E-Learning Education Program for Registered Nurses: The Experience of a Teaching Medical Center

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ABSTRACT: The aim of this study was to describe registered nurses’ experiences with an e-learning education program (ELEP) conducted at a 776-bed teaching medical center in Taipei. The study was completed in three stages: planning, implementation, and evaluation. Nurses who were registered were randomly assigned either to the ELEP or traditional in-classroom program (TICP). Data were analyzed using descriptive and inferential statistics. Forty-two nurses participated (22 in the ELEP and 20 in the TICP). Scores for participants were all > 70 points (out of 100) for both programs. Of the five courses, only teaching and learning and communication showed significant statistical difference between the two groups (p = .001). Nearly all participants (97.6%) felt satisfied with their program (both ELEP and TICP). All nurses passed the nursing care skill tests. Findings should help guide efforts to popularize e-learning education in Taiwan and help create alternative learning methods for future continuing nursing education programs.

Key Words: e-learning, nursing clinical ladder system, registered nurses, continuing nursing education.

Introduction

There is increasing interest in using web-based e-learning tools in continuing education programs for nurses. E-learning programs accessible through hospital websites allow nurses to take courses to enhance their knowledge or help find health and nursing care information. However, in Taiwan, e-learning methods have only been used by nursing students to obtain information on breast cancer self-examinations, disease prevention and promotion, smoking cessation among adolescents, and nutrition improvements in healthcare (Tung & Chang, 2008; Yeh, Chen, & Chang, 2002). Most current classes have been established to provide information, rather as a specific channel for nurses to continue their formal nursing education. E-learning is; therefore, underutilized as a tool for continuing nursing education at hospitals in Taiwan.

It is widely-recognized that delivered nursing service quality depends heavily on the knowledge and skills of nurses. However, due to a lack of systematic development processes and adequate preparation before implementation, most e-learning programs in this area have failed (Gotthardt et al., 2006). Atack (2003) stated that the adoption of a new learning method in hospitals requires appropriate strategies and well-developed processes to achieve better outcomes and improve the quality and speed of information exchange. Therefore, strategies to implement e-learning programs need to be developed and should be based on existing clinical evidence to achieve success.

Nevertheless, acquiring new knowledge and skills while remaining flexible, while a challenge for clinical nurses, is needed in the current health care delivery system as well as in all healthcare organizations to achieve comparative advantage (Atack, Rankin, & Then, 2005). The
shift from in-classroom teaching to e-learning for continuing nursing education has delivered numerous benefits, including providing courses with flexible, accessible, and convenient subject matter and improving the quality and speed of information exchange (Atack, 2003; Nelson, 2003; Williams, Rice, Piepho, Lathers, & Burckart, 2002; Zvarova, Peleska, Hanzlicek, & Zvara, 2002). Therefore, nursing educators need to develop more flexible approaches (e.g., e-learning education training programs) to improve clinical nurse knowledge and increase the performance and capabilities of the nursing workforce.

The nursing clinical ladder system for clinical nurses has been implemented in many countries, including Taiwan. The system consists of four levels (N1, N2, N3, and N4) corresponding to increasing levels competency. Each requires specific courses and nursing care skills to assist staff nurses to excel in patient care. Nurses at the N1 Level are required to master basic nursing care competencies; N2 level is for intensive care competencies; N3 level teaches new nurses, nursing students, and holistic competencies; and N4 level is for nursing projects, research, and specialty care competencies (Taiwan Nurse Association, 2004). Although the system has been enforced in all acute care hospitals in Taiwan since 1992 (Taiwan Nurse Association, 2004); few nurses have completed all four levels due to limited available time and shift rotation considerations. Additionally, since most hospital classes are offered during the daytime and in classroom settings, sometimes it is impossible for clinical nurses to be away from work to attend one or two hours of lectures. As a result, e-learning represents a potential solution that should be implemented in all healthcare organizations to update professional knowledge and assist personal growth and development (Atack, 2003; Dornan, Maredia, Hosie, Lee, & Stopford, 2003). However, research on the effectiveness of e-learning continuing nursing education programs is limited in Taiwan. Therefore, this study aimed to describe the experiences of registered nurses with an e-learning education program (ELEP) at a 776-bed teaching medical center in Taipei. The ELEP used an Active Serve Page (ASP) to develop a web-based user interface. Nurses in the ELEP program were able to log into the hospital Intranet webpage and take courses or review personal information and records, including numbers and scores on completed N level courses. In addition, e-mail addresses and contact names were posted in the system for communications amongst the five researchers, research assistant, technician, and participating nurses involved in this project. The findings of this study are hoped to provide a framework for future nursing educators and hospital administrators to apply e-learning methods for practicing nurses to update their professional knowledge and skills and to get credits awarded toward nursing clinical ladder system requirements.

### Methods

#### Study Design

This study was designed as a two group comparison. Data were collected over a 15-month period during 2004–2005. Study design covered course preparation, distribution of web-based courses, and program completion.

#### Study Samples

This study was conducted at a 776-bed medical center in Taipei. Only registered nurses who had passed the N2 level and wanted to advance to the N3 level were invited to participate. Before the programs began, all nurses were told that participation was voluntary and would not affect their job status or promotion opportunities. After signing agreement letters, participants were assigned randomly to the ELEP or TICP group. Randomization was done by a neutral party (an individual not involved in the study or outcomes) flipping a coin. In order to control other confounding factors that may possibly affect study finding validity, nurse demographics were pre-tested between programs. As no significant difference was identified between program participants ($p > .05$), we can conclude that the effect of demographic variance on study finding validity will be minimal. Additionally, in order to compare the outcomes of these two education programs, nurses who did not complete either ELEP or TICP during the study were excluded and not used in data analysis. Neither nurses nor evaluators were blinded.

#### Procedures Used to Complete the E-learning Education Program

Three stages (planning, implementation, and evaluation) were employed to complete this study. Each is described in detail below.

1. **Planning stage**

   Format and relevant details for the e-learning education program, instructors, locations, test questions, and satisfaction questionnaire were determined by the research team, and described as follows.
Because only five courses were required for N2 clinical nurses to advance to the N3 level at the study hospital, webpage contents were designed to include courses entitled, case study (1.5 hours), career development (1 hour), teaching and learning (1 hour), nursing and law (1 hour), and communication (1 hour). Five instructors were invited to participate in this study based on their expertise in the five courses. Since the ELEP was designed for audio, video, and Power Point presentation formats, all instructors were asked to put their presentations into Power Point, which was required to pass an interface review by one expert. Interface content review included accuracy, adequacy, and completeness of education materials, course length, and course consistency with learning objectives. After that, each course was divided into several subsections based on course length and expert suggestions. Adjustments were only made to one thirty-minute section to improve nurse attention. Once all five courses were completely recorded, they were converted into a format appropriate to delivery via the hospital website.

A computer expert at the study hospital established and maintained the hospital website. Because of limited hospital space and equipment, all courses could only be accessed through three workstations, and web pages could only be accessed via the hospital’s internal Intranet. User-IDs were assigned to ELEP participants. In order for these two programs to be comparable, the same five instructors invited to develop ELEP materials were also invited to give TICP presentations. Educational content and materials in both programs were the same. The research team set a three-month time frame to complete the program.

Because each course required ten multiple-choice test questions, and to make sure there were enough questions available for random selection by the computer, each instructor made six sets of questions for each course. All questions were assessed by five experts to adjust suitability and accuracy of the courses for both the programs and especially for use in the ELEP. To prevent cheating, a series number was designed to appear randomly at any time during the learning period. Nurses were required to remember their numbers to enter the test stage. Questions then randomly appeared at the ends of each course, and scores were automatically calculated after courses were completed. Conversely, for the TICP, 10 questions were administered directly after each class and scored by each instructor.

(2) Implementation stage
All implementation procedures were predetermined, and the importance of responsibilities and tasks before the study began were explained separately to nurses in each program. After programs began, nurses assigned to the TICP were contacted by a research assistant (a computer science major) one week before classes began. Nurses in the ELEP were told that they could take courses at anytime, but would need to obtain a key and sign in before entering the computer room. Three computer rooms were supervised by head nurses at the study hospital. For technical support, an instruction manual was developed by a computer technician and placed next to computers. Also, an assistance hotline and e-mail address were posted in the room for service questions 24-hours a day.

(3) Evaluation stage
During the study period, one research assistant helped keep track of records, knowledge scores, and informed the research team about update procedures. After all courses were finished, a nursing care skill test was then performed by each nurse and evaluated by three head nurses in the study hospital nursing department. Nursing care skill tests included IV injection, insulin injection, inhalation therapy, IM injection, PCT test, blood transfusion, Foley and enema. Each course was scored using a total possible score of 100 points. Nursing care skill tests were rated only pass or failure.

Finally, in order to determine nurse attitudes toward the program, all participants were invited to join post-course group meetings. Two meetings for each program were held at the study hospital. Simple questions were asked, including: (1) Can you tell me about your experience with the program? (2) Are you satisfied with the program? (3) What do you think about instructors in terms of teaching skills? (4) Were course time and location arrangements satisfactory? (5) What are the pros and cons of the program? and (6) What changes would you recommend to improve program quality?

Data Analysis
All data were analyzed using the Statistical Package for the Social Sciences/PC+ (SPSS for Windows 13.0, Chicago, IL). Descriptive analyses such as percentage, number, mean, and standard deviation were used to analyze nurse demographics and satisfaction with the program. A Chi-square test, Fisher’s exact test, and independent t-test
were used to compare differences in nurse demographics and knowledge scores. The \( p \)-value for all statistical analyses was set at .05.

**Results**

**Demographics of Nurses**

A total of 54 nurses initially agreed to participate in this study. However, only 42 nurses, 22 in the ELEP and 20 in the TICP, completed all initial requirements. Reasons for nurses not completing their program (ELEP or TICP) included: work schedule conflicts (6), withdrawals for unspecified reasons (4), transference to another position (1), and quit current position (1).

All nurses were females. Mean ages were 30.5 years for the ELEP and 30.6 years for the TICP, with a total age range between 26 and 47 years. Most (14 in each program) held a junior college degree as their highest level of academic achievement. Mean nursing experience was 7.6 years for the ELEP and 8.1 years for the TICP. Before participating in this study, mean hours of weekly internet access by nurses was 3.5 hours in the ELEP group and 3.1 hours in the TICP group.

**Course Scores and Nursing Care Skill Scores Comparison**

Mean scores for participants on the five courses were:
- Case Study: 75.8 points (ELEP = 77.71 points; TICP = 73.67 points, \( p = .238 \));
- Career Development: 84.1 points (ELEP = 81.36 points; TICP = 87 points, \( p = .195 \));
- Teaching and Learning: 92.1 points (ELEP = 87.73 points; TICP = 97 points, \( p = .001 \));
- Nursing and Law: 87.7 points (ELEP = 86.82 points; TICP = 88.82 points, \( p = .386 \)); and
- Communication: 82.1 points (ELEP = 75.91 points; TICP = 89 points, \( p = .001 \)).

All nurses passed the nursing care skill test, which required a score equal to or greater than 70 points.

**Outcomes of Group Meetings**

Group meeting results found a majority of nurses who completed both the ELEP and TICP reporting positive learning experiences. Approximately 41 nurses (21 nurses in the ELEP and 20 nurses in the TICP) felt satisfied with the programs. Because both program instructors were the same, it is not surprising that all nurses felt satisfied with the instructors. However, one nurse in the ELEP and eight nurses in the TICP felt dissatisfied with the time arrangement. With regard to the location arrangement, five ELEP participants felt dissatisfied, while none of the TICP participants expressed dissatisfaction. Nurses in the ELEP appreciated the convenience of taking the course at any time of the day as well as being able to take courses without taking time off from work or interrupting patient care duties. However, some nurses felt underprepared in terms of the technical challenges posed by online learning and expressed frustration at technical problems encountered. Hence, they suggested offering a technician hotline or more hours of computer, Intranet and web platform training prior to program commencement in order to streamline their learning experience. As there was no instructor-student interaction time provided for nurses in the ELEP, many participants suggested the desire to still meet with instructors on a regular basis to gain additional feedback. Participants also recommended that, while the ELEP is currently underused in continuing nursing education at the study hospital, they hope all courses in the nursing clinical ladder can adopt the same approach in the future. In contrast, nurses in the TICP expressed their satisfaction at being able to ask and discuss questions during class time in order to enhance learning. However, as all courses were arranged during the daytime, they occasionally felt it difficult to focus their concentration, especially when patients under their care were unstable. Hence, they suggested arranging courses in multiple, overlapping schedules or based according to nurse work shifts.

**Discussions**

We found that nurses spent less than 3.5 hours per week on the web, which is relatively low in comparison with the general average. However, this finding is supported by a study conducted by Lee, Lee, Lin, and Chang (2005), which found that about 70% of nurses spent less than one hour each day doing nursing care planning activities on the computer. This finding may also result from the fact that most hospitals in Taiwan still use printed forms and sheets for nursing documents and care planning. Therefore, further research is suggested to explore how a computerized system implemented in the hospital might affect nurses’ web access hours per week.

In these five courses, significant differences were only found in teaching and learning and communication between programs. These findings might be due to teaching and learning and communication courses requiring
more nurse-instructor interaction and the fact that nurses in the TICP had more time to discuss issues or questions with the instructors in the classroom. This finding was similar to that of Atack (2003), who found that problems reported with web-based learning included feeling out of step with class discussion and feeling remote from others. However, with changes in healthcare delivery systems and advances in the health sciences, courses delivered in an e-learning format present certain advantages and should be implemented for both teachers and learners to upgrade knowledge efficiently and effectively (Jeffries, 2005). Needs with regard to social activities for nurses and instructor participation should be taken into consideration in the development of future e-learning programs to resolve or minimize the effect of such e-learning drawbacks.

Learning requires time and energy, especially with regard to traveling to and from class locations and preparing course assignments. ELEP participants felt they did not need to leave their units in order to participate in a live presentation. Therefore, most of them thought that their time could be saved to focus on continuing their patient care responsibilities. Findings resembled those of numerous other studies (Belcher & Vonderhaar, 2005; Billings & Rowles, 2001; Jeffries, 2005; Scollin, 2001; Wang, Chung, Sung, & Wu, 2006; Yu, Chen, Yang, Wang, & Yen, 2007), which found that e-learning education could improve participant knowledge and clinical outcomes without affecting patient care continuity and that such programs are both cost-effective and impact less on family responsibilities and life. Moreover, a study by Berke and Wiseman (2003) found that e-learning education training could deliver 25% to 60% savings in terms of time in comparison with traditional classroom programs. Additionally, Tung and Chang (2008) also found that critical factors related to perceived usefulness, financial costs, and computer self-efficacy by nursing students may affect their intention to take online courses. As a result, if nurses could self-initiate and self-direct to improve their knowledge and skills at any time and location, the costs to hospitals and nurses of continuing nursing education could be reduced.

Nurses in both programs felt satisfied with course contents and instructors. High satisfaction among nurses may also indicate nurses are able to accept that instructors are not physically present for training program instruction. Such findings are supported by Belcher and Vonderhaar (2005) and Lindner (1998), who found that any continuing education can help nurses maintain professional competencies and deal with patient care problems regardless of what program format is used. Hence, ELEP is worthy of implementing at acute care hospitals for future continuing nursing education in the clinical ladder system.

Eight nurses in the TICP and one in the ELEP program felt dissatisfied with time arrangements. This finding may indicate that in-classroom education arranged during the daytime may be inappropriate and that nurses may feel a negative effect on patient care continuity. Also, five nurses in the ELEP and none in the TICP program were dissatisfied with location arrangements. These results may be due to the hospital only opening three computer access locations for students to use. Ruiz, Mintzer, and Leipzig (2006) pointed out that location can effect learner satisfaction. Atack (2003) also pointed out that e-learning can present a daunting challenge for the novice internet users during the initial few weeks. Therefore, for future e-learning education programs, careful selection of locations, computer access terms, pre-course training, and learning environment should be evaluated and better designed to improve nurse satisfaction with e-learning programs.

Limitations of the Study

Three important limitations to this study need to be mentioned. First, unlike studies done in other countries, this study offered no monetary compensation for nurse participants. This limits the ability for results to be compared directly with findings of other studies. Second, because of the small sample size and limitation of participants to a single hospital, findings may not be generalizable to medical care institutions at different levels. Third, as both ELEP and TICP were delivered in two different formats, the validity of study findings may be affected. However, all questions were developed by the same instructor for each course and, thus, we expect such effects on study results to be minimal.

Conclusions

Because all participant knowledge scores were more than 70 points (out of 100), it can be concluded that both the ELEP and TICP had similar learning outcomes for registered nurses in obtaining knowledge and meeting nursing care skill requirements. Moreover, most nurses found courses highly satisfactory regardless of the method of transmission (e-learning or classroom) and indicated they would still choose the same program for their future continuing education. As a result, future nursing educators...
may select courses such as teaching and learning and communication with caution when applying e-learning to continuing nursing education in the nursing clinical ladder system. Overall, findings are very positive and in favor of applying e-learning. The application of e-learning methods to continuing nursing education is possible and may be extended in the future to all levels of the nursing clinical ladder system.

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References


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摘要：本研究目的旨在描述護理人員電子化學習教育方案在776床醫學中心建構之經驗。本研究以計劃期、執行期及評值期三期完成。護理人員則隨機分派至電子化學習教育方案或傳統教育方案。資料以描述性與推論性統計進行分析。本研究共收案42位護理人員，其中22位在電子化學習組；20位在傳統教育組。護理人員之平均課程分數均超過70分。在五個課程中，只有教與學及溝通在兩組有統計上之顯著差異（p = .001）。幾乎所有護理人員（97.6%）對自已採行之教育方案感到滿意。所有人員均通過護理技術考試。總結，本研究結果除能激發電子化學習在台灣護理教育之應用外，亦可提供未來護理在職教育的另一種選擇。

關鍵詞：電子化學習、臨床護理專業能力進階、註冊護士、護理在職教育。