding noise and PCs close together were the most common points raised.

Generally students wanted more help with the questions ie multiple answer questions - students wanted to know how many answers to give. This was a deliberate strategy by the assessor so as not to give away any clues.

Students saw the lack of opportunity to use diagrams in answers as a disadvantage. Most students commented positively on their ability to edit their answers.

Having to scroll around the page was mentioned by most as a disadvantage.

Some students mentioned the temperamental nature of computers and the added anxiety this caused, however 92% of first years and 78% of second years felt that CBA was an appropriate method of testing them.

Appropriateness and effectiveness of the assessment package of Blackboard 5.5. The technology used in delivering the assessment - Blackboard 5.5.

A third of students are satisfied with the reliability of the SHU net. However, students are not necessarily discriminating when it comes to IT systems and any problems with the network, or the server, or a local PC, or Blackboard, may all be perceived as 'reliability of the SHU net'.

There were some technical difficulties with Blackboard causing some students to miss out on the immediate feedback and others to lose their assessment part way through.

Exact spelling and wording is needed for the word fill answers, which students found disadvantageous.

Staff Survey

All 7 staff completed the questionnaire. Many responses to the survey were split decisions and needed further exploration. This is probably due to the different roles that the staff members have. There are 5 module leaders who would have been responsible for assessment development, delivery, marking and moderation, and 2 other members of staff who would have acted as invigilators and moderators. This results in differing levels of skills and knowledge with using Blackboard and with the outcome of the assessment on the students. Additionally, some staff were year 2 modules leaders and others were year 1, which may also have an impact on their opinion of the appropriateness of the assessment.

Appropriateness and effectiveness of assessment at this stage in the course. The timing and nature of the assessment - summative assessment with formative feedback

Staff clearly articulated the justifications for assessing students knowledge and understanding at this stage of the course, but were generally unsure whether it was appropriate (5 out of 7). This is probably as a result of problems experienced with the University's assessment regulations and with convening assessment boards.

Staff feel that the CBA gives a clear indicator to students of how well they are doing in the module, however they are less sure of how effective the automated feedback is.

Appropriateness and effectiveness of CBA. Modernisation of the LTA strategy - computer based assessment.

The use of actual images in the CBA was seen as beneficial or very beneficial by staff (5 out of 7). Anonymous marking was either partially or fully implemented. Only 1 member of staff found the time taken for online marking to be less than for an equivalent paper based examination, however the majority felt that the time taken was within acceptable limits. Staff felt that the overall time taken for CBAs would reduce or at least remain the same. Investment now, is seen as important for efficiency gains in the future.

Staff are aware of a number of physical and environmental issues during the CBAs; keyboarding noise; close proximity of students at monitors; students ability to access other electronic resources during the CBA; lighting and temperature.

All have experienced technical problems that they have not always had the skills to overcome. There is a general dissatisfaction with the University's net, however the reliability is actually high and unfortunately, on the rare occasions that there have been troubles, it has usually coincided with the delivery of a CBA. Despite this, 5 out of 7 concluded that CBA is an appropriate method of assessment.

Appropriateness and effectiveness of the assessment package of Blackboard 5.5. The technology used in delivering the assessment - Blackboard 5.5.

Staff have used a variety of University-wide staff development opportunities, CIS, courseware designer support and peer support. The majority found the CBA system in Blackboard easy to use and user friendly. Some anxieties were caused due to practical issues of delivering a CBA and the lack of confidence in being able to problem solve during a CBA.

Conclusions

The evaluation is not yet fully complete. When it is, decisions will be made about the future of CBA within the assessment strategy of the course. The evaluation currently indicates the main issues, which need further exploration during the summer of 2002, however the outcome is generally positive and the current feeling is that CBA is appropriate and effective. Students have shown that they are flexible to change and willing to share their experiences of CBA by contributing constructively to the evaluation. The effort and hard work of the course team needs to be acknowledged for their contribution to the success of this innovation to date.

Recommendations

1. Further exploration of the main issues is needed through planned group interviews.

2. There needs to be further and ongoing time investment in the development and delivery of CBA.

3. CBAs need to be designed to limit the amount of scrolling needed.

4. Development of a test tool is needed to help reduce the variable viewing conditions experienced by students.

5. Further staff development (and experience) is needed to bring all staff to the same level of confidence in problem solving with technical difficulties.

6. Efforts should be made to reduce the physical and environmental issues raised in the evaluation.

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