A computer assisted assessment tool for physiological measurement within the School of Nursing

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Final Report

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Introduction

In order for student nurses to qualify as nursing practitioners they must demonstrate that an acceptable standard of clinical and academic competence has been achieved. The three year pre-registration programme offered by the University of Salford aims to produce qualified nurses who are 'fit for purpose', fit for practice' and 'fit for development' (University of Salford, 2000). Successful completion of the programme results in the qualifying nurse having their name added to the Nursing and Midwifery Council (NMC) professional register and receiving either a Diploma in Higher Education or a Bachelor of Science award. Registration with the NMC allows the newly qualified nurse to practice independently as a registered nurse as the student is deemed competent as an accountable practitioner. The NMC have recently reviewed their fitness for practice policy (NMC, 2005) and state that competence at the point of registration will be stricter to ensure that students who are not fit for practice will not be allowed onto the professional register. It is planned that students will be assessed on a number of 'essential skills clusters' covering basic nursing skills (Nursing Times, 2006). This report outlines a pilot study investigating the use of computer assisted assessment (CAA) in the school of nursing. The clinical areas assessed were blood pressure and pulse measurement, temperature regulation and measurement and respiratory regulation and measurement

Rationale

The trials and tribulations of satisfactory assessment of clinical skills have been the focus of debate within nurse education for quite some time (Somers-Smith & Race 1997). A

recurring theme found frequently in the literature is the need for assessment instruments to be objective, reliable and valid. Nursing is a practice based discipline and consequently the assessment of clinical practice and skills is essential. However, in the past, clinical skills assessment has been offered little priority when compared to the assessment of clinical credibility (Girot, 1993). The teaching and assessment of clinical skills in the clinical area is the responsibility of the qualified nurses, however, Girot expressed concerns when commenting that with ever increasing pressures on clinical staff, shorter placements and the implementation of supernumerary status; continuous clinical skills assessment is in danger of becoming no assessment at all (Girot, 1993).

The NMC (2005) reported anecdotal evidence suggesting concern about the perceived lack of competence of newly qualified nurses. Indeed, clinical skills lecturers have been made increasingly aware that students have the 'know how and know that' but not the 'know why'. Students seem to be concentrating on the physicality of skills acquisition (psycho-motor domain), for example, being able to perform patients' routine observations, with little attention being paid the affective and cognitive domains.

More recently the NMC have been investigating different methods of ensuring essential skills competency at the point of registration via assessment. One such method recently highlighted, is the use of computer assisted assessment. Over 10 years ago, Nicklin and Kenworthy (1995) discussed clinical skills development and issues around competence They felt that students clinical skills performance *should* be assessed. They felt that clinical skills assessment would; protect the public from harm, predict future behaviour, measure achievement, assess competence, motivate students and monitor students' progress. In order for nurses to qualify as nursing practitioners they must demonstrate that an acceptable standard of clinical competence has been achieved.

It is proposed that CAA of essential skills would enhance the students knowledge by developing the knowledge behind the 'know how' whilst working in harmony with existing assessment methods facilitating understanding of the 'know why'.

Course/programme details

Pre-registration Diploma in Adult Nursing Programme, School of Nursing, University of Salford.

Original aims, objectives, outcomes and benefits

The *original* aims, objectives and benefits of the project were to develop and test a software programme to allow for on line assessment of physiological skills measurement. This was to incorporate the testing, evaluation and further refinement of the software. An online user guide was proposed.

Objectives

- Research alternative solutions to requirement including 'off the shelf' and 'tailor made' solutions taking into account current student use of blackboard
- Liais with Learning Technologies Faculty
- Develop and further refine an online assessment tool to assess students at the School of Nursing
- Develop an online user guide
- Undertake a pilot study (45-50 students) to test, and evaluate the programme.
- Use the pilot data to refine the programme accordingly to professional standard
- Disseminate project within the university for further consultation
- Consult with Teaching and Learning Committee and Head of School (School of Nursing) for introduction of web based assessment tool within the pre-registration programme.

Outcomes

It was envisaged that this assessment method would work in harmony with the current assessment procedures (ward based assessments) and add the much sought after elements of rigour, reliability and validity to assessment in the area of clinical skills. In addition it was thought it could enhance the quality of and access to learning and assessment by supporting and developing the curriculum through the appropriate use of learning technologies thus providing more flexibility and accessibility.

Benefits

It was anticipated that the computerised assessment system has the potential to motivate students to develop a knowledge base for competent clinical skills acquisition. In addition it has the potential to further develop the key skills of problem solving, managing own learning, IT, communication and teamwork by the very nature of the assessment process.

Description

Sample population	Nursing students (Diploma - adult branch) 18 months into the 3 year programme

Students were asked to access and complete three on line assessments. The assessments were accessed via Blackboard. Each student was allowed 3 attempts at each test. Each test consisted of 30 or 40 multiple choice questions. Each attempt was timed with the students allowed between 45 and 60 minutes for completion. Students were asked to complete the tests in one sitting and did not have the facility to save the tests to resume at a later stage.

Data was collected as follows:

Pre (104) and post (102) CAA questionnaire

4 x post CAA focus groups (n=45 students)

Base group tutors were also asked for their experiences

The pre CAA questionnaire aimed to collected data on self perceived IT skills, previous use of Bb, current use of Bb and a self assessment on their current knowledge behind the areas being assessed. The pre CAA questionnaire revealed poor use and knowledge of Bb and virtual environments in general. In response to this a help guide was compiled to help the participating students access Bb and access the on line assessments. Without this it was doubtful that the students would have been able to participate in the study.

The post CAA questionnaire aimed to collect data on current Bb use, any problems encountered, where they accessed Bb from, an evaluation of the help guide, their current self assessment of knowledge on the areas tested, perceived learning and attitudes towards CAA.

The focus groups aimed to uncover the students' experiences, attitudes and feelings of CAA in key areas. The questions were open and were structured around the following areas:

1) Use of Blackboard to include issues of access, experience, satisfaction etc
2) Student views on the benefits to their learning from use of CAA
3) Views on the future use of CAA

Data from the questionnaires was analysed for frequency counts expressed as true percentages, whilst focus group data was analysed for recurring themes using the usual methods of thematic analysis.

Evaluation

104 students completed the questionnaire prior to attempting the tests, 102 students completed the post test questionnaires. 86% of the sample group had accessed and completed the CAA. The feedback from base group tutors was positive.

The first area investigated was their current IT skills and use of Bb. This was assessed pre and post participation with results as follows:

1. How do you rate your IT skills

	Pre study participation	Post study participation
Very good	8%	4%
Good	29%	29%
Average	60%	61%
Below average	3%	6%
Way below average	0	0

This revealed no significant difference in IT skills pre and post participation. Results display the expected distribution curve.

2. The students were then asked **if they had accessed Bb**, this was assessed pre and post study participation.

	Pre study participation	Post study participation
Yes	25%	93%
No	75%	7%

This showed a marked shift from none use to use of Bb pre and post study participation.

3. When asked **why they had not accessed Bb prior to participating in the study**, the reasons were as follows:

Didn't know how to get on it
Hadn't been taught about it
Didn't understand it
Hadn't heard of it
Never had the need
Forgot how to use it
Didn't know what to do with it
Not confident with it
Didn't think it was relevant
Didn't know their password

It was clear that some students had remembered some form of exposure to Bb when they started the course but had not been instructed to use it in their previous modules. 66% indicated that they had 'heard' of Bb but had no inclination to use it. Despite knowing about it a very small minority accessed Bb prior to this project

4. 7% of those who participated in the study **could not access Bb**. When asked why the reasons were either that they had no access to a PC (n=3), didn't know their password (n=2), no reason given (n=2). This was pleasing as we were aware that not everyone has a home PC and could bring in issues of equity and equality. For those who did not have a computer at home it was discussed that they were able to use the PCs within the University and that public libraries offered free use of PCs.

5. Students who had accessed Bb were asked **where they accessed it from** as follows:

Home	81%	
University	36%	
Clinical area	15%	Ward or Hospital Trust library
Other	2%	Internet café, halls of residence

By far the majority of students accessed Bb from home and it is pleasing to see that 36% of the sample accessed it from work. This can reduced the well documented theory practice gap.

6. The students were asked to rate their **knowledge behind the areas to be assessed via CAA pre and post study participation**. The results were as follows:

	Pre test BP, pulse	Post test Bp, pulse	Pre test Temperature	Post test Temperature	Pre test Respiration	Post test respiration
Very good	6%	1%	4%	1%	1%	2%
Good	54%	22%	57%	28%	53%	25%
Average	38%	69%	38%	65%	42%	65%
Below average	2%	7%	1%	4%	4%	7%
poor	0	1%	0	2%	0	1%

The results show that students assessed their knowledge base as being poorer having completed the assessments.

7. The participating students were then asked to indicate whether they felt **learning had taken place** as a result of working through the CAA as follows:

Do you think your knowledge has improved since undertaking the CAA?

	Yes	No	Not sure
BP and pulse	62%	10%	28%
Temperature	62%	11%	27%
respiration	65%	11%	24%

This is a very interesting area. It is clear that the students assessed themselves to be at a lower level AFTER completing the assessments yet the majority felt that learning had taken place. This raises issues around the accuracy of the participants self analysis in that they perceived their knowledge to be at a higher level than it actually was. This was also discussed in the focus groups.

8. Participants were then asked **if they would like to have access to more CAA in the future** with responses as follows:

Yes	67%
No	11%
Not sure	22%

9. Participants were asked in which areas they would like to be assessed on (CAA). A variety of areas were indicated.

Anatomy and physiology
Anything
Blood
Blood transfusion
Body systems
Bones
Catheter care
Clinical assessments
Diabetes

Disease and illnesses
Drug calculations
Everything
Haematology
Heart
Infection control
Kidneys
Lungs
Medications
Neuro obs
Ng tubes
Numeracy
Nursing process
Nutrition
Other clinical skills
Palliative care
Pharmacology
Pre and post op care
Transfer of care

All of the areas identified by the students lend themselves well to CAA. The areas identified were highlighted by many students who thought that they may need to assess themselves in these areas in order to achieve the required level of competence.

10. It was acknowledged that working through CAA for the first time may invoke a variety of feelings which needed to be explored and realised. Following their experiences of working through the on line assessments, the participants were asked to **use 3 key words to describe their feelings and experiences of using the on line assessments** as follows:

Positive	positive	Negative
Accessible	Progressing	anxious
Beneficial	Proud	big words
Calming	quick	Complicated
clarify	Quick	Confusing
Consolidate	Real life	difficult
Convenient	Reassurance	Disappointed
Different	Rewarding	Feel behind
Easy fast	Useful	Frustrating
Educational	Worthwhile	Hard
Effective		Mind boggling
Enjoyable		Nerve wracking
Focus		Panic
Good		Pressure
Helpful		Rushed
Improvement		scared (of unknown)
In depth		Scary
Informative		Strenuous
Interesting		Stressful
Knowledge		Thick
Learning		Time consuming
Learning aid		Tough
Made me buy a book		Tricky
Made you learn		Unclever
Motivating		Unsure
Pleased		Worried

This revealed a variety of feelings. The participants felt that learning was taking place and that CAA motivated them to learn – this was associated with the usual associated anxiety with assessments. Some students commented that they felt 'thick, unclever, worried and behind'. Working through the assessments demonstrated the depth of their own knowledge. For some this came as a shock as they presumed their knowledge was at a higher level. This has motivated the students to continue their learning as they didn't want to 'feel behind'.

FOCUS GROUP

Many of the quantitative measurements and results were expanded upon by further exploration in the focus groups. The following is a **very brief account** of the main areas discussed by the focus group participants.

Use of Blackboard – issues of access, experience, satisfaction

Many students experienced difficulty in accessing Bb. This caused great frustration and added more pressure. For many, the tests 'crashed' and so their attempt was lost. Many students were very annoyed by this especially if they had almost completed the tests. Students discussed their fear of Bb as they felt they were stepping into the unknown but found it got easier the more they accessed it. The self help guide was discussed in a positive light. The questionnaire revealed 78% of the participants indicating that it helped them to access Bb. Participants discussed the difficulties in attempting the tests in 'one sitting'. If they were attempting the tests from a PC in the workplace they were constantly interrupted, this was the same if they were accessed from home. If interrupted the students lost their attempt as the assessments were subject to a timer and as such the students were 'times out'. The overwhelming consensus was that there should be the ability to save the attempt to return to it at a more convenient time. Some students found the MCQs to be a little too difficult whilst others found them to be too easy.

The assessments were set so that MCQs appeared on the screen one at a time. This was disliked as it was time consuming waiting for the next question to load. The students preferred the full page format as used by MATHSCOPE. Overall, despite the access problems, the students were satisfied with the idea of CAA and felt much happier with the notion of 'virtual learning environment' and could now see the potential of its use. All students expressed satisfaction at the 'idea' of Bb and would continue to use it for future modules *especially* if it was more reliable.

Student views on the benefits to their learning from use of the tool

The students were very positive about CAA. There was strong feeling that the need to undertake the assessments motivated them to learn. Some discussed buying books, accessing books and even taking the wrappers off books they had previously bought. The educational philosophy of the programme has shifted to put the students at the centre of

their own learning, with the students being responsible for their own learning. Students discussed the area of motivation and said that this form of 'testing' was the motivation they needed – despite feeling anxious and under stress. Students discussed the issue of being assessment driven and enjoyed the element of formal monitoring. When asked if they would have completed the assessments if given in paper form, the feeling was that they would not have been completed even though they have ample study time in which to do them.

The students enjoyed the fact that tutors could access the gradebook and that the grades of other students were visible to the tutors. Competition was discussed as a motivator as was the ability to 'see where they were at' compared to other students in the group. Participants discussed assessment in great depth, a full discussion is not possible in this report, but the main areas discussed were issues with under assessment. The students felt that they were unsure of 'where they were at' as they were not subjected to enough formal measurement. Students were wanting much more feedback on their efforts to indicate good, average or poor performance. Some students felt that they had no idea how well they were doing and some felt that problem based learning was partly responsible for this. Many were shocked at their lack of knowledge when they thought they were competent in the areas assessed. Some students discussed the need for CAA in every module to standardise knowledge and to ensure that they 'know what they should know' at the point of qualification.

Students discussed the learning of clinical skills in their clinical placements. Some discussed the 'hit and miss' element in that learning was dependent on the knowledge base of the nurses who were teaching them, the motivation of the teaching nurses and the learning experiences available. They discussed a lack of occasions where they were taught about the evidence base of the clinical skills being taught, others discussed being taught how to perform a 'skill' with little else to substantiate this. They felt that working through CAA gave them the understanding of the principles behind the skills they were

practicing whilst on placements. This was seen as a step towards standardising knowledge and competence.

Views on the future use of CAA

Overall the students thought CAA was a good idea and that they wanted more of them. The issue of summative v's formative assessment was discussed. Overwhelmingly it was thought that the assessments should be formative YET be a requirement of each module, i.e. that all students were EXPECTED to complete the assessments. This being the case they also felt that a pass mark should be set and those not achieving the set grade should work on the area again. There was an overwhelming feeling that tutors should become more involved in the assessment process by checking the progress of their students. This 'formal' checking was seen as a positive motivator. Students also expressed concern at some staff members not having adequate skills or knowledge of Bb and felt that this is an very real issue in the use of Bb to date.

Consideration of how the project had changed and developed from the original bid

The project was initially to look at the use of QMark perception as an assessment tool, however and updated version of Blackboard was introduced around this time admit was suggested that this be used as it now had the capability of on line assessment. Research was undertaken to into online assessment packages already in use. Several packages were viewed but it was not felt that they were suitable for this study as they were mainly anatomy and physiology packages with basic questions around body systems. Research into the availability of prepared question sets was brief as all available quizzes etc were part of CR rom learning packages. These were very expensive at around £250- £400 and resources were not available to purchase these. Question sets were therefore produced for each test and were piloted on students not participating in the study. Following feedback, the questions were further refined. The number of students asked to participate in the

study was much higher than originally stated. It was felt that the students who were not asked to participate, from the targeted intake, may have felt disadvantaged if they were not included and so equity and equal opportunities was the rationale for this. Originally, an online user guide was proposed but the students IT skills and previous Bb use was overestimated by the project team. When asked, although 67% had heard of Bb, only 25% had previously accessed Bb with 66% of the group saying that they would not know how to access it. This led to a paper guide being developed with clear diagrams taking the students through the steps involved in accessing Bb and then the on line assessments. This evaluated well. It was thought inappropriate to develop an on line user guide when the students would have had difficulty accessing it!

Developments

It has been noted that since this study took place, both students and staff have realised the effectiveness and importance of inclusion of on line assessments in a variety of other areas. The authors have liaised with the NMC on this matter and have since submitted a bid to be included in a National project on the use of 'simulation' and CAA to investigate the measurement and standardisation of a number of 'clinical key skills clusters' to ensure competence at the point of registration.

The results of this report are to be presented at an International Nursing Education conference in Vancouver, Canada in May 2006.

Work is underway to develop a number of areas to be taught in the clinical skills laboratories and assessed via role play, simulation and CAA. Bb has developed in the School with students being taught about it in more depth at the beginning of the course. An implementation team has worked hard to train staff and help develop their modules on Bb. All modules are now on Bb and the students access the areas regularly. Bb is now much more of a standard rather than a consideration.

Transferability

Following the success of this project with the majority of students responding positively to the use of CAA it is thought that this method of assessment could be expanded to assess knowledge in other areas and other programmes. CAAs are a reliable, valid and efficient way to assess students assessments. They are graded automatically and students can access their grades immediately. This has huge potential within the School of Nursing and is currently under review for inclusion in other programmes of study.

Less successful elements

The reliability of Bb was a hindrance during this study. There were many times when the VLE was not accessible and at its worst was unavailable for 3 days. There were reports of repeated 'crashing' of the system whilst the students were working through their assessments. This led to students being 'locked out' of their attempts and data being lost. Constant vigilance was required by monitoring the gradebook.

Reflection/conclusion

This was a time consuming yet highly rewarding project. CAA was not a consideration within the School and had previously been used mainly for open learning courses. It was clear that the students enjoyed working through CAAs, felt they learned by undertaking the CAAs and wanted more of them in the programme. This was despite feeling threatened and anxious about the whole process. The benefits of CAA and the positive feedback received from the participating students has spread quickly. Staff are being asked if they can 'do some computer assessments' for individual groups of students. This has surprised many as we had moved away from an assessment driven curriculum to a student focused one with more self assessment and assumed that the students were motivated enough to manage their own learning according to their own needs. Discussions within the focus groups disagreed with this with students feeling unsure about what they should be doing and in what depth. It was a surprise to see the focus

changing self directed study to students being motivated by assessment, formal monitoring and internal competition.

There are, however, issues for consideration.

- Training of staff and students. This has improved as Bb is now in use widely. It should be acknowledged that some may require additional training in order for them to be able to achieve full benefit. Those requiring additional support should be encouraged to contact nominated tutors for help. This applies to both students and staff.
- Assessment format. It is necessary for the MCQs to be member checked and checked by practice staff to achieve question sets that are at the correct level and are developed in partnership with clinical staff. On line assessments should have the ability to be saved and revisited. Assessment format should mirror that used by MATHSCOPE for ease of use.
- More commitment from staff members to encourage and give positive feedback as the students felt this was lacking and as such they felt lost. More commitment should be focused towards those students who are not achieving the set grades and additional support given.
- Exploration of further areas where CAA could be used to assess and provide feedback on students performance.

Future

It is intended that this project now moves onto the next phase. CAA has huge potential to continue to motivate learning and assess knowledge in many areas. In particular, the NMC are keen to investigate ways in which competence can be standardized at the point of registration. This can be achieved with the use of clinical skills simulation and CAA at key points throughout the programme. The beneficiaries of this should be both students and the patients they care for. This is an exciting prospect and one which will form the

basis of doctoral study. It is intended to present in depth results within the School of Nursing and this will form the basis of publication in a peer reviewed journal.

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