Devising an e-learning package for vital-signs monitoring

INNOVATIVE approaches to teaching are critical in nursing and midwifery, given the current demand that higher education courses are relevant to the changing health care environment. Courses must also meet the requirements of the curriculum, based on the principles of Making a Difference (Department of Health, 1999), and integrate the content with practice requirements.

A variety of sources provide evidence that it is important to consider a range of different approaches to student education in the light of increasing student numbers (DoH, 2000; Maier and Warren, 2000), the requirement to maintain standards (DoH, 1999; Bull et al., 1998), and the need to ensure safe and effective practice (UKCC, 1999).

Interest in web-based learning has increased greatly among both students and academic staff (Gilliver et al., 1998; Ribbons, 1998), and significant investments are being made in information technology (IT), in line with the Dearing report (Department for Education and Employment, 1998).

Skills assessment

Today’s nursing students will lead and influence the health services of tomorrow. Their professional journey starts early in their first semester at university when they are bombarde with information and knowledge before entering the practice environment in their fifth week.

The first placement can occur in a variety of settings – in the community or hospital – where students’ skills will be tested, but often not their knowledge. Evidence for this is that when they have a skills assessment late in the first semester the majority will be capable of undertaking a particular skill but will often have limited knowledge of the physiological changes and specific applications associated with that skill. An electronic learning package was therefore developed to help students apply their knowledge and to prepare for their skills assessment in vital signs monitoring.

The paper-based learning package

Students taking nursing and midwifery part 1 courses at the University of Greenwich can opt to complete a self-directed paper-based study to support their learning and understanding. Historically, the study has been developed by the course coordinator, and it provides students with a valuable aide-mémoire for their skills assessment.

The questions are structured so that the students fill in the gaps in a sentence, so indicating their knowledge of a topic, for example: ‘State the medical term for a high temperature … and a low temperature’. The paper-based package is distributed during a teaching session, which means that students who do not attend the session are precluded from obtaining this important revision aid. However, in some instances, students will have a valid reason for their absence, so it is important that they are not penalised.

One major concern about this paper-based learning package is that the amount of feedback will vary according to the forums attended by the students – their professional tutor groups, for example. The students themselves have commented that they would like the package to be revised so that everyone has equal feedback. However, because of the increasing demands put on professional tutor groups, it is not always possible to address this concern in the scheduled sessions. Inequity of feedback will therefore continue, which means that students in some groups will be disadvantaged.

A further problem with the paper-based package is that it is not possible to ensure that students always obtain or document the correct answers to the questions, which means that their responses during their practical assessment could be incorrect, so causing them to fail the evaluation. It was to overcome these problems that the paper-based package was developed into an e-learning format.

The electronic learning package

The e-learning package introduces students to electronic forms of learning early in their course and supports them as they progress through their studies.

When considering the introduction of this learning package, the developers felt that it was essential that everybody knew about it and how they would be able to access it. Guidelines and information are therefore included in the course handbook.

The developers felt that it was important when coaching students for their skills assessment that the information in the electronic version should clearly relate to what students would see in their clinical practice. It was agreed, therefore, to focus on a specific section of the course: vital-signs monitoring. A series of multiple-choice questions was devised relating to physiology, practice and professional issues (Box 1). This format was chosen because the developers believed that not only was this a potentially simple approach but also that it was an effective method of assessment with benefits for both students and lecturers.

The pros and cons of e-learning

There are two particular advantages of using computer-marked multiple-choice questions:

- They can be marked much more easily than by a human; for example, a lecturer marking multiple-choice questions can be marked much more easily than by a human. However, there are several disadvantages:

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BOX 1. SAMPLE QUESTIONS FROM THE E-LEARNING PACKAGE

What systems control blood pressure?
- a) Tricuspid valve, right atrium, superior vena cava.
- b) Sinoatrial node, atrioventricular node.
- c) Sympathetic nervous system, chemoreceptors, baroreceptors.
- d) The falx cerebelli, thyroid gland, bundle of His.
  
  Note: The student has to choose the correct answer.

Match the appropriate ranges of respiratory rates to age ranges:
- a) 15–18 breaths per minute. Adult.
- b) 40–60 breaths per minute. Neonate.
- c) 25 breaths per minute. Two-year-old child.
- d) 20 breaths per minute. Eight-year-old child.
  
  Note: The student has to match the correct breaths per minute to age range. The computer generates altered ranges. (This box shows the correct answers.)

Where is the regulatory centre for the pulse rate?
- a) Medulla oblongata.
- b) Subarachnoid space.
- c) Cerebellum.
- d) Diencephalon.
  
  Note: The student has to choose the correct answer.

What mechanisms are activated to increase heat production and maintain temperature when body temperature falls below normal?
- a) Hairs stand on end.
- b) Constriction of peripheral vessels.
- c) Cessation of sweating.
- d) Altered behavioural activities (turning on the heat/stamping feet).
  
  Note: The student has to choose the correct answer.

What can incorrect deflation of the blood pressure cuff result in?
- a) Correct result.
- b) Underestimation of both recordings.
- c) Overestimation of both recordings.
- d) Underestimation of systolic pressure and overestimation of diastolic pressure.
  
  Note: Practice-related question.

When you have completed vital-signs monitoring, what are the important actions you should consider as a health care practitioner?
- a) Documentation.
- b) Information-giving.
- c) Referral, if appropriate.
- d) All the above.
  
  Note: Professional issues question.

Questions has to look at two papers – first at the answer paper, and then at the student’s paper in order to transfer the answer to this paper. Marker reliability and consistency therefore play a vital role in ensuring that there are no errors (Morse and Field, 1995; Polit and Hungler, 1995).

- Multiple-choice tests can provide more explicit questioning of course content (although, for the purposes of this package, only a specific area of need was identified for exploration – vital-signs monitoring).

  There are, however, drawbacks and more general concerns about the use of e-learning methods, and these apply to both students and lecturers:

  - Certain packages may require specific computer applications to run successfully. This has cost implications for those who need to purchase the appropriate software. This issue should be considered at the developmental stage of any package. Developers should therefore decide what is really needed and what simply makes a package look nice so that one is developed that has costings that are appropriate for both students and the institution.

  - Effective time management appears to be the key to successful e-learning (Maier and Warren, 2000). Lecturers must encourage students to plan their time online in the same way that they would plan assignments and courses. The importance of self-motivation and discipline should be stressed to students at an early stage in their studies.

Access considerations

Ease of access was an important consideration in developing the package: the developers wanted students to feel that they could use the package anywhere. Students are therefore encouraged to access the package both from home or through the computing services at the university.

  - Washer (2001) provides an argument regarding the ‘scarcity of machines on campuses’, especially in ‘new universities’. Because our school is part of a new university, the package development team considered the issue of resources in consultation with the university’s electronic learning office. It was decided that the package should be made available to students for 10–12 weeks.

  - Washer (2001) also states that web-based learning can lead to disadvantaged students becoming more disadvantaged. The rationale for the statement is that, despite students having clear information regarding access times and being able to choose whether or not they want to use the package and when would be appropriate for them to do so, they may potentially disadvantage themselves by choosing not to use the package either from home or from the university.

  - Students with poor reading skills and those for whom English is a second language need not be disadvantaged by e-learning because they can use the package at their own pace. In addition, students who misjudge their own knowledge and ability, either positively or negatively, can benefit from the instantaneous feedback that e-learning can provide.

For related articles on this subject and links to relevant websites see www.nursingtime.net
learning offers (Falchikov and Boud, 1989).

To ensure that the package would be user friendly, a number of issues were considered in the development stages: ease of access and ease of use, password protection, hardware and software compatibility, assessment structure, topics covered and feedback on the students’ responses. Box 2 indicates the outcomes of considering these issues.

**Evaluation**

Anecdotal evidence suggests that using the package has brought a number of benefits, both to students and to lecturers. The benefits to students include:

- They are encouraged to develop their knowledge on vital-signs monitoring in a safe environment and are able to use the learning package as many times as they wish. (Currently, usage is limited to three attempts, pending further evaluation);
- Their IT skills are enhanced, and learning is more efficient and effective.

The benefits for lecturers of e-learning include:

- The assurance that students obtain correct answers in relation to a topic;
- Statistical information on students’ performances can be obtained;
- Areas that may merit further development can be highlighted; for example, if certain questions are always being answered incorrectly, perhaps the information being taught to students should be reviewed;
- Paper costs per student can be reduced.

Because not all students are computer literate when they arrive at university, extra input may be necessary for those with insufficient IT skills to use computers confidently. To help such students, IT study skills sessions are provided, currently run by the university’s library and information services.

We intend to compare data on a cohort of students who completed the paper-based learning package with those students who used e-learning, in order to evaluate the impact of the online format. The information obtained will be correlated against future use of the e-package to see whether more or fewer students access the online package compared with the number using the paper version.

A student evaluation questionnaire will be developed to review the e-package, based on the aims and outcomes of the course. This will enable the course coordinators to compare collected data with the students’ success rate with the vital-signs assignment at the end of the first semester and will also give members of the programme team vital feedback.

**Conclusion**

The development of this e-learning package should enable students to develop their knowledge about vital-signs monitoring in a safe environment. In addition, it will give lecturers feedback on areas of the curriculum that merit further development.

Effective time management appears to be the key to successful e-learning because this teaches students self-motivation and discipline.

As health care professionals and lecturers, it is essential that we embrace the available technology to enrich students’ learning experience, thereby promoting a culture of lifelong learning and exploration within the technological arena.