ABSTRACT

E-learning is regularly promoted in higher education settings as a way of fostering more flexible approaches to learning. It has been argued however that the 'potential benefits of new information and communication technology instruments in education' have not been subjected to critical scrutiny (Debande 2004 p.192). This paper outlines a multi-method evaluation of an e-learning innovation designed to teach clinical skills to student nurses. Responding to the challenges of teaching clinical skills to large class sizes, we developed a set of instructional videos for one undergraduate skills-based module, which are now integral to that module and available online to students on a continuous basis. Evaluation suggests that students' performance outcomes are unchanged. The students view the flexible and self-management aspects of this method of learning positively, with some attitudinal differences between male and female, and mature and non-mature students. However, it is best used to complement rather than replace lecturer demonstration, lending support to a 'blended' model (Collis and van der Wende 2002).

BACKGROUND

Pre-registration nurse education in Ireland moved to the higher education sector in 2002. In the process, hospital-based Schools of Nursing amalgamated with affiliated higher education institutes to become university-based schools. Consequently, class sizes increased significantly, with annual cohorts of 240 at Dublin City University School of Nursing, the site of this study.

The undergraduate Bachelor of Science in Nursing has a significant nursing skills component, embedded in the modular structure and taught to students in conjunction with relevant theory. The 'traditional' method for skills teaching involved demonstration of the

skill by a lecturer to groups of 25-30 students, in the Clinical Education Centre, followed by an opportunity to practice under supervision. These large class sizes, which are determined by timetabling constraints and availability of teaching staff, posed several challenges. The requirement for large numbers of staff led to concerns about procedural consistency (Corbally 2005). Also, we believed a single demonstration was insufficient and that students would benefit from being able to see the skills repeatedly, if necessary. As a means of continuously improving and developing innovative teaching methods and as an extension of the work reported by Corbally (2005), we developed a series of twelve instructional videos for clinical skills in one undergraduate module. The video development project lasted 15 months, beginning in December 2005 with a successful application for funding to the Learning Innovation Unit at Dublin City University and ending in February 2007 with the integration of the videos into a core module 'Meeting Fundamental Needs in Nursing'. The project had been piloted early in 2005 (McGrath et al. 2005) with the development of a single video, which demonstrated the practices used in aseptic technique. This was used to replace the lecturer demonstration element for teaching aseptic technique. The students viewed the video in a time-tabled period of supervised practice. It was also available continuously online. The pilot project was evaluated using a questionnaire in which students rated aspects of the video. Of the 66 students who completed the questionnaire, 86.4% rated it positively. The attributes that were highly rated included increased autonomy, a sense of responsibility for learning and being able to self-pace learning. The success of the pilot project therefore led to a decision to introduce this as the standard method of teaching skills in the module.

Thakore and McMahon (2006 p. 228) suggest that developing an effective multi-media module consists of four phases:

- Identifying the educational objective
- Designing the content

- Building or creating multimedia material that is relevant to the educational objective and

- The evaluation and integration of the e-learning module into the programme.

These stages were broadly adhered to in our project, in that the videos were specifically designed to meet the educational objectives of the module. Consequently, the content was specifically tailored to Year 1 learning outcomes. The production and development of the videos involved the following steps:

- Scriptwriting, circulation and feedback
- Recruitment of actors
- Identification and procurement of material resources and equipment
- Initial filming
- Reviewing and editing of video footage
- Reshooting of video footage (where required)
- Voiceover recording
- Insertion of graphics
- Final editing

Although these are presented as individual steps, many of them occurred simultaneously. This innovation is unique in that the videos are continually available to students online so they can access them wherever or whenever they want provided they have a broadband connection. Students attending the module are required to attend nine two-hour skills classes during the semester. They are expected to view the relevant video(s) prior to coming to class but the decision as to when and where rests with them, in contrast with the pilot project where the viewing was time-tabled. This is intended to promote student autonomy and self-direction in learning, both considered key characteristics of the adult learner (Rogers 2002). The purpose of this study was to evaluate the effectiveness of the

online videos in terms of student outcomes and to explore students' attitudes towards this method of skills teaching.

LITERATURE REVIEW

The literature reviewed presents conflicting views about students' uptake of online learning methods. Low participation rates (in online learning) are reported by Fox & McKeogh (2003), whose students claimed not feeling comfortable with technology or motivated to engage in online learning. Conversely, Thiele (2003) in her evaluation of an online nursing research course found it encouraged participation, which was viewed positively by students. Furthermore, an evaluation of an online health informatics course for undergraduate nursing students, noted that online learning promoted equal participation opportunities for all students and provided a safer learning environment for reticent students in particular (Kenny 2002).

One advantage of online learning is the increased flexibility it offers. Research suggests increased flexibility and freedom in planning learning schedules (Thiele 2003) and that students appreciate the opportunity to work at their own pace and in a location of their choosing, consequently reporting increased levels of self-direction as they became accustomed to the system (Kenny 2002). Rogers (2002) asserts that autonomy is a key characteristic which separates the 'adult' from the 'non-adult' learner. Broadly speaking, autonomy implies a degree of voluntariness and responsible decision-making. Applied to education programmes, acceptance of the 'adulthood' of our students implies we will take measures to promote rather than deny personal responsibility and choice in learning. Akerlind & Trevitt (1996) posit that increased learner independence may be regarded as both a goal and a desirable side-effect of computer-assisted learning. However, Hopcraft (2002) cautions that poor (e-learning) practises may be 'offered under the guise of diversity and

flexibility of learning' (p. 84). Therefore, when introducing students to e-learning methods, educators need to ensure they meet a required standard (Forman et al. 2002). The Institute of IT Training (UK) (2001 cited in Forman et al. 2002), suggests this includes adequacy of learner support, interactive nature of the material, user-friendliness of the navigation system, general media quality and technical ability and quality.

Online learning methods have attracted some criticism. These include lack of interaction with lecturing staff and preference for a traditional class with instructions from an 'expert' (Thiele 2003, p. 366), and student anxiety and stress particularly among those who were not computer literate or who were using out-dated computer equipment (Kenny 2002). However, Akerlind & Trevitt (1996) suggest that online learning methods require a 'paradigm shift' in student's conceptions of, expectations about, and approaches to their learning, and that some resistance should be anticipated.

It is suggested that the impact of technology on student learning has not been sufficiently established. Debande (2004) for example, reports a lack of studies to determine the effects of e-learning on student attainment. Thiele (2003) attempted to compare performance in a multiple-choice examination among 64 students who attended an online nursing research course and 42 students who attended the traditional classroom-based course. Students of the online programme performed significantly better in their examination. However, variation in the way the test was administered to the two groups suggests the findings are questionable. McAndrew et al. (2004) comment 'in setting (e-learning) strategies, there should be a sound knowledge of what approaches are effective and significant for the take-up of e-learning' (p. 1). They also note that simply changing the mode of delivery of education may have little impact on student learning. Goodison (2001), however, believes that e-learning, as long as it produces comparable results to face-to-face contact, can be justified on the basis of efficiency for the students and the organisation.

E-learning methods have been compared to face-to-face learning in a number of studies. In comparing the experiences of first year undergraduate nursing students who were assigned to on-line discussion groups and those in face-to-face discussions, Jacobsen (2006) found the on-line discussion group experienced more anxiety about using communication technology and they reported feelings of isolation and dissatisfaction with the software and access to it. Conversely, Woo and Kimmick (2000) found no overall difference in satisfaction levels between students taking an online course and those taking a traditional lecture-based course. Smith et al. (2006) compared the effects of face-to-face demonstration with an instructional CD on the acquisition of clinical skills of physical therapy students. A pre-test post-test control group experimental design was used to assess students' cognitive and practical performances in two skill areas. Written examination scores showed no significant difference in the two teaching methods. Practical performances showed no significant difference in one skill area, with significantly higher scores in another area, in the groups who viewed the instructional CDs. The authors concluded that instructional CDs were at least as effective as face-to-face demonstration for teaching psychomotor skills.

AIMS AND OBJECTIVES

The aims of this study were to inform practice and curriculum design in relation to e-learning in undergraduate nursing education. The research objectives were to:

- Determine how online learning videos compare with the traditional lecturer demonstration in terms of the outcomes 'knowledge attainment' and 'student performance'.
- Explore how Year 1 student nurses feel about learning clinical skills through online learning videos.

METHODS

The multi-method study evaluated outcomes relating to student attainment of knowledge and practice. This was achieved through a quasi-experimental post-test only control group design. Outcomes, albeit important, are but one element to be examined in an evaluation, and consideration should also be given to process. Process evaluation focuses on how people – in this case the students - feel about what is happening in a programme (Patton 2002). Therefore, we evaluated students' attitudes to the innovation using a questionnaire.

<u>Outcomes evaluation</u>

The students were informed of the study through an e-mail announcement and a short verbal presentation by the module co-ordinator in class. The University Research Ethics Committee granted approval for the study on condition that an academic who was not associated with the study attended the presentation. This was to ensure that no sense of coercion was communicated to the students. The broad purpose of the study was explained in plain English and the methods of data collection and analysis outlined. The students were assured that participation would not contribute to their module grade and there would be no penalty for non-participation or withdrawal from the study. Detailed feedback would also be available to individual participants on their performance and knowledge outcomes. Interested students were invited to contact the module co-ordinator by e-mail.

The students who volunteered to participate in this phase were randomly assigned to a control or experimental group. The control group was taught three key skills in the 'traditional' manner of lecturer demonstration followed by a scheduled period of practice under supervision. They were not given access to the videos during data collection but once data collection was finished, access was unlimited. The experimental group was instructed to

view the instructional videos relating to the three skills prior to a scheduled period of supervised practice. They were informed that they could view the relevant videos as many times as they wished prior to the practice sessions, this being a key feature of the innovation. The skills in question were: measuring and recording a patient's peak expiratory flow rate using a peak flow meter ('Peak Flow'); Teaching a patient the correct way to use an incentive spirometer to encourage deep breathing ('Incentive Spirometry'); and the procedure for pulse oximetry ('Pulse Oximetry'), which is a non-invasive method of monitoring arterial blood oxygen saturation. In teaching the skills, whether through video or lecturer demonstration, both the communication and procedural aspects were emphasised. As part of the module academic content, both groups received a lecture on indications for and nursing management of patients who require fundamental respiratory therapies. All volunteers signed an informed consent to participate in this phase of the study.

The volunteers' knowledge and performance were assessed 1 week after their period of supervised practice. Performance outcomes in the three skills were tested by Objective Structured Clinical Examination (OSCE) using standardised assessment tools developed by the project team. Student knowledge was tested using a 15-item multiple choice quiz (MCQ).

<u>Attitude questionnaire</u>

To evaluate students' attitudes to the project, we distributed an anonymous questionnaire in class on the last day of the module. Completion was voluntary and students were advised to return a blank folded questionnaire if they did not wish to participate. Three questions addressed key demographic variables: branch of nursing, age and gender. Likert-scale questions were used to elicit whether students strongly agreed, agreed, disagreed or strongly disagreed with sixteen statements regarding the videos items. Finally, two open-ended questions asked students what they liked the most and least about the videos.

RESULTS

Fourteen students out of 204 (6.8%) volunteered for the outcomes evaluation phase of the study. These were randomly assigned to the control ($n=7$) and experimental ($n=7$) groups. Four students withdrew before the assessment, leaving four students in the control group and six in the experimental group. In upholding the principle of autonomy, the students were not required to provide an explanation for withdrawal thus there is no information on reasons why.

The mean and median scores for the three skills and the MCQ for both groups are outlined in Table 1. As the sample size was small and the data was not normally distributed, Mann Whitney-U test for independent groups was used for analysis. This indicates no significant difference between the control and experimental groups.

Table 1. Median and mean scores in skills assessments.

Assessment	Median Scores			Mean Scores		
	Control	Exp.	Difference	Control	Exp.	Difference
Peak Flow	82.50	77.50	5.00	76.25	73.33	2.92
Incentive Spirometry	65.00	72.50	7.50	61.25	66.67	5.42
Pulse oximetry	67.50	70.00	2.50	65.00	70.00	5.00
MCQ %	73.33	86.67	13.34	78.33	80.00	1.67
Overall	76.04	80.20	4.16	70.20	72.50	2.50

One hundred and thirty four out of 204 students completed the questionnaire, a response rate of 65.6%. Demographic details of the students who completed the questionnaires are outlined in Table 2. A small minority of students did not supply information on their age or gender. In keeping with demographic trends among nursing students, the majority were female and under 23 years of age.

Table 2. Demographic details of questionnaire respondents.

Gender	$N = 129$	Male: 15 Female: 114	
Age	$N = 131$	Under 23: 102 Over 23: 29	
Branch	$N = 134$	General Nursing:	55
		Intellectual Disability Nursing:	34
		Mental Health Nursing:	26
		Integrated General and Children's Nursing:	19

Student responses suggest that the uptake of the videos was high (Table 3) with 60.6% of respondents viewing 75% or more of the videos. Mann Whitney-U and Kruskall Wallis tests showed no significant differences in the percentage of videos viewed across gender, age and branch of nursing.

Table 3. Student estimation of percentage of videos watched

	N	< 25%	25 – 49%	50 – 74%	75 – 99%	100%
Overall	132	12 (9.1%)	11 (8.3%)	29 (22.0%)	43 (32.6%)	37 (28.0%)
Males	15	1 (6.7%)	1 (6.7%)	2 (13.3%)	6 (40.0%)	5 (33.3%)
Females	113	11 (9.7%)	10 (8.8%)	27 (23.9%)	36 (31.9%)	29 (25.7%)
Under 23	101	11(10.9%)	6 (5.9%)	25 (24.8%)	34 (33.7%)	25 (24.8%)
Over 23	28	1 (3.6%)	3 (10.7%)	3 (10.7%)	9 (32.1%)	12 (42.9%)
General	54	2 (3.7%)	8 (14.8%)	10 (18.5%)	20 (37%)	14 (25.9%)
ID	33	4 (12.1%)	2 (6.1%)	8 (24.2%)	11 (33.3%)	8 (24.2%)
MH	26	1 (3.8%)	1 (3.8%)	6 (23.1%)	7 (26.9%)	11 (42.3%)
Integrated	19	5 (26.3%)	0 (0.0%)	5 (26.3%)	5 (26.3%)	4 (21.1%)

The frequencies and equivalent percentages of student responses to the close-ended questions are outlined in Table 4.

Table 4. Student attitudes to learning skills through video.

Statement	N	Strongly Agree	Agree	Disagree	Strongly Disagree	N/A
I enjoy learning skills through video	134	22 (16.4%)	58 (43.3%)	42 (31.3%)	12 (9.0%)	
I enjoy learning skills through a lecture in the lecture theatre	134	27 (20.1%)	61 (45.5%)	38 (28.4%)	8 (6.0%)	
I enjoy learning skills through demonstration by a lecturer in the skills lab	134	97 (72.4%)	31 (23.1%)	1 (0.7%)	5 (3.7%)	
I find the skills classes useful	133	88 (66.2%)	36 (27.1%)	4 (3.0%)	5 (3.8%)	
I felt prepared for the skills class after I watched the videos	133	18 (13.5%)	70 (52.6%)	37 (27.8%)	8 (6.0%)	
I feel the videos and skills classes have prepared me for the skills in clinical practice	134	33 (24.6%)	72 (53.7%)	19 (14.2%)	10 (7.5%)	
I would like videos to be used more in skills teaching	134	23 (17.2%)	40 (29.9%)	54 (40.3%)	17 (12.7%)	
I would like to have more demonstration of the skills by the lecturers in skills classes	134	85 (63.4%)	33 (24.6%)	11 (8.2%)	5 (3.7%)	
I found it easy to assess the videos	133	24 (18.0%)	71 (53.4%)	23 (17.3%)	15 (11.3%)	
The instructions on how to access the videos were easy to understand	134	32 (23.9%)	66 (49.3%)	30 (22.4%)	6 (4.5%)	
I was able to download the videos to my home computer	132	21 (15.9%)	19 (14.4%)	32 (24.2%)	58 (43.9%)	2 (1.5%)
I like the fact that I can watch the videos in my own time	134	52 (38.8%)	60 (44.8%)	14 (10.4%)	7 (5.2%)	1 (0.7%)
I would prefer if we watched the videos in the skills class	134	30 (22.4%)	32 (23.9%)	53 (39.6%)	19 (14.2%)	
I feel motivated to learn the skills through video	134	14 (10.4%)	59 (44.0%)	46 (34.3%)	15 (11.2%)	
I set aside sufficient time to watch the videos before the skills classes	134	23 (17.2%)	59 (44.0%)	39 (29.1%)	13 (9.7%)	
I feel I will use the videos to revise clinical skills in the future	133	56 (42.1%)	51 (38.3%)	15 (11.3%)	11 (8.3%)	

Examination of the responses by gender yielded some differences. Only one third of the male students were favourably disposed to learning skills through video, a finding which was reversed in the female responses. Roughly one third of the male students compared to one half of the female students would like more use of videos for teaching skills, however the vast majority of both male and female students were in favour of more lecturer demonstration to teach skills. Chi-square tests showed that the only significant difference in male and female responses was in relation to the statement 'I enjoy learning skills through video' ($p = 0.003$), the frequencies of which are outlined in Table 5. This indicates that the female students are more positively disposed to learning skills through video than the male students.

Table 5. Male and female responses to 'I enjoy learning skills through video'

	N	Strongly Agree	Agree	Disagree	Strongly Disagree
Males	15	3 (20.0%)	2 (13.3%)	5 (33.3%)	5 (33.3%)
Females	114	18 (15.8%)	54 (47.4%)	35 (30.7%)	7 (6.1%)

Differences were also noted in the responses of the over-23 and under-23 age groups. Significant differences in relation to age were identified for several statements (Table 6). The frequencies outlined in Table 7 suggest the over-23 age-group view the videos more favourably.

Chi-square tests were also used to examine all of the responses in relation to branch of nursing with no significant differences identified.

Table 6. Statements to which responses were significantly different in over-23 and under-23 students.

Statement	Chi-square value (x^2)	df	p
I enjoy learning skills through video	21.881	3	0.001
I felt prepared for the skills class after I watched the videos	24.271	3	0.001
I feel the videos and skills classes have prepared me for the skills in clinical practice	14.729	3	0.002
I would like videos to be used more in skills teaching	12.413	3	0.006
I like the fact that I can watch the videos in my own time	9.530	3	0.023
I feel motivated to learn the skills through video	10.410	3	0.015
I feel I will use the videos to revise clinical skills in the future	8.341	3	0.039

Table 7. Under 23 and over 23 responses to questions in Table 6.

		N	Strongly Agree	Agree	Disagree	Strongly Disagree
I enjoy learning skills through video	Under 23	102	9 (8.8%)	50 (49.0%)	34 (33.3%)	9 (8.8%)
	Over 23	29	13 (44.8%)	7 (24.1%)	6 (20.7%)	3 (10.3%)
I felt prepared for the skills class after I watched the videos	Under 23	102	7 (6.9%)	54 (52.9%)	35 (34.3%)	6 (5.9%)
	Over 23	28	11 (39.3%)	14 (50.0%)	1 (3.6%)	2 (7.1%)
I feel the videos and skills classes have prepared me for the skills in clinical practice	Under 23	102	17 (16.7%)	61 (59.8%)	17 (16.7%)	7 (6.9%)
	Over 23	29	14 (48.3%)	11 (37.9%)	1 (3.4%)	3 (10.3%)
I would like videos to be used more in skills teaching	Under 23	102	12 (11.8%)	30 (29.4%)	46 (45.1%)	14 (13.7%)
	Over 23	29	11 (37.9%)	9 (31.0%)	6 (20.7%)	3 (10.3%)
I like the fact that I can watch the videos in my own time	Under 23	102	33 (32.4%)	52 (51.0%)	11 (10.8%)	6 (5.9%)
	Over 23	29	18 (62.1%)	8 (27.6%)	3 (10.3%)	0 (0.0%)
I feel motivated to learn the skills through video	Under 23	102	7 (6.9%)	43 (42.2%)	39 (38.2%)	13 (12.7%)
	Over 23	29	7 (24.1%)	15 (51.7%)	5 (17.2%)	2 (6.9%)
I feel I will use the videos to revise clinical skills in the future	Under 23	101	37 (36.6%)	41 (40.6%)	13 (12.9%)	10 (9.9%)
	Over 23	29	19 (65.5%)	8 (27.6%)	1 (3.4%)	1 (3.4%)

Of the 134 students who completed questionnaires, 130 answered the opened ended questions. These were analysed using thematic content analysis. The results support the findings from the close-ended questions. The main themes to emerge were

- Can watch repeatedly to ensure understanding 54.6%

- Can learn / watch in own time 35.4%

- Preparation for class / idea of what to expect in class 21.5%

- Cannot ask questions 18.5%

- Difficulty accessing from home 17.7%

- Prefer demonstration to video 13.8%

- Useful for revision 13.1%

DISCUSSION

Overall, the findings of the questionnaire support the use of videos for teaching clinical skills to student nurses, albeit in conjunction with – not as a replacement for – lecturer demonstration. The flexibility of this method was one of the most positive aspects, supporting the findings of Kenny (2002) and Thiele (2003). In general, the students in this study feel motivated to learn this way and believe the videos help prepare them for the skills practice classes, although the majority would not like greater usage of videos and would like more demonstration by the lecturers. Student dissatisfaction at being unable to ask questions while watching the videos endorses the preference for the presence of an 'expert' reported by Thiele (2003).

Although the students found it easy to access the videos, and the instructions for downloading easy to understand, the high percentage reporting difficulty downloading to their home computers warrants attention. The project team's aspiration that students would watch the videos wherever and whenever they wanted is tempered by this finding. This may

be due to outdated equipment as cited by Kenny (2002) or inadequate internet access at home. Although computer laboratories in the University provide broadband access, having to watch the videos on campus limits the degree of autonomy that students can exercise over their learning.

The finding that mature students responded more positively to some of the questionnaire statements suggests the flexibility of learning and associated autonomy appeals to this group of adult learners (Rogers 2002). Kale & Richardson (2006) found that mature students had difficulties in adapting to e-learning but this was not reported as a particular problem in our study.

The revision benefit of the videos was (surprisingly) unanticipated by the researchers. To quantify the students' use of the videos for revision purposes, we checked the rate of usage prior to the end of semester OSCE, which assessed their competence in monitoring pulse, respirations and temperature and which was communicated to them in advance. The information on student uptake of the videos was available to us from an inbuilt reporting system on the server, available to the web server administrator. Uptake at this point was indeed very high, with two of the relevant videos, Pulse and Respirations and Monitoring Tympanic Temperature viewed collectively 263 times by 148 viewers. Many of this student group requested online videos for skills being learnt when they progressed to the second year of the programme. These interesting, anecdotal findings suggest that the videos meet students' learning needs and could be used across the curriculum to teach a variety of practical skills. Perhaps the 'paradigm shift' referred to by Akerlind & Trevitt (1996) as a requirement for the acceptance of e-learning was occurring with this group.

One obvious limitation of this study was the very small sample size for the knowledge and performance evaluation, which prohibited meaningful statistical analysis. A power analysis had indicated that a sample of 77 students, divided evenly into control and

experimental groups would be necessary to establish the significance of the findings. Out of consideration for the volunteers and the potential learning for them, we decided to proceed with the assessment. Nonetheless, it raises important questions about the feasibility of recruiting students to this type of research.

The low participation rate may have resulted from the power relationships between staff and students (Paterson 1994). As School of Nursing staff, we were most likely perceived by students as holding positions of power, perhaps resulting in reluctance to participate in the outcomes evaluation out of fear of being judged. On reflection, the quasi-experimental approach may have been inappropriate for conducting research with students. In essence, this is a non-participatory design, with the research being 'done on' as opposed to 'done with' students. Viewed through a student's lens it may have paid insufficient attention to the student 'voice'. It is also likely that participation in the study merely represented more assessments, on top of an already heavy study-load. Although the sample size was too small to allow any generalisation of results, the findings do suggest that instructional videos are at least as effective as face-to-face demonstration for teaching psychomotor skills thus lending support to the findings of Smith et al. (2006).

CONCLUSION

This educational innovation was designed to improve the way we teach clinical skills to large numbers of undergraduate nursing students. The instructional videos ensure a defined standard, thus helping to minimise procedural and methodological inconsistencies in skills teaching. Our evaluation suggests that students are favourably disposed to the self-management and flexible aspects of this method of teaching. However it is best used to complement rather than replace lecturer demonstration, thus lending support to a 'blended' model (Collis & van der Wende 2002). This evaluation focussed on students as the key

stakeholder group. Further research is recommended to ascertain the views of academic staff who contribute to this type of module.

References

McAndrew, P. ,Brasher A., Hardy P., 2004 Determining research questions in e-learning. Networked Learning Conference 2004 proceedings. http://www.shef.ac.uk/ncl2004/proceedings/Individual_papers/McAndrew_et_al.htm

Akerlind, G. S., Trevitt, C., 1996. Enhancing self-directed learning through educational technology: when students resist the change. IETI 36(2) 96-102.

Collis, B., van der Wende, M., 2002. Models of technology and change in higher education: an international comparative survey on the current and future use of ICT in higher education. University of Twente, Center for Higher Education Policy Studies, The Netherlands.

Debande, O., 2004. ICTs and the development of e-learning in Europe: the role of the public and private sectors. European Journal of Education, 39(2) 191-208.

Forman, D., Lovemore, N., Rich, T., 2002. E-learning and educational diversity. Nurse Education Today 22, 76-82.

Fox, S., McKeogh, F., 2003. Can e-learning promote higher-order learning without tutor overload? Open Learning 18(2) 121-134.

Goodison, T., 2001. The Implementation of e-learning in higher education in the United Kingdom: The road ahead. Higher Education in Europe, 26(2) 247-262.

Jacobsen, H., 2006. A comparison of on-campus first year undergraduate nursing students' experiences with face-to-face and on-line discussions. Nurse Education Today 26, 494-500.

Kale, S. and Richardson, B., 2006. The effective use of e-learning in postgraduate health-care students. International Journal of Therapy and Rehabilitation, 13(7) 299-302.

Kenny, A., 2002. Online learning: enhancing nurse education? Journal of Advanced Nursing, 38(2) 127-135.

Paterson, B.L., 1994. A Framework to identify reactivity in qualitative research. Western Journal of Nursing Research, Vol. 16 (3) pp. 301-316.

Patton, M.Q., 2002. Qualitative Research and Evaluation Methods. 3rd edition. Sage Publications, London.

Rogers, A., 2002. Teaching Adults. 3rd Ed. Open University Press. Maidenhead.

Smith, A.R., Jones J., Cavanaugh C., Venn J., Wilson W., 2006. Effect of interactive media on basic clinical psychomotor skills performance by physical therapist students. Journal of Physical Therapist Education, 20 (2) 61-68.

Thiele, J., 2003. Learning patterns of online students. Journal of Nursing education, 42 (8) 364-366.

Woo, M., Kimmick, J., 2000. Comparison of internet versus lecture instructional methods for teaching nursing research. Journal of Professional Nursing 16(3) 132-139.

Zemsky, R., Massy, W., 2004. Thwarted Innovation: what happened to e-learning and why. The learning alliance for higher education, University of Pennsylvania.