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Evaluation of a Computer-Assisted Assessment (CAA) for Nursing Students

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Abstract

Background: Computer-assisted assessment (CAA) refers to use of computers to deliver, mark and analyse assignments or examinations. In the Anatomy and Physiology course for nursing students at Sahlgrenska Academy at University of Gothenburg, a CAA was introduced in 2010.

Aim: The aim of this study was to investigate how students handle and experience the CAA.

Methods: A student questionnaire was developed to shed light on student's handling and experience of the CAA.

Results: Twenty-five students out of approximately 30 completed the questionnaire. Of these all but 3 had successfully completed the CAA; number of attempts varied from 1 to more than 10. Nineteen students had course literature available during the CAA and 21 had access to other sources of information. Most students did the CAA alone. Ten students were positive to the CAA. The remaining 15 students blamed the exam to be complicated. Deciding on the tempo without nervousness was appreciated by all students.

Conclusions: Overall students were positive to CAA as a general concept. Some aspects emerged related to this specific CAA that negatively impacted students' experience and potentially learning. The arbitrary selection of questions seemed to warrant the CAA being a fair evaluation tool over the years.

Key words: Computer-Assisted Assessment (CAA), Web-Based Testing (WBT), Information Communication Technology (ICT), Assessment, Questionnaire

Introduction

Assessment plays an important role in teaching and has significant effects on learning (1-4). The positive effects primarily results from the feedback it provides (2). Meaningful feedback, however, is difficult as teachers deal with many learners at the same time (2, 5). With the development of Information Communication Technology (ICT), an opportunity to overcome this problem has emerged. Development of web-based assessment systems provides an opportunity for teachers to administer assessment and provide meaningful feedback to learners during the assessment (2, 5-8).

At universities, the use of ICT in learning and teaching is rather advanced while the use of ICT to support assessment is more patchy (9). In higher education, assessment is very much a “local” activity related to a particular module or course. Computer-assisted assessment (CAA) refers to the use of computers to deliver, mark and analyse assignments or examinations. CAA is normally understood to involve use of multiple-choice questions and questions with short-answer responses both of which can be marked online, i.e. automated (9).

In the Anatomy and Physiology course for nursing students at Sahlgrenska Academy at University of Gothenburg, a CAA was introduced in 2010 for parts of the course for two reasons; 1) Complaints from students that final paper- and pencil course examination covered too many topics at one occasion, and 2) Course management felt more time would be needed for face-to-face interactions with the students instead of marking tests. A total evaluation of the course in Anatomy and Physiology is done every semester, but so far no specific questions regarding the CAA has been requested. The aim of this study was therefore to investigate how students handle and experience the CAA.

Methodology

Computer-assisted assessment (CAA)

Areas important for the basic understanding of the course, but not for the nurse everyday profession, were included in the CAA, i.e. biochemistry, cell biology, histology and integumentary system. The remaining parts of the course were continuously examined in a paper-based format in the end of the course. The CAA involved the use of multiple-choice questions. Once the students had finished the CAA, questions were immediately marked

online. Students could choose whether to do the exam alone or together, with or without text books and they were allowed to do as many attempts as needed. To pass the exam 90% correct answers were required and students had a pre-specified time period when they conducted the CAA.

Study participants and data collection

Nursing radiology students participating in the course in Anatomy and Physiology conducted the CAA over a pre-specified time-period in Sep-Oct 2014. The student questionnaire (Appendix 1 (original Swedish version), Appendix 2 (translated English version)), asking for feedback on the CAA, was distributed to the students in relation to a lecture in the end of the pre-specified time-period. In total, 25 students out of ~30 answered the questionnaire and laid the basis for the results presented in this paper.

Student Questionnaire

The student questionnaire included questions regarding their handling and experience of the CAA (Appendix 1, Appendix 2). The questionnaire included the following questions: 1) Have you passed the exam (yes/no); 2) Number of attempts for passing the CAA; 3) Availability of course literature during CAA (yes/no); 4) Other sources of information during the exam (yes/no), if “yes” – which sources; 5) Was the CAA done in isolation or together with one or more other students; 6) If CAA was done in collaboration, how many students worked together; 7) Free text comments on experiences of the CAA; 8) Free text comments on advantages of the CAA; 9) Free text comments on disadvantages of the CAA. Students were informed that answering the questionnaire was optional.

Data analyses

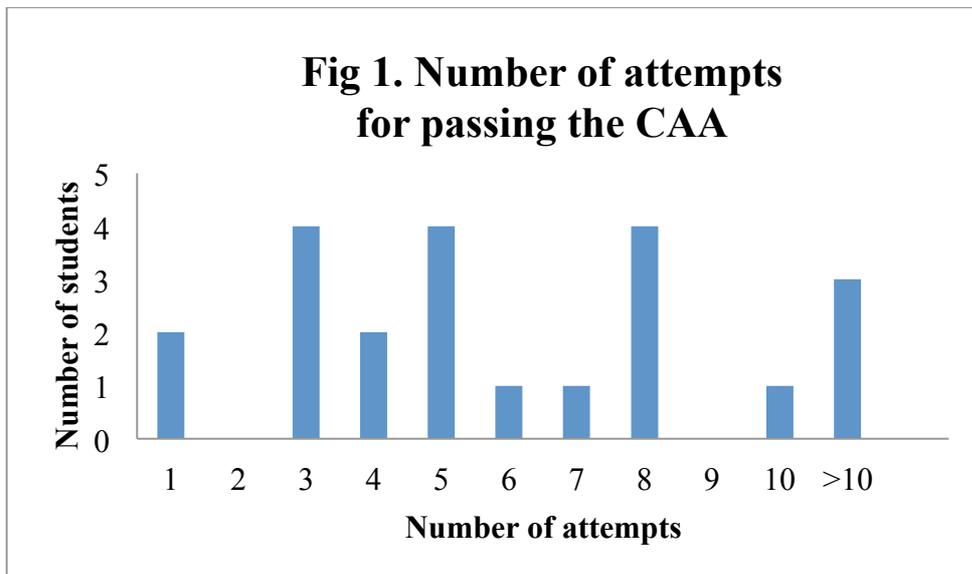
Questions 1 to 6 will be presented in a descriptive manner. Questions 7 to 9 will be compiled in themes and examples of comments will be cited referring to the different themes.

Results

Twenty-five nursing radiology students out of approximately 30 completed the questionnaire. Out of the 25 students responding, all but 3 had successfully completed the CAA.

Question 2 asked for number of attempts for passing the CAA. Among students who had passed the examination (n=22), number of attempts varied from passing the exam on the first try to more than 10 attempts before passing (Fig 1). The 3 students who had yet not passed the exam had made 2, 3 and 6 attempts respectively.

Question 3 asked about availability of course literature during the CAA. Nineteen students reported having course literature available, while 5 did not. One student did not answer the question. Among students not having course literature available during the CAA, 2 needed more than 10 times to pass the exam, 1 needed 8 times, 1 needed 4 times and 1 student had yet not passed the exam. All students reporting not having course literature available during the CAA, reported using other sources of information in Question 4.



Twenty-one students reported having other sources of information available during the CAA, while 3 did not and 1 did not answer the question (Question 4). The number of other sources varied from 1 to 3, where 10 students used 1 additional source, 9 used 2 other sources, and 1 used 3 other sources. One student mentioned the use of other sources, but left the number out. The sources used were internet, notes from lectures, other text books, power-point presentations and friends. Of these, internet was most commonly used (18 students), followed

by notes from lectures (9 students), other text books and friends (2 students each) and power-point presentation (1 student).

Twenty students reported working alone during the CAA, 1 reported working in group, 1 student reported working both alone and in group and 3 students did not answer the question (Question 5). No group consisted of more than 2 persons (Question 6).

In Question 7, free text comments on experiences of the CAA were asked for. Not unexpectedly, two themes emerged. One positive with statements such as “Very good and fun” and “A good way to learn”. Such statements accounted for approximately 10 of the students. The remaining 15 students blamed the exam to be complicated. A general comment was that the CAA contained many questions with “which (singular) or which (plural)” and many students believed it was very difficult not knowing the number of correct statements in advance for each question. Other comments included wishes to learn the correct answers. If there were several correct answers for a question and students responded correctly to all but one, the complete question was scored “wrong”, but students did not receive any feedback on what was right and what was wrong. Students were disappointed on questions with many correct answers. “If one alternative was missed, the full question was dis-qualified which felt unfair.”

Description of advantages of the CAA, Question 8, provided similar statements from all students regardless if they had a positive attitude to the CAA or blamed it to be complicated. Statements were more of a general character, including “learning and examination at the same time”, “good being at home in peace and quiet searching for information in the text book and notebook, no need to cram as would be the case in a paper- and pencil exam”, “good with repetition”, “deciding on the tempo yourself, will increase learning“, “no need to get nervous”.

The last question, Question 9, asked students to describe disadvantages of the CAA. This question provided more diverse statements comparing the group of students being positive to the exam (n=10) and the group of students finding it more complicated (n=15) compared to Question 8. In the group of students positive to the exam, 3 students explicitly stated they saw no disadvantages associated with the CAA. Other statements in the group of positive students included “Difficult to pass questions where more than one alternative could be correct”,

“Sometimes difficult to understand the correct answers. Difficult to understand if you had answered correctly or not”, “You could learn the correct answers, but this did not mean you understood the content”, “Some questions were difficult to interpret. Depending on how they were interpreted the answers turned out differently”, “Some of the answers were only from the lectures requiring notes from the lectures”.

Among students blaming the CAA to be complicated, statements could be classified into two different themes: 1) the build up of the CAA including how questions were asked and how feedback was provided; and 2) general aspects on the exam and facts laying the basis for the exam.

Statements regarding the build up of the CAA included “I dislike questions that are exactly the same with the exception of one single word. I don’t believe that will add to the learning. It is just irritating”, “One disadvantage is if you have 3-4 questions that are not correct, you need to redo the full CAA”, “It would be valuable to see what was wrong in order to learn”, “Normally I love web-based exams, but this one included which (singular or plural) questions and it was only irritating. Each alternative was its own question and it was extremely difficult to get any correct mark at this kind of questions”, “Too many alternatives, difficult to know what is correct or not”, “Strange questions” and “The questions are deceptive and for us with dyslexia it is very hard to get 90% correct answers when we easily miss words and letters”.

More general statements included “Many things that had not been mentioned at the lectures”, “High level to pass the exam”, “Regarding knowledge I believe this will not lead to deep knowledge, but this may not be the purpose as more detailed knowledge should be provided in the next chapter”, “Most likely I did not learn as much as I had done if I had prepared for a paper-and pencil test”, “Using text book as a dictionary means that I do not capture the overall context”, “I seriously don’t believe I learnt that much”.

Discussion

The majority of nursing students conducted the CAA themselves, despite being allowed working together. This was somewhat unexpected as one would believe the chance to pass the exam would be higher if working together in a collaborative manner. Collaborative work is

also one of the generic competencies being important for most professions, not least a nurse, and conducting the CAA in a group had provided an opportunity to develop this generic competence. On the other hand, working alone fits well with the general comments from the students on advantages of the CAA. Comments such as “Good being at home in peace and quiet searching for information in the text book and notebook, no need to cram as would be the case in a paper- and pencil exam” and “Deciding on the tempo yourself, will increase learning” may explain the choice of working alone which would allow the students to be in full control of the tempo themselves. One could speculate if the choice to work alone is also related to the students’ situation at home. If having kids at home, one would assume students find it advantageous having the opportunity to conduct the CAA whenever a free slot occurs rather than having a pre-specified booking in the calendar.

All students either used course literature or other sources of information or both. Interestingly, a wide range of attempts were noted before passing the exam. This indicates that the arbitrary selection of questions used in this CAA setting, warrants the CAA being a fair evaluation tool over the years, i.e. no leakage of questions from previous students. The fairly high number of attempts before passing the CAA highlights the burden to pass the exam. One can argue that 90% correct answers for passing may explain the high number of attempts. However, only the student with dyslexia claimed this cut off to be a major hurdle. Instead, the CAA was described as complicated by the majority of students. Students described difficulties in understanding the questions and difficulties in understanding if they had answered correctly or not. These difficulties are mirrored in the feedback provided by students, e.g. “I dislike questions that are exactly the same with the exception of one single word. I don’t believe that will add to the learning. It is just irritating” and “It would be valuable to see what was wrong in order to learn”/“Too many alternatives, difficult to know what is correct or not”.

Assessments are considered being important for learning if properly applied (1-2, 6). The positive effects of assessment primarily results from the feedback it provides. A formative assessment could provide room for improvement. A formative assessment is when information from the assessment is fed back to, or shared with, the learner to enhance learning. Feedback in terms of marks or grades alone does not enhance learning, while feedback in terms of comments about good features of the work/performance, what is

incorrect/weak and what needs to be done to improve will enhance learning (10). The feedback from the students indicates room for improvement. Many students described lack of understanding which answers were right or wrong. Re-doing the CAA several times without getting feedback on correct answers may lead to incorrect learning and a remaining uncertainty what was right or wrong. If the database of web-based assessment system is pre-equipped with proper and meaningful feedback, learners could correct their own mistakes and recover from the impasse of misconceptions effectively (2). When students fail to answer items correctly, they could obtain instructional prompts (IPs; hints) in a graduated way guiding them to the right answer (6). Hints could be general or more specific.

Furthermore, students claim they most likely did not learn as much as if they had prepared for a paper-and pencil test. This is most likely true, as students know they can use any information during the CAA. If students have not completed the literature reading before the CAA, but use the CAA as a chance to learn, learning will most likely be superficial which is reflected in the feedback “Using text book as a dictionary means that I do not capture the overall context”, “I seriously don’t believe I learnt that much”. Partly this could be mitigated by making students aware of the need for a similar reading of course literature before the CAA as before a paper-and pencil test. At higher education, students should be responsible for capturing the learning from each course regardless of format of examination. Additionally, the format of the CAA could be changed to increase learning. For example statements of numbers of correct answers in all questions and a direct feedback on what is right and wrong would improve the learning aspect. If not answering correctly, graduated hints can be provided, directing students in the right way. These relatively small changes will most likely improve the learning aspect of the exam substantially. Adding a question on the learning aspect of the CAA in the questionnaire would help out evaluating the impact of changes.

Conclusions

Students are generally positive to a CAA. The CAA covering parts of the course in Anatomy and Physiology for nursing students is overall welcomed, but has room for improvements. Revising the CAA with more precise questions including number of correct answers for each question and better feedback to students during the assessment would dramatically increase students’ experience of the CAA and most likely improve learning effectiveness.

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Appendix 1 – Student questionnaire on CAA (Original Swedish version)

Du har nyligen gjort en webbaserad deltentamen i kursen för Anatomi och Fysiologi. Den webbaserade tentamen skapades efter synpunkter från studenterna och vi vill nu utvärdera denna form av tentamen. Vi tar därför tacksamt emot Dina synpunkter!

Ditt deltagande är frivilligt.

- 1) Har Du blivit godkänd på webb-tentamen? Ringa in Ditt svar: Ja Nej

- 2) Hur många gånger fick Du göra om tentamen innan Du blev godkänd? Ringa in rätt alternativ: 0 1 2 3 4 5 6 7 8 9 10 >10

- 3) Hade Du dina kursböcker tillgängliga under tentamen? Ringa in Ditt svar: Ja Nej

- 4) Använde Du dig av någon annan informationskälla under examinationen? Ringa in Ditt svar: Ja Nej.

Om Ja, vilken källa.....

- 5) Satt Du ensam eller i grupp när Du gjorde tentamen?

- 6) Om Du satt i grupp, hur många satt ni tillsammans?

- 7) Vad tyckte Du om den webbaserade tentamen?

8) Beskriv de fördelar Du ser med webbaserad tentamen?

9) Beskriv de nackdelar Du ser med webbaserad tentamen?

Appendix 2 – Student questionnaire on CAA (Translated English version)

You have recently conducted a computer-assisted assessment (CAA) for parts of the course in Anatomy and Physiology. The CAA was created based on feedback from students and we are now keen on evaluating this computer-based format of examination. We would therefore highly appreciate to hear your view!

Answering the questionnaire is optional.

- 1) Have you passed the exam? Put a circle around your answer: Yes No

- 2) How many attempts were needed before passing the exam? Put a circle around your answer: 0 1 2 3 4 5 6 7 8 9 10 >10

- 3) Did you have your course literature available during the CAA? Put a circle around your answer: Yes No

- 4) Did you have access to other sources of information during the CAA? Put a circle around your answer: Yes No

If Yes, what other sources were used:.....

- 5) Was the CAA done in isolation or together with one or more other students?

- 6) If CAA was done in collaboration, how many students worked together?

- 7) How did you experience the CAA?

8) Please describe the advantages you see with the CAA?

9) Please describe the disadvantages you see with the CAA?