Effects of Computer-Based Clinical Conferencing on Nursing Students' Self-Efficacy

Yolanda Babenko-Mould, MScN, RN; Mary-Anne Andrusyszyn, EdD, RN; and Dolly Goldenberg, PhD, RN

ABSTRACT

A pretest-posttest, quasi-experimental, control group design and Bandura's theory of self-efficacy were used to examine the influence of computer conferencing on fourth-year baccalaureate nursing students' self-efficacy for professional nursing competencies and computer-mediated learning (CML) during a final clinical practicum. Descriptive analysis was also used to explore themes regarding strengths and challenges of online learning. The convenience sample included 42 direct-entry students (control group: $n = 27$; online intervention: $n = 15$). Within both groups, there was a significant difference in self-efficacy for nursing competencies from pretest to posttest. However, between-group posttest scores were not significantly different. Computer conferencing enhanced learning, and students' self-efficacy for CML increased at posttest. Strengths of CML included connection, support, learning. and sharing. Challenges involved time and Internet access. Insights gained may assist educators in curriculum development when considering how CML strategies support clinical courses and strengthen learning communities.

Learning communities have evolved from the traditional classroom to online distance education settings in which students come together in a virtual environment to exchange ideas, solve problems, explore alternatives, and create new meanings along a connected journey (Andrusyszyn et al., 2000; Billings, 2000). Online courses are offered at universities throughout North America and Europe (Collison, Elbaum, Haavind, & Tinker, 2000; Harasim, 1986; Salmon, 2000), in Asia (Hee Soon, In Sook, Won Jung, & Mo Im, 2000) and in the Middle East (Marini, 2000). Advances in technology have enabled global transitions in learning settings, providing students with enhanced flexibility in meeting their educational needs (Hee Soon et al., 2000; Rose, Frisby, Hamlin, & Jones, 2000). In nursing education, the move toward integrating distance education and Web-based learning into curricula continues as students and faculty experience the effects of distance education technologies on teaching and learning (Billings, 1999; VandeVusse & Hanson, 2000).

Just as in classroom settings, nursing programs delivered by distance education can involve students as co-participants who shape learning through inquiry. Bevis and Watson (2000) suggested that "self-understanding and connectedness is deemed essential to human problem solving and even discovery of new knowledge" (p. 39). Transposing this worldview of nursing education to the virtual learning environment helps clarify how self-understanding, self-efficacy, and connectedness influence students' interactions as a community of learners and demonstrates how their involvement in sharing perspectives about clinical experiences is worthy of study.

To a large extent, research into Web-based technologies in nursing education has involved graduate students. However, it is also important to discern how computer-mediated learning influences undergraduate nursing students, particularly regarding the substantive, practice-

related discussion that occurs in clinical practicum courses. Therefore, this study analyzed questionnaire responses to determine how the addition of computer conference discussions in the final, fourth-year clinical practicum course influenced undergraduate nursing students' self-efficacy in professional nursing competencies and computer-mediated learning (CML), as well as their rating of computer conferencing as a teaching method. In addition, open-ended questions were used to glean themes emanating from online students' responses regarding experiences with CML.

THEORETICAL FRAMEWORK

Bandura's (1977, 1986) theory of self-efficacy was selected as the theoretical framework for this study because it is based on the concept that an individual's belief or perceived confidence for coordinating and carrying out a specific action influences whether a specific action is taken. The concept of self-efficacy stems from social cognitive theory, which posits that three factors (i.e., environmental, behavioral, and cognitive) comprise one's psychological capacity and constantly interact with each other. The cognitive factor is further differentiated into efficacy and outcome expectations (Bandura, 1977). An efficacy expectation is composed of the belief an individual has for successfully carrying out an action to yield an outcome, and arises from four domains of information (i.e., performance accomplishment, vicarious experience, verbal persuasion, and physiological states). Outcome expectations involve an individual's appraisal that a specific action will bring about a decided outcome.

In this study, Bandura's (1977, 1986) theory of self-efficacy was used to conceptualize differences between fourth-year baccalaureate nursing students' beliefs or confidence (i.e., self-efficacy expectations) for carrying out professional nursing competencies and participating in CML during their final, 3-month clinical practicum. In addition, the theory was helpful in examining students' online contributions for sources of self-efficacy information embedded in discussion comments.

LITERATURE REVIEW

Self-Efficacy Theory in Health Care and Nursing Education

Self-efficacy has been studied extensively in the health sciences: in lifestyle and health behavior changes with smoking (Allen, 1988; Chen, Horner, & Percy, 2002; Martinelli, 1999; Warnecke, Morera, Turner, & Mermelstein, 2001), exercise (Allison, Dwyer, & Markin, 1999; Chase, 2001; Ferguson & Jones, 2001), and weight reduction (Strecher, McEvoy DeVellis, Becker, & Rosenstock, 1986); in therapeutic programs of cardiac (Gortner & Jenkins, 1991) and respiratory interventions (Krall Scherer & Schmieder, 1997; Krall Scherer & Shimmel, 1996); and in spinal injury care (Hampton & Marshall, 2000; Wise & Hale, 1999). Self-efficacy has also

been examined in education related to academic and learning performance (Fall, Balvanz, Johnson, & Nelson, 1999; Fall & McLeod, 2001; Jackson, 2002; Lane & Lane, 2001; Lent, Brown, & Larkin, 1984; Pajares, 2001; Schunk, 1985).

In nursing education, use of Bandura's (1977, 1986) theory has not been extensive. To date, noteworthy studies have demonstrated how self-efficacy beliefs influence behaviors in various teaching-learning experiences of nursing faculty and students (Ford-Gilboe, Laschinger, Laforet-Fliesser, Ward-Griffin, & Foran, 1997; Goldenberg, Iwasiw, & MacMaster, 1997; Laschinger, McWilliam, & Weston, 1999; Madorin & Iwasiw, 1999). In Goldenberg et al.'s (1997) investigation, nursing students' (n = 23) and nurse preceptors' (n = 24) self-efficacy related to participating as preceptees (students) or preceptors during a final, fourth-year, 12-week clinical practicum was assessed. Preceptees identified their level of confidence for carrying out specific nursing actions. Their clinical practicum posttest scores were significantly higher than their pretest scores (p < .01). Bandura's (1986) sources of self-efficacy information were incorporated into the preceptorship experience and may account for the increase in students' self-efficacy levels from pretest to posttest. Preceptors identified their level of confidence for collaborating with students to carry out these specific nursing actions. Their self-efficacy levels remained high and unchanged from pretest to posttest, conceivably due to their previous experience and confidence in their roles.

Computer-Mediated Learning in Nursing Education.

Perceptions related to nursing leadership and health care were explored in a 7-week, distance education experience between graduate nursing students from Norway and Canada, through analyzing case studies using asynchronous computer conferencing and video-teleconferencing methods (Andrusyszyn et al., 2000; Iwasiw et al., 2000). Prior to the experience, faculty from both universities collaborated in defining concepts; identifying suitable teaching methods and appropriate distance education technologies, course expectations, course dates, and video-teleconferencing times; and arranging for translators. Students valued this method of sharing international insights and perceptions about nursing leadership. In addition, collegial relationships were developed, computer conferencing dialogue was rich and substantive, and learners were able to think critically about nursing issues from a global perspective.

Wambach et al. (1999) developed online courses for American primary nurse practitioner students in rural and remote areas. Courses included debates, computer conferencing group activities, video-teleconferencing meetings, e-mail discussions, online journals through e-mail, and links to other online resources, while self-evaluations and scholarly papers were paper based. The flexibility of computer conferencing was appreciated, the discussions were insightful, and the scholarly papers and

course evaluations were of equal quality as those delivered by on-campus methods.

In a qualitative study, Cragg (1994) explored the experiences of 7 RN-to-BSN students in a two-term computer conferencing community nursing course. Frustration with the medium, the lengthy orientation, and working through technological problems initially interfered with meaningful participation in course discussions, but the asynchronous nature of computer conferencing afforded students opportunities to balance employment, family, and academic commitments, as well as assume leadership roles as moderators.

From these studies, it is apparent that research involving self-efficacy and computer conferencing participation is a natural combination for studying online education, learner confidence, and knowledge development. However, further research is necessary to identify how participation in online discussion influences fourth-year baccalaureate nursing students' beliefs regarding confidently carrying out nursing competencies and engaging in reflective thinking, collaborative problem solving, and collegial support.

HYPOTHESES AND RESEARCH QUESTIONS

The following hypotheses and research questions were developed based on Bandura's (1977, 1986) theory of self-efficacy and the review of the literature described above.

Fourth-year baccalaureate nursing students who participate in the addition of computer conferencing discussions to both classroom and clinical experiences during the final clinical practicum course will demonstrate:

• Higher levels of self-efficacy for professional nursing competencies than nursing students who attend classroom and clinical experiences alone.

• Higher levels of self-efficacy for computer-mediated learning at the end of their final clinical practicum course than at the beginning.

This study sought to answer the following research questions:

• How do fourth-year baccalaureate nursing students rate computer conferencing as a teaching method to enhance their learning throughout a clinical practicum course?

• How do fourth-year baccalaureate nursing students describe their experiences of prior computer use and the strengths and challenges of participation in computer conferencing?

METHOD

A pretest-posttest, quasi-experimental, non-equivalent control group design was employed to examine the differences in fourth-year baccalaureate nursing students' self-efficacy for nursing competencies and CML. Descriptive analysis of themes emanating from open-ended questions was also used.

Sample

Students were selected from the fourth year of a baccalaureate nursing program in a southwestern Ontario university. The nonprobability convenience sample was composed of 42 students who volunteered to participate

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(69% participation rate). Thirty-three students (79%) volunteered to participate in computer conferencing discussions and complete questionnaires. From this group, 15 students were randomly selected and assigned to the intervention group; the remaining 18 formed part of the control group. Nine students (21%) volunteered to complete questionnaires but not participate online and, thus, were also assigned to the control group. Therefore, 15 students comprised the intervention group, a manageable size to moderate, while 27 students formed the control group.

Students in the intervention group participated in an orientation to the asynchronous, password-protected conferencing platform (WebCT), designed to prepare them for online dialogue during their final 3-month clinical practicum. Students could select links to the main discussion space to share practice experiences; to nursing and health-related Internet sites; and the "virtual café" to engage in social dialogue. Students usually contributed to the online discussion in the main discussion space twice weekly, posting new practice-related topics and responding to topics already initiated.

Instruments

Two researcher-designed instruments were used to collect study data:

• The Self-Efficacy for Professional Nursing Competencies Instrument (SEPNCI) was distributed to all participants prior to the final 3-month clinical practicum (pretest) and immediately following the practicum (posttest).

• The Self-Efficacy for Computer-Mediated Learning Instrument (SECMLI) was distributed to the intervention group only at posttest.

A student demographics questionnaire was also included at pretest.

The Self-Efficacy for Professional Nursing Competencies Instrument. The professional nursing competencies included in the SEPNCI were adapted from the Canadian Nurses Association's (CNA) *Blueprint for the Canadian Registered Nurse Examination* (1999) and reflect the "knowledge, abilities, skills, attitudes, and judgment" required of the "entry-level RN" to practice "safely and effectively" (p. 1). This 183-item instrument measures the degree of confidence one has for performing a specific task or skill related to professional nursing competencies.

SEPNCI items were grouped into six domains, as designated in the CNA practice framework: nurse-client relationships, health promotion, illness-injury prevention, curative-supportive care, rehabilitative care, and professional practice. A standard, summative scale measured participants' overall confidence for meeting nursing competencies with anchors at 0 (not confident at all) and 100 (very confident). Prior to distribution in this study, the instrument was pilot tested with doctorally prepared nurse educators with expertise in Bandura's theory and professional nursing competencies, and with newly graduated baccalaureate-prepared RNs. The Cronbach's alpha reliability coefficient calculated on study participants' scores from pretest to posttest was .98.

The Self-Efficacy for Computer-Mediated Learning Instrument. The SECMLI contained 10 items and a standard, summative scale, ranging from 0 (not confident at all) to 100 (very confident) and measuring participants' degree of confidence for learning through computer conferencing. Each of the 10 items specifies a particular sociocognitive aspect involved in computer conferencing. This level of specificity is congruent with Bandura's (1997) premise that the "item content of self-efficacy scales must represent beliefs about personal abilities to produce specified levels of performance and not include other characteristics" (p. 45).

Additional SECMLI items ask participants to rate the computer conferencing experience as a teaching method, using a 6-point, Likert-type scale, and to respond to two open-ended questions related to prior experience with computers and their perceived strengths and challenges with CML. The SECMLI was pilot tested for content and face validity with doctorally prepared nurse educators who had expertise in teaching-learning using computer technology, and five volunteer nursing students who had recently used CML in undergraduate or graduate nursing courses. Cronbach's alpha reliability for the 10 items on the SECMLI calculated for study participants' pretest and posttest scores ranged from .78 to .87.

Data Collection

Following university ethical approval, the researcher (Y. B.-M.) met with the director of the School of Nursing and obtained verbal and written support to conduct the study with the fourth-year baccalaureate nursing students. Permission was also obtained from fourth-year nursing faculty for class time at the end of the first and second terms to distribute and have students complete pretest and posttest instruments.

Student participation was voluntary, and return of the instruments constituted consent. Students could complete some or all of the questions or withdraw from the study at any time, and participation or nonparticipation would affect neither students' grades nor their program status. The instruments were coded, and no names were associated with any data. The online discussions were private and confidential to the participants and researchers, and the transcripts were shredded at study completion.

RESULTS

Demographics

The majority of participants were women (95.2%), with an average age of 24 (SD = 5.26). Their self-reported grades ranged from B to A+. Most participants were single (73.8%). Part-time employment was reported as a demand on time by 33.3% of the students, and an additional 33.3% noted having multiple demands. Many participants reported multiple experiences in health care (45.2%). Completion of a university degree was accomplished by 21.4%, while 14.3% obtained some university credits. In the absence of statistically significant ($p > .05$) differences in the distribution of the demographic variables (i.e., age, gender, marital status, grade, demands on time, prior experience in health care, level of postsecondary education) across the groups, split-plot analyses of variance (ANOVA) were conducted. This was performed on both the total and subscale SEPNCI scores of paired participants (n = 36) to determine whether there was a difference between the control and intervention groups' scores from pretest to posttest.

Hypothesis 1

Results of the first hypothesis examining students' self-efficacy for professional nursing competencies indicated that, overall, split-plot ANOVA revealed no significant group by test time (pretest and posttest) interaction (F (1,34) = .69, $p < .05$), a significant within-subjects effect for test time (F (1, 34) = 46.61, $p < .05$), and no significant between-subjects effect for group (F (1, 34) = .70, $p < .05$). Therefore, the self-efficacy for professional nursing competencies posttest scores of students in the intervention group were not found to be significantly different from the scores of students in the control group. However, overall for both groups, students' SEPNCI scores increased from pretest to posttest. Approximately 15% of the variance of scores on the total SEPNCI is explainable by time. The split-plot ANOVA results for each of the SEPNCI subscales revealed no interaction ($p < .05$) or between-subject effects ($p < .05$). However, for each subscale, there was a statistically significant within-subject effect (time) ($p < .05$).

Hypothesis 2

For the second hypothesis, the paired t test results revealed a statistically significant difference between the

pretest and posttest SECMLI scores (mean = 11.25, SD = 10.52, t (11) = 3.70, $p < .05$, d = 1.07), based on the students' experience with the medium. The means and standard deviations of online students' (n = 12) SECMLI scores were as follows: pretest, mean = 77.91 (SD = 6.80) and posttest, mean = 89.16 (SD = 8.29).

Research Question 1

For the first research question, which examined participants' ratings of computer conferencing as a teaching method (from 1 = strongly disagree to 6 = strongly agree), students in the intervention group (n = 12) moderately agreed that computer conferencing enhanced learning (mean = 5.17, SD = .83). There were no ratings below 4 (slightly agree), suggesting that all students (n = 12) agreed computer conferencing enhanced learning. In addition, some students (n = 5) strongly agreed (rating of 6) that computer conferencing was a teaching method that enhanced their learning.

Research Question 2

Online participants' responses to the SECMLI open-ended questions were explored inductively and described according to thematic categories. Students in the intervention group (n = 12) used computers mostly for word processing school assignments (n = 6) and e-mail (n = 5). Two students noted they had taken an online course. Frequency of computer use ranged from occasionally for school purposes only, often each day, and used frequently for years. Two participants noted they had never used the Internet; thus, this was a new learning experience.

Four major themes emanating from online students' (n = 12) SECMLI descriptions of strengths associated with computer conferencing were: "connection," "support," "learning," and "sharing." Connection was expressed as being joined together as peers and colleagues across a virtual space. Support denoted providing encouragement to each other. Learning signified acquiring knowledge from discussion of experiences. And sharing was described as giving and receiving insights and perspectives. Students in the intervention group indicated that challenges involved time availability and Internet access.

In addition, students' text-based online contributions were a rich source of information from which to explore potential associations between online participants' comments and Bandura's (1977, 1986) theoretical propositions. Many of Bandura's sources of self-efficacy information appeared to be interwoven in the online dialogue. The following example demonstrates how online comments may have aroused positive emotions and contained an element of support:

I don't know if you are aware of this, but in your last posting, you said some very important and powerful

things! I hope everyone reads your posting. You amaze me with your intelligence and insightfulness. Thank you for sharing your insights AND your experiences…. I know that it has made me so much more aware about why we are there.

Similar feelings were noted by other online participants in responding to the SECMLI.

A variety of sources of self-efficacy information emanated from online discussions: performance accomplishment, verbal persuasion, and vicarious experience. These sources of efficacy information may have combined to enhance students' beliefs in their abilities to substantively participate in CML and potentially influenced their self-efficacy for professional nursing competencies and CML.

DISCUSSION

Regardless of their learning method, these fourth-year baccalaureate nursing students demonstrated increased levels of confidence in all nursing competence domains. Importantly, this study is one of the first to incorporate all CNA (1999) competency items in an instrument that assesses students' levels of confidence during a 3-month final clinical practicum. Although high levels of confi-

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dence for professional nursing competencies prior to the practicum were reported, even higher levels of self-efficacy for professional nursing competencies were evident at posttest. This supports the idea that clinical practicum experiences augment students' beliefs in their abilities as "soon-to-be" nurses.

Participation in computer conferencing fostered a feeling of community through connection, support, learning, and sharing. It is important that nurse educators recognize that teaching-learning methods such as computer conferencing could contribute to students' increased senses of confidence and connection and, therefore, are worthy of integration into curricula. Students' positive expressions of online experiences may be construed as being similar to principles of emancipatory education in which human caring, reflection, and connection are fundamental characteristics of creative teaching-learning experiences (Bevis & Watson, 2000). In this study, the comput-

er conferencing environment provided an excellent avenue for students to engage in discussions, which mirrored the emancipatory philosophy of nursing education (i.e., to awaken the self, discover and share voice, and collaboratively construct knowledge).

IMPLICATIONS FOR NURSING EDUCATION

Nurse educators must be aware of the benefits of online courses as a means to further enrich clinical practicum experiences. In this study, students shared their real-world practice experiences with each other in a way that enabled them to internalize the discussion, process individual meaning in light of their own encounters, and express personal insights to the group. The potential value of CML as contributing to students' sense of control over learning should be acknowledged because participants in this study seemed to have fostered a shared sense of power. No one student dominated the discussion (Billings, 1999), and group process skills were augmented, in conjunction with learning from, and participating in, the whole group's experiences. In addition, nurse educators should consider the value of online resources, which permit students to access global links and, thus, extend inquiry beyond local issues (Colling & Rogers, 1999).

Although Web-based learning is growing in application during clinical conferencing, this learning method can also be used across the nursing curriculum. For example, students in leadership, ethics, and family-community health education courses can engage in online learning to:

• Develop analytical skills through review and discussion of case studies.

• Enhance leadership skills by sharing the role of online moderator.

• Engage in reflective thought when posing and responding to others' questions.

• Participate in group process by completing group assignments.

• Develop presentation skills using PowerPoint technology online.

• Share knowledge through interdisciplinary discussions.

Web-based learning can also be applied in clinical laboratory courses through the use of computer software in which students use interactive media to engage in simulated scenarios of nurse-patient interactions and fundamental skill development. Finally, online learning need not be geographically oriented, as nursing students and faculty can be connected across universities throughout the world to discuss professional practice issues and learn, share, and grow from each other.

RECOMMENDATIONS FOR FUTURE RESEARCH

Replication of this study with nursing students participating in clinical courses in each of the four years of the program is worthwhile to understand how students'

learning needs, levels of autonomy in learning, depth of reflective thinking, and confidence for developing professional competencies and CML evolve. To extend the current findings and further inform educators about how academic successes, leadership, empowerment, and confidence are experienced online, a qualitative study of students' experiences in an online course that involves shared moderation, collaborative problem solving, and interactive learning activities could be undertaken. In addition, a 1-year follow-up study may take the form of a program assessment, which may reveal how students' self-confidence for nursing competencies, learning, and CML are applied in the practice setting. Finally, validation of Bandura's (1977, 1986) theory in a similar study with post-RN students is warranted. Post-RN students' experiences of CML could conceivably be very different from those of undergraduate students', perhaps due to depth of life complexities and preferences for learning.

CONCLUSION

The results of this study provide support for aspects of Bandura's (1977, 1986) theory of self-efficacy, particularly the proposition that sources of self-efficacy information can influence cognitive self-appraisal of confidence for carrying out specific actions. The findings also suggest that computer conferencing is an effective teaching method, which contributes to the development of a community of learners. Computer conferencing could also be partnered with clinical practicum experiences because this learning environment provides further opportunities for broader exchange and generation of thoughtful dialogue. The influence of online participation may be applied in future interactions with peers and colleagues. Bonds of trust and friendship formed in this online community of nursing students could extend into lifelong connections.

This research signifies intriguing and relevant progress toward understanding social and cognitive processes involved in online computer conferencing learning settings. Results revealed the theoretical relationship between beliefs in oneself for performing specific nursing competencies or participating in CML and levels of confidence, and supported computer conferencing as a teaching method to enhance learning. Four predominant social processes (i.e., sharing, connection, learning, and support) were highlighted as strengths of computer conferencing. However, the results and conclusions should be viewed cautiously due to the use of convenience sampling and self-selection to groups. Nonetheless, the findings demonstrate the usefulness and applicability of online learning in nursing education.

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