ORIGINAL PAPER

Using Computer Assisted Learning in Nursing Education: A Pilot Study in Turkey

Deniz Öztürk, RN, MSN
Research Assistant, Gazi University Faculty of Health Sciences Nursing Department , Ankara, Turkey

Hülya Bulut, MSN, PhD
Assistant Professor, Gazi University Faculty of Health Sciences Nursing Department Ankara, Turkey

Corespondence: Öztürk Deniz, RN, MSN, Research Assistant, Gazi University Faculty of Health Sciences Nursing Department, Ankara, Turkey E-mail: deniz__genc@hotmail.com

Abstract

Aim: This is an experimental study aiming to determine the effect of two different methods on student success in the teaching of subcutaneous injection (SI).
Methodology: Of 77 students attending the principles of nursing class in the academic year of 2006–2007, 59 were included in the study (study group 31 and control group 28). After preparing the "Lesson content of the practice of SI" and the "SI practice CD," data were collected by an independent observer using the "SI practice control list" and the "SI practice test."
Results: In the present study, no significant difference was found between students whose education was carried out with CD and those who were trained with present methods with regard to students success in 16 procedure steps whereas significant difference was established in 8 procedure steps.
Conclusions: It was determined that students educated using the CD were more successful especially in administering the injection. It was also found that the students in the study group had higher success scores and a favorable opinion of CD use.

Key words: Computer Assisted Learning, Nursing Education, Subcutaneous injection

Introduction

Education is basically an activity of behavioral modification. This activity aims not only to change individuals' externalized behavior, but also the mental structure underlying this behavior that is associated with knowledge, attitude, and skills. These behavior modifications within the educational process are accomplished using certain training techniques and methods (Öğüt, et al., 2004). In the traditional method, the process is shaped according to the teacher to a large extent. The teacher is the lecturer, while the student is passive in the position of a listener who is bound by strict timelines and who feels the pressures of reproach, criticism, and authority. In this educational method the individual differences, aptitudes, interests, expectations, and characteristics, such as the speed of learning, of the students are largely overlooked (Demir, 2000; Sancak, 2003).
Today educators uphold the use of training tools that respond to the expectations of

societies and the information requirements of the times. This requirement is observed to grow progressively, especially taking into consideration the rapid development in technology (Anaç, 2001; Görpeli, 2003; Karalar, 2006). Studies show that information technologies and, in this context, computers, can help improve creativity and the ability to think critically, enrich the learning environment, and create changes in the quality of education (Lynch, 2000; Rainbow & Sadler, 2003; Özmen & Kolomoç, 2004).

Nursing education is one where many cognitive and psychomotor skills need to be imparted to the student. However, adverse conditions like the lack of clinical lab buildings, crowded classes, a dearth of expert educators, and limited materials lead to restrictions in creating the desired behavior during both in-class lectures and laboratory practice (Bauer & Huynh, 1997; Souers, 1998). On the other hand, nursing education is a discipline that requires precision in practice. In particular, students are expected to correctly perform each procedure that requires psychomotor skills before they can be allowed to practice in a hospital setting. Therefore, a well-planned education enhanced by audiovisual components is essential to ensure that students acquire the desired gains from in-class lectures and laboratory practice.

Benefits to be derived from computers also must be taken into consideration in nursing education. Nurses should perceive computers as a professional nursing tool to facilitate providing comprehensive and quality care, and the use of computers in nursing education must be expanded (Dinç, 1995; Jeffries, 2005; McNeil, et al., 2003). There are studies that demonstrate the effectiveness of augmenting nursing education with computers, or with the use of CDs (Fasce, et al., 1995; Schare, et al., 1991; Nalphoz & McCanse, 1994). In Turkey, however, the introduction of computers into nursing education is fairly recent. No references related to the use of computers in nursing education, computer-assisted education, or use of CDs in education in the country could be found. Nevertheless, it is observed that difficulties like scarcity of instructors, crowded classes, and limited supplies are experienced in giving psychomotor skills to students in nursing education. Further, it was also observed that the inclination to use traditional supplementary training tools continued because of inadequacy of the number of instructors with the knowledge and skills of computer use (Dinç, 1995).Additionally, computer equipment in nursing colleges is reported to be inadequate (Ülker, 2001). Thus, nursing students actively use computers, want to take advantage of computers during class and work in an environment equipped with computers (Koç, 2006).

In this study it is believed that CD use alone will increase both cognitive and psychomotor skills of students, and will bring a new perspective to nursing education in Turkey.

Background

Studies associated with the use of computer-assisted education and use of computers in various fields of education were encountered in the literature (Howerton, et al., 2004; Liao, 2007; Lynch, 2000). These studies examined the impact of computer-assisted education on the students' success and attitude, and arrived at different conclusions. While some studies determined that computer-assisted education increased students' success (Lynch, 2000; Rainbow & Sadler, 2003) others concluded that computer-assisted education had no effect on student success (Howerton, et al., 2004). According to Lewis et al. (2005) the first resource related to the use of computers in nursing education is the software program developed in 1969 by Bitzer and Boudreaux for gynecology-obstetrics nursing. The developments in the use of computer-assisted education occurred in the 1980s. The first international conference on the impact of computers in nursing was held in 1982. In the same year, "The British Computer Society Nursing Specialist Group" and "Network of Users of Microcomputers in Nurse Education" were established. In the 1980s three important endeavors were made to develop computer-assisted education. According to Lewis, Norman published an article entitled "Computers in Nurse Education" in 1985, which confirmed the benefits of computer-assisted education and computer-based learning. During the 1990s, a range of

government- and locally sponsored projects produced a number of nursing CBL packages.

The literature includes studies with differing conclusions on the use of computers in nursing education. Souers (1998) compared use of interactive video against the demonstration technique of the instructor, and determined that a highly cognitive learning occurred in the group who learned through interactive video display. Similarly Botris et al. (2004) used a computer simulation of the physiology of the respiratory system in nurse education, and found the practice to be a contributing factor in student success. Lowdermilk and Fishel (1991) determined that computer-assisted education caused a significant increase in students' decision-making process and practical scores, and that the clinical success of these students was also greater. Fasce et al. (1995) used a computer program of their own device to give hypertension education to their students, and found a higher level of success among those students who received computer-assisted education. Additionally, they concluded that the computer-assisted learning method was advantageous over existing methods, and could indeed to be used as an alternative to these methods. Again, an interactive videodisc instruction module on therapeutic communication in nursing was evaluated to assess its impact on learning and retention by Napholz and McCanse (1994). Their study's results support the use of computer-assisted instruction, and more specifically, interactive videodisc instruction for teaching therapeutic communication skills.

In contrast to the findings of this study, Patricia (1997) compared traditional learning with interactive learning on videodisc, and found no significant difference between the groups. Engum et al. (2003) developed a computer simulation of intravenous catheterization and compared the results of this method with those of traditional laboratory experience. In both groups there was progress in student satisfaction and cognitive learning, but no differential was noted in the students' demonstration of their skills. Frazier (1997) stated that there was no significant difference in the basic nursing skills and knowledge of students taught with interactive education and traditional education. Similarly Rehberg (2003) reported that the use of computers did not create a statistically significant difference in the knowledge tests and psychomotor skills of students in cardiopulmonary resuscitation. Rouse (2000) compared the effectiveness of computer-assisted instruction and traditional classroom lecture for teaching nursing students about congenital heart disease. The study showed that there was a significant improvement in scores for all students but no significant difference in improvement in scores between the two groups of students. But concurrent use of the two techniques significantly improved student performance.

The results of these studies, which examined the impact of computers and computer-assisted instruction on nursing education, indicate that computer-assisted education in particular increases the cognitive accomplishment of students, but does not create an important difference in imparting psychomotor skills. Despite this, it is reported that the addition of computer-assisted programs to existing educational methods would be useful (Bauer & Huynh, 1998; Engum, et al., 2003; Souers, 1998).

Methodology

Research Design, Sample, And Participants

This is an experimental study aiming to determine the effect of two different methods on student success in the teaching of subcutaneous injection. The study was carried out in a nursing college affiliated to a university. The study universe consisted of 77 students enrolled in the first-year Fundamentals of Nursing class of the 2006-2007 academic year, and all of the students were included in the study. However, a total of 17 students who were repeating Fundamentals of Nursing (11), had experience in subcutaneous injection (4), and were newly transferred from other school (2) were excluded from the sample of the study. The number of students composing the study sample was determined as 60. Because one student from the control group was absent on the date the study was implemented, and because one student was accidentally assigned to the study group, the study group was formed with 31, and the control group, with 28 students. All of the students voluntarily agreed to participate in the study. Students were

assured that this activity was not a test and would not affect their educational standing in any way.

Instrument and Data Collection

The 24-item "Subcutaneous Injection Practice Control List" (CL) examining in detail the steps of subcutaneous injection at the psychomotor level, and the "Subcutaneous Injection Practice Test" consisting of 15 questions related to the performance of subcutaneous injection, were used as data collection tools.

The "Lesson content of the practice of SI" CD, which contained the necessary information for the administration of subcutaneous injection, was first prepared for the study. and based on this content, the "SI practice CD" was developed. Lesson Content of the Practice of Subcutaneous Injection was developed by the researcher by reviewing relevant literature (Potter & Perry, 2005; Ulusoy & Görgülü, 2001; Kozier, et al., 2002) and by obtaining expert opinion on the subject. The lesson content includes properties of subcutaneous tissue, definition of subcutaneous injection, sites of application for subcutaneous injection and the criteria for site selection, properties of the syringe and needle to be used, and a detailed, rationale-oriented description of the steps of subcutaneous injection. The Subcutaneous Injection Practice CD was prepared based on the Lesson Content of the Practice of Subcutaneous Injection and is composed of three parts: One is, Theoretical explanation of subcutaneous injection; second is, Rationale-oriented explanation of the steps of subcutaneous injection on a model and the third is, Exercise questions on administering subcutaneous injection.

Intervention

The study and control groups formed using the Simple Random Table of Numbers were admitted into classes in two groups. Information on the research was provided to the students in both the study and the control groups before implementation. The students in the study group were placed in the computer-equipped classroom where each student was assigned one computer. It was explained to the students that they were to study the CD alone with the presence of an observer, and they could restudy the parts they did not understand clearly. Instruction of the students in the control group started simultaneously with the study group, and the same lesson content as in the Subcutaneous Injection Practice CD was transferred to the control group. The lecture was given by using expression, question-answer, and demonstration methods by using a projector. Additionally, all of the questions asked by the control group students about the unit were answered. When the control group students completed the lesson at the end of 25 minutes, the class of the study group was also terminated. Following completion of the delivery of the lesson, the classroom was arranged to allow the students to practice subcutaneous injection. Subsequently the students were readmitted singly to the classroom to perform the procedure. While the students practiced on a model, they were monitored by an independent observer who was not involved in the study. The observer, who was a specialist in the Fundamentals of Nursing, was previously informed about the steps in the Subcutaneous Injection Practice Control List, and observed the students during practice without intervening in any manner. The data were formed by marking the behavior noted by the independent observer on the control list. Each student completing practice was released from the classroom after taking the Subcutaneous Injection Practice Test. Following the practical session, the students in the study group were asked 15 open-ended questions like "What are your opinions about the delivery of the topic of subcutaneous injection through a CD?" in order to determine their views on learning by using a CD. After all stages of practice were completed, in order to fulfill the principle of justice as an element of ethical concern, the topic of subcutaneous injection was explained to the students in the study group, using same teaching methods while it was ensured that the control group students worked in the computer classroom, with one student per computer.

Data Analysis

Data obtained from the study were divided under expert advice into three groups of preparatory stage (items 1-5), the stage of

performing the injection (items 6-16), and the stage of terminating the injection (items 17-24) to facilitate statistical evaluation, and were assessed by computer using an SPSS software package. The presence in categorical data of a differential between the study and control groups in terms of Subcutaneous Injection Practice items (steps) was evaluated using the Chi-Square test, and the students' success score averages, using the Mann-Whitney U-test. One score point was allocated to each correct answer given to the test. The significance level was set as 0.05.

Results

No meaningful difference was noted between the students in the study and control groups in the practice of the steps of the preparatory stage of subcutaneous injection. However, the students in the control group were observed to have performed the step of "Checking doctor's order" listed under "Checking Patient Information" in greater proportion than the study group ($p=0.041<0.005$) (Table 1).

A greater proportion of the students in the study group were noted to perform the steps of "Correctly positioning the injection site" ($p=0.0001<0.05$), "Grasping the skin with the thumb and forefinger of the free hand and separating the subcutaneous tissue from the muscle" ($p=0.001<0.05$), "Aspirating the needle by slightly withdrawing the pump of the syringe" ($p=0.032<0.05$), "Slowly infusing the drug into the tissue if no blood is sighted in the neck of the syringe" ($p=0.011<0.05$), "If blood has entered the syringe, terminating the procedure without injecting the drug" ($p=0.027<0.05$) than the control group (Table 2).

The data are presented under the headings, the following stages of subcutaneous injection practice: Preparatory stage, Making the injection and Terminating the injection.

Table 1 Status of Performing the Steps of the Preparatory Stage of Administering Subcutaneous Injection in the Study and Control Groups

Steps in the Preparatory Stage	Study (n=31) Performed		Did not perform		Control (n=28) Performed		Did not perform		X^2 p value
1. Verbalization of placement of materials on the medication tray	23	74,2	8	25,8	23	82,1	5	17,9	X^2=0,541 p=0,462>0,05
1a. Medication card	26	83,9	5	16,1	25	89,3	3	10,7	X^2=0,368 p=0,544>0,05
1b. Medication drawn into the syringe	31	100,0	0	0	28	100	0	0	**
1c. Cotton tampon saturated with antiseptic solution	30	96,8	1	3,2	27	96,4	1	3,6	X^2=0,005 p=0,942>0,05
1d. Waste container	29	93,5	2	6,5	28	100,0	0	0	X^2=1,870 p=0,171>0,05
1e. Gloves	28	90,3	3	9,7	27	96,4	1	3,6	X^2=0,868 p=0,352>0,05
2. Washing hands	29	93,5	2	6,5	28	100,0	0	0	X^2=1,870 p=0,171>0,05
3. Verbalization of checking patient information	9	29,0	22	71,0	14	50,0	14	50,0	X^2=2,719 p=0,099>0,05
3a. Identification information	24	77,4	7	22,6	21	75,0	7	25,0	X^2=0,048 p=0,827>0,05
3b. Doctor's order	14	45,2	17	54,8	20	71,4	8	28,6	X^2=4,157 p=0,041<0,05*
3c. Dosage of drug	22	71,0	9	29,0	19	67,9	9	32,1	X^2=0,067 p=0,796>0,05
4. Informing the patient about the procedure and receiving consent	30	96,8	1	3,2	27	96,4	1	3,6	X^2=0,005 p=0,942>0,05
5. Putting on gloves before the procedure	30	96,8	1	3,2	26	92,9	2	7,1	X^2=0,468 p=0,494>0,05

* Found to be statistically significant.
** Not evaluated statistically.

Table 2 Status of Performing the Steps in the Stage of Making Subcutaneous Injection in the Study and Control Groups

Steps during the stage of making the injection	Study (n=31) Performed		Did not perform		Control (n=28) Performed		Did not perform		X^2 p value
6. Correctly positioning the injection site	23	74,2	8	25,8	2	7,1	26	92,9	X^2=27,087 p=0,0001<0,05*
7a. Swabbing the injection site with cotton tampon, starting from the injection site and working outward with a circular motion while applying slight pressure	29	93,5	2	6,5	25	89,3	3	10,7	X^2=0,345 p=0,557>0,05
7b. Discarding the cotton tampon in the waste container	28	90,3	3	9,7	28	100,0	0	0	X^2=2,855 p=0,091>0,05
8. Waiting briefly for the skin to dry	17	54,8	14	45,2	15	53,6	13	46,4	X^2=0,010 p=0,922>0,05
9. Placement of cotton tampon between the ring and little fingers of the hand holding the syringe	24	77,4	7	22,6	22	78,6	6	21,4	X^2=0,011 p=0,915>0,05
10. Removal of the needle from its protective cover without touching any surface and stabbing the hand	31	100,0	0	0	28	100,0	0	0	**
11. Grasping the skin between the thumb and index finger of the free hand, and separating the subcutaneous tissue from muscle	18	58,1	13	41,9	27	96,4	1	3,6	X^2=11,964 p=0,001<0,05*
12. Holding the syringe with the open end of the needle pointing up	10	32,3	21	67,7	4	14,3	24	85,7	X^2=2,626 p=0,105>0,05
13. Stabbing the needle quickly but gently into the tissue at an angle of 45º-90º	25	80,6	6	19,4	27	96,4	1	3,6	X^2=3,505 p=0,061>0,05
14. Releasing the pinched skin	30	96,8	1	3,2	26	92,9	2	7,1	X^2=0,468 p=0,494>0,05
15. Aspirating the needle by slightly withdrawing the plunger of the syringe	28	90,3	3	9,7	19	67,9	9	32,1	X^2=4,583 p=0,032<0,05*
16. a. If no blood is visualized in the neck of the syringe, infusing the medication slowly into the tissue by using the free hand	29	93,5	2	6,5	19	67,9	9	32,1	X^2=6,402 p=0,011<0,05*
16. b. If blood has entered the syringe, terminating the procedure without injecting the drug	20	64,5	11	35,5	10	35,7	18	64,3	X^2=4,883 p=0,027<0,05*

* Found to be statistically significant.
** Not evaluated statistically.

Table 3 Status of Performing the Steps in the Completion Stage of Subcutaneous Injection in the Study and Control Groups

Steps in the termination stage of injection	Study (n=31) Performed		Did not perform		Control (n=28) Performed		Did not perform		X^2 p value
17. Removal of the needle from the tissue quickly but gently, without losing the angle of entry	31	100,0	0	0	28	100,0	0	0	**
18.Applying slight pressure on the injection site with cotton tampon	31	100,0	0	0	26	92,9	2	7,1	X^2 =2,292 p=0,130>0,05
19. Positioning the patient as required by her/his condition	27	87,1	4	12,9	24	85,7	4	14,3	X^2=0,024 p=0,877>0,05
20. Removing gloves	30	96,8	1	3,2	27	96,4	1	3,6	X^2=0,005 p=0,942>0,05
21. Verbalization of recording the injection	1	3,2	30	96,8	2	7,1	26	92,9	X^2=0,468 p=0,494>0,05
21a. Date and time of administration	17	54,8	14	45,2	13	46,4	15	53,6	X^2=0,416 p=0,519>0,05
21b. Area of injection	15	48,4	16	51,6	7	25,0	21	75,0	X^2=3,441 p=0,064>0,05
21c. Name of drug	8	25,8	23	74,2	13	46,4	15	53,6	X^2=2,729 p=0,099>0,05
21d. Dosage of drug	16	51,6	15	48,4	14	50,0	14	50,0	X^2=0,015 p=0,902>0,05
21e. Side effects, if any	9	29,0	22	71,0	13	46,4	15	53,6	X^2=1,904 p=0,168>0,05
21f. Reactions of the patient	12	38,7	19	61,3	12	42,9	16	57,1	X^2=0,105 p=0,746>0,05
22. Removal of used materials from the environment and proper disposal	19	61,33	12	38,7	24	85,7	4	14,3	X^2=4,440 p=0,035<0,05*
23. Washing hands after the procedure	19	61,33	12	38,7	15	53,6	13	46,4	X^2=0,359 p=0,549>0,05
24. Evaluation of the patient for the effects/side effects of the drug	24	77,4	7	22,6	22	78,6	6	21,4	X^2=0,011 p=0,915>0,05

* Found to be statistically significant.
** Not evaluated statistically.

Table 4 Subcutaneous Injection Administration Success Score Averages of the Study and Control Groups

Groups	$\bar{x}$	Median	Minimum	Maximum	Sd	Status of Significance
Study	14,42	15	11	15	0,823	M.W U=33,001 p=0,0001<0,05
Control	10,78	11	7	14	2,02	

For the final stage of subcutaneous injection practice, no significant difference was noted between the students in the study and control groups except in the steps of "Removal of used materials from the environment and Proper disposal" ($p=0.035<0.05$) (Table 3).

A look at the success score point averages of the study and control groups shows a success point average of 14.42 for the study group, compared with 10.78 for the control group (Table 4).

Discussion

In this study conducted to investigate the effect on student success of CD use in subcutaneous injection training, the differential was found to be significant in terms of student success in eight steps out of a total of 24, while 16 steps reflected no such difference. However, students in the study group were found to do better than the control group especially in the dexterity-based stage of giving the injection. It is believed that the opportunity the students had for reviewing the CD in their own time increased their success. The students explained the reasons for this in their own words, as follows: *"The subject was better grasped because it was visual. It was interesting because it was out of the ordinary. That it was both visual and audial helped with better grasp of the subject.""It was better to work on the computer, because abstract concepts became more concrete and lasting through diagrams and figures.""I think it was good to work on the computer. It helped us better understand the subject and retain the practice."*

Similarly, Botris et al. (2004) used a computer simulation model to explain the functions of the respiratory system to their students, and determined that this practice was effective on student success. Further, studies have reported that the addition of visual elements to the skill training of students makes the imparted behavior more permanent (Orgun, 1999; Bauer & Huynh, 1998; Rouse, 2000). Lowdermilk and Fishel (1991) reported from a study that computer-assisted education increased the decision-making ability and practice scores of students, and that clinical success was greater among these students as well. Engum, et al. (2003) also reported heightened skills application among students when an interactive computer simulator and traditional laboratory experience were used concomitantly.

Besides studies indicating the effectiveness of CD use in education on student success (Fasce, et al., 1995; Nalpz & McCanse, 1994; Schare, et al., 1991), the literature includes efforts that have determined the reverse to be the case (Frazier, 1997). For example, Rehberg (2003) has reported that use of computers did not create a statistical differential in terms of students' knowledge tests and psychomotor skills. Similarly, the present study did not identify differences in student success in 16 procedural steps. In fact, in the case of some items, the control group students were found to be more successful than their peers in the study group. The literature indicates that when students educated on computers are not steered by an educator, their success rate declines, and that students therefore should be guided (Gibbons, et al., 1999; McNeil, et al., 2003). For instance, in Engum, et al.'s study (2003), students who received their education through the traditional method stated that they preferred studying with an educator to computer-assisted education, because they received assistance from the educator. During the study, one of the students expressed this need with the statement, *"There should still be a teacher beside us so that we can ask about points we don't understand."*

In addition, the success scores of the students in the study group were found to be significantly higher than the control group's. It is thought that self-pacing by the students of their learning and re-viewing of the CD were effective factors in this outcome (Table 3). Results from previous studies are also parallel to this finding (Bektaş, 2003; Rouse, 2000; Souers, 1998). For example, Souers (1998) found that students learning with the assistance of computers received higher cognitive grades. Similarly Koç (2006) reported that computers improve the quality of education and enable students to study at their own learning pace. The following examples from statements made by the students in our study are illustrative of their satisfaction with studying individually and using a CD: *"I got a better understanding by going back to the parts I didn't understand. Before having a computer, 60 of us were only listening to the instructor in the classroom. I felt I was studying individually while on the computer.""Because I listened to the topic one-on-one and by myself, it was more instructive and I understood better.""In studying with a computer everyone gets the opportunity to view as frequently as she wants according to her manner of comprehension, and to go back to the beginning."*

In conclusion, the students stated that "retention of the subject was higher," "they could visualize the procedure," and "they learned the subject better" with the CD. Additionally, the students using the CD stated that although they were happy with this practice, support from an instructor was also necessary.

Limitations

This study has certain limitations. Primarily, the study was conducted in a nursing college and cannot be generalized to other schools. Further, the study entailed delivery of a single psychomotor skill through CD. Another limitation is the belief that the students in the study group had increased success scores because the sample tests were included following the chapter in the CD.

Conclusions and Implications

In the study of the effect of CD use on student success in the administration of subcutaneous injection, although meaningful differences were lacking in the acquisition of psychomotor skills by the students in the study and control groups, it was found that those students who learned by CD alone were successful especially during the performance of the procedure, and had high success scores of cognition. Additionally, students using the CD reported satisfaction with this practice. It is believed that augmentation of existing methods with CD use while training students on psychomotor skills would be useful in imparting psychomotor skills to nursing students when used simultaneously with guidance by the instructor, especially in schools where there is a shortage of expert faculty.

References

Anaç, A. (2001). Ders yazılımı hazırlamada kullanılan yazarlık sistemlerinin ders yazılımı yardımıyla öğretimi. Master thesis. Ankara: Ankara Üniversitesi.

Bauer, MD., & Huynh MV. (1998). Nursing student' blood pressure measurement follawing CD-ROM and conventional clasroom instruction: a pilot study. *International journal of medical information*. 50, 103-109.

Bektaş, A. (2004). Hemşirelik öğrencilerinin kuramsal ve uygulamalı eğitimde yaşadıkları güçlükler ve öğretim elemanlarından beklentileri. *Hemşirelik Forumu*. Eylül-Ekim Sayısı, 45-54.

Botris, T., Halkiotis, SC., & Kourlaba, G. (2004). Computer simulation of the human respiratory system for educational purposes. *Computers, Informatics, Nursing*. 22 (3): 162-170.

Demir, Z. (2000). Video destekli öğretimin öğrenci başarısına etkisi. Master thesis. Ankara.

Dinç, L. (1995). Bilgisayarın hemşirelik eğitimi ve hizmetlerindeki yeri. *Hacettepe Üniversitesi Hemşirelik Yüksekokulu Dergisi*. 2(2): 47-50.

Engum, SA., Jeffries, P., Fisher, L. (2003). Intravenous catheter training system: computer-based education versus traditional learning methods. *The American Journal of Surgery*. 186: 67–74.

Fasce, E., Ramırez, L., Ibanez, P. (1995). Evaluation of a computer-based independent study program applied to fourth year medical students. *Revısta Medıca De Chıle*. 123(6): 700-5.

Frazier, SH. (1997). A comparison study of educational instructional delivery methots. Master thesis. Lousville, Kentucky: Bellermine College.

Gibbons, C., Bachulis, A., Allen, G. (1999). A Comparison of a Computer and Pencil and Paper Assignment. *Computers in nursing*. 17(6): 286-290.

Görpeli, T. (2003). Biyoloji öğretiminde bilgisayar destekli öğretim ile geleneksel öğretim yöntemlerinin öğrenci başarısına etkisi. Master thesis. Ankara: Gazi Üniversitesi.

Howerton BW, Enrique RT, Ludlow BJ, Tyndall AD. (2004). Interactive computer-assisted instruction vs. lecture format in dental education. *Journal of dental hygiene.* 78 (4): 1-9.

Jeffriess, P. (2005). Technology trends in nursing education: next steps. *Journal of nursing education*. 44: 3-4.

Karalar, H. (2006). Microsoft Excel programında formül yazımı öğretiminin, bilgisayar destekli öğretim yöntemi ve geleneksel öğretim yönteminin kullanıldığı gruplardaki, öğrencilerin erişileri ve kalıcılık düzeyleri üzerine etkisi. Master thesis. Muğla: Muğla Üniversitesi.

Koç, Z. (2006). Hemşirelik öğrencilerinin hemşirelik eğitimi ve uygulamalarında bilgisayar kullanımı konusundaki görüşlerinin belirlenmesi. *Cumhuriyet Üniversitesi Hemşirelik Yüksekokulu Dergisi*. 10(2): 29-40.

Kozier, B., Erb, G., Berman, A., Snyder, S. (2002). Techniques in clinical nursing. 5th Ed. New Jersey: Banta Company.

Lewis, MJ., Jenkins, D., Tait, M. (2005). A review of evaluative studies of computer-based learning in nursing education. *Nurse Education Today.* 25: 586–597.

Liao C. (2007). Effects of computer-assisted instruction on students achievement in Taiwain: A meta-analysis. *Computers & Education.* 48: 216–233.

Lowdermilk, DL., Fishel, AH. (1991). Computer simulations as a measure of nursing students' decision-making skills. *Journal of Nursing Education*. 30(1): 34-9.

Lynch, L. (2000). Computer-asissted reading interventionin a secondary school: an evaluation study. *British Journal of Educational Technology*. 31(4): 333-348.

McNeil, JB., Elfrink, LV., Bickford, JC., Pierce, TS., Beyea, CS., Averill, C., Klappenbach, C. (2003). Nursing information technology knowledge, *Survey, Journal of Nursing Education*. 42: 341-349.

Napholz, L., Mccanse, R. (1994). Interactive video instruction increases efficiency in cognitive learning in a baccalaureate nursing education program. *Computers in Nursing.* 12(3):149-53.

Orgun F. (1999). Hemşirelik eğitiminde bireysel öğretim yönteminin etkililiğinin incelenmesi. Master thesis. İzmir: Ege Üniversitesi.

Öğüt, H., Altun, A., Sulak, S., Koçer, E. (2004). Bilgisayar destekli, internet erişimli interaktif eğitim cd'si ile e- eğitim. *The Turkish Online Journal of Educational Technology*. 3 (1). Article 10. Elektronik adresi: http://www.tojet.net/articles/3110.doc

Özmen, H., Kolomuç, A. (2004). Bilgisayarlı öğretimin çözeltiler konusundaki öğrenci başarısına etkisi. *Kastamonu Eğitim Dergisi*. 12(1): 57-68.

Patricia, AD. (1997). Interactive Videodisc Instruction is an Alternative Method for Learning and Performing a Critical Nursing Skill. *Computers in nursing.*; 15(3): 155-158.

Potter, PA, Perry, AG. Fundamentals of nursing, 5th ed, St. Louis-Missouri: Mosby Inc; 2005.

Rainbow, S., Sadler-Smith, E. (2003). Attitudes to computer-assisted learning amongs business and management students. *British Journal of Educational Technology*. 34 (5): 615-624.

Rehberg, RS. (2003). Classroom versus computer-based CPR training: a comparison of the effectiveness of two instructional methods. Doctor of philosophy. Touro University International University.

Rouse, DP. (2000). The Effectiveness of Computer-Assisted Instruction in Teaching Nursing Students About Congenital Heart Disease. *Computers in nursing*. 18(6): 282-287.

Sancak, Ö. (2003). Okulöncesi eğitim kurumlarına devam eden 6 yaş çocuklarına sayı ve şekil kavramlarının kazandırılmasında bilgisayar destekli eğitim ile geleneksel eğitim yöntemlerinin karşılaştırılması. Master thesis. Ankara: Gazi Üniversitesi.

Schare, BL., Dunn, SC., Clark, HM., Soled, SW., Gilman, BR. (1991). The effects of interactive video on cognitive achievement and attitude toward learning. *Journal of Nursing Education*. 30(3):109-13.

Souers, C. (1998). A comparison of two teaching strategies for nursing skill acquisition. Master of science in nursing. Louisville, Kentucky: Bellarmine College.

Ulusoy, MF., Görgülü, RS. (2001). Hemşirelik esasları: temel kuram, kavram, ilke ve yöntemler. 5. Baskı. Ankara: TDFO Ltd Şti.

Ülker, S. Temel mesleki eğitim ile insan gücü'ne ilişkin sorunlar ve çözüm önerileri-2001. Cited 2007. Elektronik adresi: http://www.yok.gov.tr/egitim/raporlar/hemsirelik/hemsire.pdf