A descriptive study of registered nurses’ experiences with web-based learning

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Aims. To describe the experiences of registered nurses (RNs) who enrolled in a web-based course from either their home or the workplace.

Rationale. In order to maintain competency in rapidly changing health care systems, and meet the challenge of overcoming traditional barriers to continuing education, RNs need access to innovative educational delivery methods. As yet, little is known about the web-based learners’ experience, particularly when courses are accessed from the nursing practice setting.

Methods. The article focuses on the results from questionnaires conducted with 57 RNs enrolled in a web-based, postdiploma course. These findings emanate from a larger study using survey method and focus group interviews. Nurses’ experiences were measured using the Online Learner Support Instrument which was developed and tested for use in the study.

Results. Most nurses found the course highly satisfactory. Not all experiences were positive however, and a number of challenges were faced. Access to the course from home was reported as very satisfactory for the majority, while work users encountered a number of serious barriers such as insufficient time and limited computer access. The RNs made significant gains in their learning with e-mail, Internet, keyboarding and word processing skills during the 16-week course. Lack of computer skills, erroneous perceptions of course workload and inadequate preparation for web learning were largely responsible for the majority of withdrawals.

Conclusion. Web-based learning can be an effective mode of delivery for nursing education. Advance preparation by educational institutions, employers and prospective students is essential. Teachers, peers, technology, course design and the learning environment are key variables that influence the learners’ experience and success.

Keywords: registered nurses, continuing education, web-based learning, internet education, workplace learning

Introduction
A major problem facing registered nurses (RNs) is the ongoing challenge of maintaining professional competence with the continuous influx of new knowledge in the context of rapidly changing health care systems. Changes in patient acuity and budget constraints have impacted on nurses’ roles in all settings, demanding new knowledge and skill sets.
These skills are not simply hands-on or technological skills; employers are demanding higher level thinking skills related to decision making and communication (Cervero & Azzaletto 1990). In the interest of improving care to clients and job satisfaction for their staff, administrators are becoming increasingly interested in advancing the skill sets of employees through continuing education (Billings et al. 1994). Access to continuing education is a challenge for nurses who have work and family responsibilities, work shifts and may live a considerable distance from institutions of higher education (Canadian Nurses Association 1997).

Innovative educational delivery methods, such as web-based learning, are needed to overcome the traditional barriers to continuing education. Indeed, the potential role of the Web in continuing nursing education is now attracting global interest (Kenny 2000, Billings & Rowles 2001, Washer 2001). Web-based learning has developed rapidly in certain institutions of higher education, however, a number of key issues have not been well explored, including the needs of web-based learners accessing courses from home and work.

Literature review

While the development of innovative delivery methods using technology is exciting, it raises questions about quality and accessibility. In 1999, when the study commenced, there was very little in the research literature regarding web-based learning. A great deal of research in the form of quasi-experimental studies had taken place in which learning outcomes for students using various earlier forms of technology were compared with those in classrooms (Keck 1992, Souder 1993, Billings et al. 1994, Daley et al. 1994). The majority of these studies suggest that students who take technology-assisted courses have equivalent or greater knowledge gains compared with those students sitting in traditional classrooms (Russell 1999). Considerable emphasis has been placed on determining whether students learn, however insufficient attention has been paid to the quality of the student’s learning experience.

More recently studies have emerged that address the limitations of earlier work. Daugherty and Funke (1998) examined university faculty and student (n = 55) perspectives of the effectiveness, advantages and disadvantages of web-based learning. Students reported their learning was meaningful and that they had increased access to current and global information. Problems encountered were largely technical. The participants in this study are reflective of those in many other studies of web learning, in that they were education students registered in graduate or undergraduate programmes. Research with web-based learners whose primary activity is nonacademic work (e.g. staff nurses), who have not studied at the baccalaureate or graduate level, is conspicuously absent in studies of technology-assisted education.

Jacobsen et al. (1999) studied graduate engineering students’ (n = 36) experiences with a computer-mediated course that used WebCT, e-mail, a list serve and NetMeeting. The students were expected to post all assignments to the course web page which was technically challenging for many. Overall, students found the learning experience worthwhile and convenient, although some students reported they were relieved to come together for face-to-face sessions at the end of the course.

Andrusyszyn et al. (1999) evaluated 10 students and three faculty members’ perceptions of computer conferencing in a graduate nursing course. Participants completed a course evaluation form that examined interactions with others, environment and technical support. The students were able to engage in meaningful interactions with teachers and peers and found computer conferencing a convenient way to access higher education in nursing. Some nurses reported feeling isolated and disconnected while online and missed classroom contact with their peers, verifying findings from earlier studies. This report of the major variables influencing online learning is helpful; a limitation is that the evaluation was conducted with one course, in one setting.

Vrasidas and McIsaac (1999) used a grounded theory approach employing observation and interviews with seven students and one professor in a graduate online course. Participants completed a course evaluation form that examined interactions with others, environment and technical support. The students were able to engage in meaningful interactions with teachers and peers and found computer conferencing a convenient way to access higher education in nursing. Some nurses reported feeling isolated and disconnected while online and missed classroom contact with their peers, verifying findings from earlier studies. This report of the major variables influencing online learning is helpful; a limitation is that the evaluation was conducted with one course, in one setting.

Other authors have reported students’ experiences with online learning, however, many of these are anecdotal, reports of course evaluations or adoption studies (Hart 1996, MacPherson 1997, Kroder et al. 1998, Steiner 1998). These reports are of limited value in that the results cannot be generalized beyond the study group. A recent review of the literature conducted for the Institute for Higher Education Policy supports these conclusions (Phipps & Merisotis 1999).

It is also interesting to note that while there is increasing evidence of the relevance and need for learning in the workplace (Billett 1992, Nowicki 1996), no studies were identified that examined nursing workplace, web-based learning. The nursing practice environment is fairly unique in that it is characterized by fast-paced work, noise, ongoing patient transfers and stressful situations. If the trend towards workplace, web-based learning is adopted in health care,
educators and administrators will need a clearer understanding of the needs of RN workplace learners.

The study

Theoretical framework

Lawton’s (1997) model of supportive learning for distance education provided the theoretical framework for the study. Lawton’s model was used as it describes the variables that influence the distant learner, explicitly focuses on the needs of practicing nurses and was developed from two nursing practice models developed by Davies and Oberle (1991) and Peplau (1952). Lawton suggested it is essential that support for distance students come primarily through relationships with the teacher and peers. These relationships are inextricably linked and supported by the learning environment, course organization and structure. Survey subscales and focus group questions were developed based on variables from the Lawton model.

Aim

To describe the experiences of RNs who enrolled in a web-based course from either their home or the workplace. The findings reported here are part of a larger study that measured nurses’ perceived level of support and the impact the course had on their clinical practice (Atack 2001).

Design

The methods used in this descriptive study included cross-sectional questionnaires and focus group interviews. In this paper, we will focus on the description of nurses’ experiences with web-based learning based on the survey findings.

Background to study population

The nurses who participated in the study completed the postdiploma, baccalaureate level, web-based course Health Care Relationships. The 16-week course was designed to help nurses develop knowledge and skills in nursing theory, research and interdisciplinary communication to better coordinate patient care across the hospital-community continuum. Participants accessed the course using the Internet in one of three ways: only from home, only from work or from home and work. Course content is delivered as web-based text. The course includes a discussion forum for asynchronous student–teacher and student–student communication about identified weekly topics. A CDROM is used to deliver video clips of nurse leaders discussing current health care issues.

Participants

Fifty-seven nurses enrolled in the course. The group included hospital and community nurses from three provinces and one territory in Canada. Upon enrolment the nurses were randomly assigned to one of three online class sections composed of 18–20 students each.

Ethical approval

The study was approved by the appropriate institutional ethics committees.

Data collection instruments: reliability and validity

Three questionnaires were used: the Learner Demographic, the Online Learner Support Instrument (OLSI) and the Follow-up Survey. The Learner Demographic Survey, administered at the start of the course, consists of 26 items and provides a demographic profile of participants regarding age, gender, work history, education, access to a computer and the Internet, computer skills and site of course access.

The RNs’ experiences with the web course were measured at the end of the course using the OLSI. The OLSI is a 56-item instrument developed by us which includes five subscales: Interaction with Teacher and Peers, Course Design and Resources, Technology, Environment and an ‘Overall Impressions’ scale. An extensive four-stage instrument development and testing process described by Hambleton (1984) was used to design the OLSI. Items for the OLSI were generated on the basis of an analysis of focus group interviews with nurses in a pilot study, empirical studies, Lawton’s model, distance education theory, and the writers’ own online teaching experience.

A panel, composed of six experts in web-based learning and instrument development was consulted to review the OLSI for content and construct validity following which, revisions were made. A pilot version of the OLSI was then posted on the Web. Evidence for internal consistency, the $\alpha$ coefficient for the 45 items (Environment subscale items were computed separately because of the branching by home and work users in this subscale) was 0.95. An $\alpha$ greater than 0.90 is associated with a lengthy instrument and suggests item redundancy (Boyle 1991). The decision was made not to delete redundant items for the present study as this was a new instrument. Alpha for the present study was 0.95. The $\alpha$ for the seven Work Environment subscale items and the four Home Environment items was 0.62 and 0.76, respectively. A full description of the validity and reliability testing and the OLSI items is available (Atack 2002).
The Follow-up Survey was sent to any nurse who withdrew from the course. The survey consisted of three demographic items and a checklist of reasons for withdrawing from the course. The survey also included an open-ended question inviting nurses to comment on their experience.

Data analysis
The statistical package for Social Sciences (SPSS 10 Windows) was used for data analysis. Data were analysed using descriptive statistics to summarize the data. Fisher’s exact tests were conducted on nominal or categorical demographic data to compare findings for nurses who completed with those who dropped the course. A paired t-test was computed to examine the difference in nurses’ computer abilities before and after the course. A Mann–Whitney U-test, was computed to compare differences in the total OLSI scores for home only users and home and work users.

Findings

Characteristics of participants

Learner Demographic Survey

Of the fifty-seven nurses enrolled, 43 actually started the web course. Thirty-nine demographic questionnaires were returned from this group with a response rate of 90%. The sample consisted entirely of women. The majority were aged 40–49, with ages ranging from 25 to 59. Table 1 presents the RNs’ demographic characteristics. The demographic profile of respondents is fairly consistent with the proportions of nurses in Canada in relation to age and level of education (Registered Nurse Statistical Highlights 1999).

Computer access and skills

The Learner Demographic Survey included nine items related to computer access and skills. At the start of the course, 67% \((n = 26)\) took the web course only from home. Eight per cent \((n = 3)\) took the course only from work, and 26% \((n = 10)\) accessed the course from both home and work. Nurses who took the course from work used a computer situated on a nursing unit or in the hospital library. There was no statistically significant change in access site during the course \((P = 1.0)\). In other words, nurses largely continued to access the course from the same location throughout the course.

At the start of the course 64% \((n = 25)\) of the nurses rated themselves as beginners in an overall rating of their computer skills and 67% \((n = 26)\) as beginning Internet users. The nurses also rated their computer skills at the end of the 16-week web course. A paired t-test was performed to compare pre- and post-training scores. The nurses made significant gains in all aspects of computer skills \((P < 0.001)\) including word processing, keyboarding, e-mail and Internet use.

Experiences with web-based learning

Respondents rated the 45 items on the OLSI using a Likert-type scale ranging from 1 to 5 where 1 = strongly disagree and 5 = strongly agree (Table 2).

Responses were summed to produce a total OLSI score for each respondent. Twenty-eight OLSI were completed, and 26 had complete responses, with a response rate of 82.3%. With possible scores ranging from 1 to 5 for each of the 45 items, the maximum possible score for the total OLSI was 225 and the minimum was 45. Scores were converted to a figure out of 100 to facilitate interpretation.

The mean converted score for the entire group \((n = 26)\) was 77 and the converted \(\text{SD}\) was 9.54. Scores ranged from 59 to 91. A Mann–Whitney U-test was computed and results showed no significant difference in the total OLSI scores for home only users and home and work users \((P = 0.13)\).

The RNs were given the choice of completing the OLSI either on the Web or as a paper version. Of the 28 nurses who completed the questionnaire, 54% \((n = 15)\) chose the web version, and 46% \((n = 13)\) completed the paper version. The mean total OLSI score for ‘web’ respondents was not significantly different from that of ‘paper’ respondents \((t = -0.048, \text{d.f.} = 24, P = 0.63)\).

While it is helpful to have an overall group score for the total OLSI, scores on the OLSI subscales are more

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td><strong>Place of employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>30</td>
<td>77</td>
</tr>
<tr>
<td>Community</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Both</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td><strong>Level of education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>19</td>
<td>49</td>
</tr>
<tr>
<td>Post-diploma certificate</td>
<td>13</td>
<td>33</td>
</tr>
<tr>
<td>Baccalaureate degree</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td><strong>Time since last course</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last 5 years</td>
<td>27</td>
<td>69.2</td>
</tr>
<tr>
<td>6–10 years</td>
<td>3</td>
<td>7.7</td>
</tr>
<tr>
<td>11–15 years</td>
<td>3</td>
<td>7.7</td>
</tr>
<tr>
<td>16–20 years</td>
<td>2</td>
<td>5.1</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>4</td>
<td>10.3</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>8</td>
<td>20.5</td>
</tr>
<tr>
<td>Part-time</td>
<td>31</td>
<td>79.5</td>
</tr>
<tr>
<td><strong>Previous computer experience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8</td>
<td>20.5</td>
</tr>
<tr>
<td>No</td>
<td>31</td>
<td>79.5</td>
</tr>
</tbody>
</table>
informative as the scores capture nurses’ experiences with the various aspects of online learning (Table 3).

As may be seen from Table 3, the mean OLSI scores for five of the six categories were over 70, indicating a satisfactory level of support. Regarding interactions with the teacher and peers, most nurses (79%) felt that the information they received from the teacher was helpful. Forty-three per cent wanted more regular teacher feedback while 36% were satisfied. Fifty-four per cent of nurses felt their online discussions with peers had helped them learn while 14% disagreed. Forty-two per cent agreed with the item, ‘I missed talking to other students.’ The mean score of 75 for web course design suggests that most nurses found the course design well organized and user-friendly. The technology subscale score of 80 suggests nurses perceived e-mail communication, CDROM use and technical support positively at the end of the course. The range of scores from 58 to 100 illustrates the diversity of experiences with technology in the course.

The converted subscale mean for Work Environment items was 58 (sd = 14·5); this score was the lowest of the five subscale means. The range of scores for this subscale was 37–74, suggesting that the workplace was very unsuitable for some while satisfactory for others. It is important to note that the subgroup who accessed the course for any part of the time from work at the end of the course was small (n = 7) and only from work, even smaller (n = 1). Sixty-three per cent reported they did not have time to access the course from work and 43% found it difficult to gain access to a computer. These findings applied to both hospital and community nurses.

The range of scores from 50 to 100 for the Home Environment subscale suggest home study was problematic for some, while viewed as an almost ideal learning setting by others. One problem encountered by some nurses (31%) was that they had to compete with family members for the computer and telephone line at home. The majority of home users (93%) found taking the online course from home convenient and most (96%) liked working on the course from home. All (100%) nurses indicated that they would take another course on the web in the future, and the majority (82%) felt that the online course had met their learning needs.

<table>
<thead>
<tr>
<th>OLSS subscale</th>
<th>n</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction with teacher and peers</td>
<td>28</td>
<td>51</td>
<td>96</td>
<td>71</td>
<td>12·2</td>
</tr>
<tr>
<td>Course design and resources</td>
<td>27</td>
<td>56</td>
<td>92</td>
<td>75</td>
<td>10·2</td>
</tr>
<tr>
<td>Technology</td>
<td>28</td>
<td>58</td>
<td>100</td>
<td>80</td>
<td>11·3</td>
</tr>
<tr>
<td>Work environment</td>
<td>5</td>
<td>37</td>
<td>74</td>
<td>58</td>
<td>14·5</td>
</tr>
<tr>
<td>Home environment</td>
<td>24</td>
<td>50</td>
<td>100</td>
<td>80</td>
<td>14·5</td>
</tr>
<tr>
<td>Overall impressions</td>
<td>27</td>
<td>56</td>
<td>96</td>
<td>80</td>
<td>9</td>
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</tbody>
</table>
Follow-up survey

Fifty-seven nurses enrolled in the web-based course. Twenty-five per cent never started and 16% later withdrew. Seventynine per cent of those who started, completed the course. Fisher’s exact tests showed there was no statistically significant difference between nurses who completed and nurses who withdrew with respect to age, marital status, level of education, number of hours worked per week, shifts worked, number of years since last taking a course or previous computer course experience.

Nurses dropped the course for a variety of reasons, not all of which were related to web course delivery. Web course specific reasons included: technical problems, difficulty accessing a computer, missing classroom learning, and web course workload. Thirty-three per cent (n = 3) of those who dropped the course were ‘work only’ users. None of those in the completion group were ‘work only’ users.

Discussion

The majority of nurses enrolled in the web-based course were beginner computer users. Despite this, the OLSI mean of 77 and the Overall Impressions subscale mean of 80 suggest that most nurses who completed the course had a very satisfactory experience with web learning. The range of scores from 59 to 91 however, indicates that some nurses were dissatisfied while others were highly satisfied with the course. The finding that most participants’ perceive web-based learning as very satisfactory has been documented in earlier studies (Curran 1998, Daugherty & Funke 1998, Andrusyszyn et al. 1999).

Responses to items on the OLSI indicated that the nurses were dissatisfied in two major areas: interactions with others and the work environment. The Teacher and Peer Interaction subscale mean was 71; this was the lowest mean of the OLSI subscales with the exception of Work Environment. Many nurses reported wanting more feedback from the teacher; they missed talking to the teacher and their peers. Feeling isolated and missing social contact have been reported in earlier studies of computer conferencing (Bullen 1998, Andrusyszyn et al. 1999). The social problems of web-based distance learning are partly due to isolation from other learners, and these are compounded by the characteristics of computer conferencing. The absence of non-verbal cues in computer conferencing may leave participants feeling they have been communicating with largely with a machine rather than other human beings. Mixing technology, such as videoconferencing and the web, may help to alleviate some of the ‘coldness’ associated with solely web-based learning. The exploration of human–machine interface communication may also be a fruitful area of research.

Not all the RNs expressed feelings of being disconnected. The majority indicated they felt part of a learning group and that online discussions with the teacher and their peers promoted learning. This finding is consistent with data reported in earlier studies (Cragg 1994, MacPherson 1997, Daugherty & Funke 1998). The teacher provides critical support to the distance learner (Lawton 1997), and plays a key role in web-based learning (Burge 1994, Bullen 1998, Vrasidas & McIssac 1999). The teacher needs to be well prepared in web-based delivery and needs to develop an online presence which conveys an interested and supportive manner. Photographs and brief biographies of teacher and students posted on the Web also help support a sense of connection. Teachers need to respond frequently and in a timely manner to students’ online comments, particularly in the first weeks of the course, and work to prepare students to engage in student to student discussions. A separate forum for social discussions needs to be established for casual communication.

Accessing the course from home and work presented nurses with challenges unique to each setting. The lowest mean of the five subscales on the OLSI was the one for Work Environment. The range for the Work Environment subscale of 37–74 reflected the dichotomy of markedly unsatisfactory workplace learning for some nurses, and a more satisfactory experience for others. Not surprisingly, nurses found the greatest barrier to online learning was the lack of time to work on the course. Gaining access to a computer was also problematic. Time for learning (Spotts & Bowman 1993), computer location, proximity and flexibility have been identified in earlier studies as factors that influence learning in the workplace (Khoiny 1995). Billett (1992) noted that learning is of secondary interest in the workplace; service or production activities will always take precedence. The importance of student–teacher and student–student connection, and the learning environment as key variables influencing the learner’s experience, lend support for Lawton’s distance education model.

It would be important for health care employers who are interested in using the Web for workplace learning, to examine closely factors such as staffing assignments, learning environment and the optimum amount of staffing to enable RNs to access web resources at work. Employers who wish to support web-based learning for staff need to provide convenient access to a sufficient number of Internet connected computers. In addition, on-site technical help should be available.
The nurses who accessed the course from home had to compete with family members for the computer and telephone line. In spite of this, most nurses were very positive about the convenience of taking a web course from home. The finding of time convenience has been cited in earlier studies (Burge 1994, Bullen 1998).

Post-test scores at the end of the course showed that nurses had made significant gains in all technical skills measured: word processing, keyboarding, using e-mail and searching the Internet ($P < 0.001$). The finding that participation in a computer-based course enhanced computer skills supports the results of earlier studies (Ball et al. 1985, Bachman & Panzarine 1999). This is an important finding as nurses will increasingly require computer skills for nursing practice in the future (Young 2000).

One surprising finding was that of the 57 RNs who enrolled, 25% did not start the course. While anecdotal evidence suggests this is not uncommon in web courses, no evidence of this ‘non-starter’ phenomenon was found in the literature and further study is warranted. A further 16% eventually dropped the course. It might be argued that a major reason for dropping the course was due to technical/web difficulties. It is important to note, however, that not all reasons for dropping the course can be attributed to the Web. Nurses dropped the course for personal reasons, time constraints and work demands. These reasons are the same as for the traditional on-campus courses.

Six nurses (15%) had not taken any course in over 15 years. Recommencing continuing education using the Web after such an extended study break was a remarkable undertaking. The teacher needs to be alert to the high risk for attrition at the start of the course and to be pro-active in communicating with at-risk students. There is also a need for an instrument to identify ‘at-risk’ students prior to commencing a course. We are currently working on a Web-based Learning Assessment Tool (WeBLAT), which will provide a diagnostic for the prospective web-based learner.

**Recommendations for educational practice**

Faculty and staff at educational and workplace institutions need to recognize the major adjustments novice web learners will make, particularly during the first weeks of the web course. Advance planning and preparation are essential in reducing attrition and enhancing the quality of the learning experience. Students need to be fully informed about hardware and software requirements, Web connections, required computer skills and issues faced by home and work learners well in advance of course start dates. A pre-course assessment of computer and Internet skills is strongly recommended using a valid and reliable tool such as the WeBLAT. Participation in an orientation session to web-based learning is also strongly recommended. The presence of an on-site facilitator is also helpful.

**Recommendations for research**

By the end of the course, the number of nurses accessing the course from work was small ($n = 7$), which limited comparisons of total OLSI scores for home and work users. Although the number of work users was small, the larger study also involved focus group interviews which provided a full and thoughtful description of the workplace learners’ experiences. Findings from the focus group interviews were congruent with survey findings and enhance the validity of survey results. The difficulties of studying at work were strongly articulated by nurses in the focus group interviews with nurses giving several examples of migrating from work to home study. The finding that there was no statistically significant difference in access site from the start to the end of the course may be the result of the small sample size in the ‘work only’ group. Further study with a larger sample of work learners is recommended.

The OLSI was developed for this study and provided a useful description of nurses’ experiences. Further development and testing of the OLSI is recommended. Even after a 16-week web course, 46% of the nurses chose to complete the paper version of the OLSI. This finding has implications for researchers who plan to use the web for data collection.

**Study limitations**

In accordance with the ethical protocol, faculty teaching the web-based course were fully informed about the research taking place with the RNs in their course. Awareness of the research project may have influenced teaching practices and in turn influenced nurses’ experiences. The issue of media novelty as potentially contributing to nurses’ positive perceptions of web-based learning must be considered.

**Conclusion**

Web-based learning can be a satisfactory experience for RNs who are faced with the challenge of accessing continuing education. Adapting to web learning however, presents a number of challenges. Advance preparation and ongoing support from teachers and employers is required to make the learning experience a positive one for RNs. In addition, employers who wish to use web-based learning in the
workplace need to take account of the factors which are likely to influence the success of the RN learner.

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