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Attitudes toward web-based distance learning among public health nurses in Taiwan: A questionnaire survey

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Abstract

Background: Public health nurses (PHNs) often cannot receive in-service education due to limitations of time and space. Learning through the Internet has been a widely used technique in many professional and clinical nursing fields. The learner's attitude is the most important indicator that promotes learning.

Objectives: The purpose of this study was to investigate PHNs' attitude toward web-based learning and its determinants.

Design: This study conducted a cross-sectional research design.

Settings: 369 health centers in Taiwan.

Participants: The population involved this study was 2398 PHNs, and we used random sampling from this population. Finally, 329 PHNs completed the questionnaire, with a response rate of 84.0%.

Methods: Data were collected by mailing the questionnaire.

Results: Most PHNs revealed a positive attitude toward web-based learning (mean $\pm$ SD = 55.02 $\pm$ 6.39). PHNs who worked at village health centers, a service population less than 10,000, PHNs who had access to computer facility and on-line hardware in health centers and with better computer competence revealed more positive attitudes ($p < 0.01$).

Conclusions: Web-based learning is an important new way of in-service education; however, its success and hindering factors require further investigation. Individual computer competence is the main target for improvement, and educators should also consider how to establish a user-friendly learning environment on the Internet.

Keywords: Public health nurses; Attitude; Basic computer competence; Web-based learning; The Internet

Statement

What is already known about this topic?

- Attitude is an element for learning which influences learning efficiency, motives, and knowledge application.
- Web-based learning is a way of breaking education's space–time barriers which limit nurses' continuing education.
- Previous studies found that computer equipment, Internet connection, and learners' computer skills influence their participation in web-based learning program.

What this paper adds?

- Better understanding of Public health nurses' (PHNs') attitudes toward web-based distance learning. Most

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PHNs have a positive attitude toward web-based learning, especially for non-synchronous learning style. However, some PHNs still worry about its interaction and effect.
- Apart from except personal and equipment factors, working factors (types of health centers and service population) also play important roles in influencing PHNs' attitudes toward web-based learning.
- The learners' fear of this new learning method due to this technology and their insufficient computer skills can lead them to avoid or withdraw from distance learning courses.

1. Introduction

The increasing uses of computers, targets with advances in hardware and software technologies, have made information transmission patterns and distance education more diverse. A learner can now select a distance learning environment to meet his/her needs (Williams et al., 1999). Web-based education is an open learning environment with abundant information resources that provide an abundance of wordtexts, pictures, video, and audio materials to learners through the Internet linkage. It is only in the past two decades that web-based distance education has been applied to nursing education. Reinert and Fryback (1997) surveyed 353 schools of the American Nursing School Alliance and found that web-based courses have increased more than five-fold in the past 5 years. In terms of educational effect, Dixon et al. (2001) reported, based on 53 specialist breast care nurses, that web-based learning produced significant improvements in practical nursing knowledge and skills. Kooker et al. (2000) observed that nursing staff who had completed their masters degree nursing courses via web-based distance education with the focus group interview method, experienced significant improvements in their professional ability and that these nurses were able to cooperate and coordinate better with doctors.

Billings et al. (2001) described distance learning as an education environment where the learner and teacher are separated by time and/or space. A learning environment established by educational technology will provide an opportunity for continuing education of nursing staff. Web-based distance education provides educational opportunities for those with limited time and space through the combination of systematic teaching plans and computer technology. Learners can flexibly select suitable times, places, and methods for learning, and via interaction with the teacher and classmates through media.

Previous studies found that learners' fear of technology and insufficient computer skills influence their choice of, or resistance to distance learning programs (Bryson, 1991; Igbaria et al., 1996; Jayasuriya and Chapman, 1997; Kenny, 2000; Tilson et al., 2000; Yellen, 1998; Leasure et al., 2000; Billings et al., 2001). In addition, appropriate computer equipment and Internet connection (Garland, 1993; Cragg, 1994) as well as a supportive learning environment (Pym, 1992; Garland, 1993) can influence a person's willingness to participate in and finish distance learning courses. Simonson et al. (1999) indicated that the learner is the key person in distance learning processes. So the learner's attitude, experience, cognition, and learning style are four important indicators that contribute to learning, with attitude being the most important. Positive attitude is favorable for learning (Clark, 1984) because of its influence on learning efficiency, motives, and knowledge application (Hamby, 1986). Chapman (2000) conducted a focus group to explore the perception and acceptance of web-based learning by 18 community nurses. The interviewees thought their need for such a learning method would increase if updated practical knowledge was provided in the courses.

There have been few studies to explore attitudes toward web-based distance learning in Asian countries. In Taiwan, there is a lack of relevant studies to explore health professionals' attitudes toward web-based learning. Public health nurses (PHNs) are key health professionals in the health care systems of many countries, including Taiwan. Here, PHNs who are responsible for promoting community health, preventing disease, disability and premature death, and protecting the health of vulnerable populations. PHNs need to be aware of health problems and the risks of their community population so they can provide early counseling and prevention strategies. They play many roles in maintaining a population's health, such as that of health care providers, health educators, health planners, case managers, consultants, and researchers (Yu and Chin, 1996). Because of rapid changes in health information, PHNs need to update their knowledge and skills continually to deliver essential public health services effectively and to ensure the quality of health care (Gebbie, 1999). Whether this new media (i.e. the Internet) learning method can be used and accepted by PHNs and whether it can figure as a new way of learning in the future in the knowledge economy era are valuable questions to investigate. Therefore, the purpose of this study was to understand PHNs' attitudes toward web-based learning and the factors influencing these attitudes.

2. Methods

2.1. Design

This study conducted a cross-sectional research design. We used a structured questionnaire to collect

data via a mailing method in order to investigate PHNs' attitude toward web-based distance learning as a way of in-service training.

2.2. Population and sample

The population of this study was the 2398 PHNs working in the 369 health centers in Taiwan (Bureau of Health Promotion, Department of Health, 1997). According to power analysis, we calculated that the minimal valid sample size is 197 when the power, effect size, and α were set as 0.80, 0.20, and 0.5, respectively (Polit and Hungler, 1995).

Since the general response rate of mailing methods is approximately 50–80%, we randomly selected more samples than the minimal valid samples. In this sampling method, first, all health centers were stratified into three strata: urban, village, and mountainous/islet. Then, health centers in each stratum were proportionally selected by a cluster random sampling, and the PHNs working at the selected health centers comprised the study sample. Excluding those who declined to participate in this study, quit their jobs, provided incomplete responses, etc., 329 PHNs finally completed the questionnaire, with a response rate of 84.0%.

2.3. Instrument

A questionnaire was used to collect data in this study. The questionnaire was developed by reviewing the literature, conducting personal interviews and through expert consultation. The questionnaire was self-administered and consisted of two parts: independent variables (including personal and work factors) and dependent variables (attitude toward web-based distance learning).

2.3.1. Basic data

2.3.1.1. Personal factors. This category included age, educational level, marital status, work position, years of nursing job experience, computer facilities and on-line hardware at home, average hours spent in computer use at home per week, previous computer training, previous experience in web-based learning, and personal basic computer competence. To measure personal basic computer competence, a 26-item questionnaire (called "the Basic Computer Competence Scale") was used to investigate PHNs' basic computer skills, including Microsoft Word, Excel, PowerPoint, Windows 95/98/2000, Internet Explorer (IE)/Netscape, and E-mail application capability. A five-point Likert scale was used as follows: 5, very familiar; 4, familiar; 3, average; 2, not very familiar; and 1, unable to use. The maximum score was 130. Total scores were between 26 and 130, with a higher score indicating greater computer competence.

2.3.1.2. Working factors. They included the type of health centers, population serviced, computer facilities and on-line hardware in health centers, average hours spent in computer use at the worksite per week, and average hours spent on-line at the worksite per week.

2.3.2. Scale of attitudes toward web-based learning

There were 16 questions in this section of the questionnaire—seven negative and nine positive questions. Positive statements were answered with a response ranging from five to one, representing "very much in agreement", "agree", "no comment", "disagree", and "very much in disagreement". A higher score indicated a higher degree of agreement. The negative statements were scored in the opposite way. The range of the total score was 16–80 points, with higher total scores indicating that a PHN had a more positive attitude toward web-based learning.

For reliability and validity, six experts in the fields of computer science and information technology, nursing, and education were invited to validate the questionnaire. In terms of reliability, the α coefficients for "Basic Computer Competence scale" and "Scale of Attitude toward Web-based Learning" were 0.92 and 0.87, respectively, indicating good reliability in both scales.

2.4. Data collection and ethical consideration

Data were collected by mailing the questionnaire. After the list of selected health centers was confirmed and oral approval obtained by municipal or county health bureaus and relevant health centers via telephone, we filed the official letter with the relevant centers for administrative recognition and support. The questionnaires were sent according to the list, and pre-survey contact, follow-up, and promotion was performed during the process to improve the return rate. There were two follow-up efforts, and recipients were reminded of the mailing in weeks 2, 3, and 4 after the questionnaire was sent. Of the 372 recipients, 329 returned completed questionnaires, with a return rate of 84.0%. Considering the study ethics, the study protocol and informed consent form were reviewed and approved by the Institutional Review Board, Taipei Veterans General Hospital, to guarantee the subjects' rights and interests. All subjects participated in the survey voluntarily.

2.5. Data analysis

The Statistical Package for Social Sciences (SPSS) version 10.0 for Windows was used for statistical analyses. Statistical methods used included frequency, percentage, mean, and standard deviation for univariate analysis. For bivariate analysis, we used Pearson's Correlation, the independent t-test, and one-way

analysis of variance to examine the relationships between independent and dependent variables (i.e. attitude toward web-based learning). Finally, a stepwise multiple regression analysis was used to examine predictors of attitude.

3. Results

3.1. Basic data for PHNs

3.1.1. Personal factors

The average age of the 329 PHNs was 38.98 years (SD = 7.78). Most (56.5%) had graduated from nursing schools. The percentages of nurses, registered nurses, and head nurses were 72.3%, 20.4%, and 7.3%, respectively. The average experience in nursing was 16.62 years (SD = 7.37), and 80.9% were married. Among those who had children, most (42.6%) had two and 52.6% of them had accompanied a child to some type of computer training for Internet browsing. Three quarters (75.1%) of the PHNs had computer and on-line hardware at home, and their weekly on-line time was 2.06 h/week (SD = 3.69), which was not long. As for to basic computer competence, we found that PHNs computer competence needs to be improved ($M = 57.57$, SD = 22.83, range = 26–130).

3.1.2. Working factors

In terms of the type of health centers, 15.5% were urban regions, 12.8% were mountainous/island, and 71.7% were villages. Most of the health centers (57.1%) provided service for populations of less than 10,000. All the selected health centers had computer and Internet facilities. On an average, PHNs spent 8.35 h (SD = 7.68) using a computer for their job per week. The most commonly used software was PHIS (85.4%), which is the database for PHNs. The main purpose of this software is to record client data. Then, word processing (Word) and Internet application software (IE and Netscape) followed, accounting for 67.5% and 37.7%, respectively. The average hours per week for web site browsing at the workplace was 1.35 h (SD = 2.46).

3.1.3. Distance learning attitude of PHNs and influencing factors

Overall, the attitude of PHNs toward web-based learning tended to be positive ($M = 55.02$, SD = 6.39, range = 16–80), indicating that most of the PHNs could accept this learning method, and implying their acceptance of the value and significance of web-based learning. Univariable analysis showed that the PHNs had the most positive attitude toward items such as: web-based learning provides me with new nursing knowledge; it saves time spent commuting to in-service training programs; it allows me to choose the courses that I want to take; it provides more abundant learning information (Table 1). These responses indicate that most of the PHNs believe that web-based learning provides nursing care knowledge, saves travel time and cost, allows freedom of choice for learning, and provides course diversity, abundance, and individuality. For influencing factors, our findings showed that there was a significant positive correlation between basic computer competence and distance learning attitudes ($r = 0.164$, $p = 0.003$) (Table 2), indicating that with better competence, there are better attitudes. The type of health centers ($F = 5.83$, $p = 0.003$), population for which they provide service ($F = 3.88$, $p = 0.022$), and computer facilities and on-line hardware in health centers ($t = 2.88$, $p = 0.004$) were also significantly correlated with the attitude of web-based learning (Table 3). Analysis by Scheffe' post hoc test showed that the PHNs at village health centers had a more positive attitude than nurses working in urban health centers or in mountainous/island regions. In terms of the responsible population, the PHNs providing services to a population of more than 10,000 had a more negative attitude than those providing services to a population of less than 10,000. Finally, stepwise regression analyses were conducted to test the contributions of the three variables which significantly correlated to attitude, with respect to their influence on the attitude toward web-based learning. However, no predictors were found.

4. Discussion

In this study, we found that PHNs tend to agree that the Internet learning model is a feasible new way of learning. Among with this attitude, we found that PHNs recognize that this learning model has certain strengths such as flexibility in time and space, consistent with Armstrong (1989) and Cragg (1994), which imply that for PHNs (indeed for health professionals), non-synchronous distance learning model might be more suitable than the synchronous model. For example, Cragg (1994) indicated that non-synchronous distance education can better accommodate the limits of learners' work and family, and is a suitable learning method for professional education (Farel and Polhamus, 2001).

Some PHNs worry that web-based learning could not help them improve their actual nursing practice, and wonder about the effect of learning, or think that web-based learning has difficulty in providing systematic and organized material to fulfill the needs for nursing information. The reasons for this hesitation might be related to their unfamiliar with this learning model. Indeed, the provision of abundant and diverse information is the main characteristic of web-based learning. However, a need assessment is necessary for designing

Table 1
Scores of each question in the scale of web-based learning attitude ($n = 329$)

Statements	Mean	SD	Rank
Web-based learning provides me with new nursing knowledge	3.93	0.70	1
It saves time spent commuting to in-service training programs	3.93	0.65	1
It allows me to choose courses that I want to take	3.91	0.64	3
It provides more abundant learning information	3.90	0.60	4
It is an educational method of economic benefit	3.83	0.65	5
It allows me to learn freely by using my own time	3.83	0.65	5
It provides on-line interaction with teachers and classmates to solve my problems at work	3.67	0.68	7
It is not helpful for the improvement in individual nursing care capability[a]	3.46	0.79	8
It does not affect my family life	3.44	0.79	9
It provides more abundant teaching activities than traditional classroom teaching	3.31	0.79	10
Learning by computer will lower learning effect[a]	3.12	0.85	11
It only provides partial or unsystematic nursing information[a]	3.08	0.82	12
It is an additional burden to my work[a]	3.07	0.82	13
It makes me feel isolated from the teacher and classmates	2.93	0.86	14
It does not provide systematic courses as a traditional classroom course does[a]	2.90	0.87	15
It will increase my computer software and hardware expenses[a]	2.72	0.82	16

All statements were scored so that higher the score, the more positive the attitude, and vice versa.
[a]Represents negative statements.

Table 2
Relationship between continuous independent variables and web-based learning attitude of PHNs ($n = 329$)

Variable	r	p-Value
Age	−0.066	0.235
Years of nursing job experience	−0.065	0.240
Average hours spent in computer use at home per week	0.100	0.071
Personal basic computer competence	0.164	0.003**
Average hours spent in computer use at the worksite per week	0.052	0.345
Average hours spent on-line at the worksite per week	−0.082	0.139

*$p<0.05$, **$p<0.01$, ***$p<0.001$.

content, and a clear guide would help PHNs to choose more appropriate learning topics. Chapman (2000) also pointed out that providing practical knowledge with more updated, systematic, completed contents (adding hyperlinks) should be highly respected when designing the in-service education for community health nurses. Learning goals and learning activities should be linked to provide abundant information to meet the learners' needs. Some PHNs worry about the isolated feeling that arises when using the web-based learning model and this finding is consistent with that of Cobb and Mueller (1998), indicating that poor interaction and the absence of timely feedback are factors that hinder the promotion of distance learning. Moore (1993) also indicated that in distance learning, because the student and teacher are in separate locations, special course design, teaching skills, and methods of electrical and technological transmission are needed. With a lot of attention being paid to interaction, some strategies might be useful in solving this problem, including designing an easy-to-use entry or plate, providing an open discussion area on-line, giving immediate feedback if possible, and establishing web-based learning groups to improve relationships among learners and to increase teacher-to-learner and learner-to-learner interaction.

With respect to factors influencing PHN's attitude toward web-based learning, the current study revealed a low level of computer competence for PHNs, and also presented a significant relationship between computer competence and attitude. This finding is consistent with several previous studies (McDaniel et al., 1998; Yellen, 1998; Kenny, 2000; Simonson et al., 1999; Leasure et al., 2000; Tilson et al., 2000; Billings et al., 2001) that indicated basic computer competence is a prerequisite for participating in web-based learning programs. Lack of sufficient competence tends to make PHNs assume

Table 3
Relationship between discontinuous independent variables and web-based learning attitude of PHNs ($n = 329$)

Variable	*N*	Mean	SD	*F*-value	*p*-Value	Scheffe's post hoc method
Education level						
Vocational high school	108	54.92	6.14	0.14	0.871	
College of nursing	186	55.17	6.60			
University and above	35	54.60	6.23			
Marital status						
Single	63	54.60	6.26	−0.59	0.056	
Married	266	55.12	6.43			
Computer facility and on-line hardware at home						
Yes	247	55.19	6.46	0.81	0.421	
No	82	54.54	6.21			
Work position						
Registered nurse	238	54.82	6.19	0.61	0.545	
Registered professional nurse	67	55.79	6.80			
Head nurse	24	54.96	7.35			
Previous computer training experience						
Yes	234	55.21	6.44	0.85	0.396	
No	95	54.56	6.28			
Pervious experience in web-based learning						
Yes	26	53.46	5.46	1.50	0.145	
No	303	55.16	6.46			
Type of health centers						
Urban	51	53.00	5.20	5.83	0.003**	Village > Urban
Mountainous/island	42	53.31	6.31			
Village	236	55.77	6.51			
Population serviced						
None	13	56.85	8.03	3.88	0.022*	Less than 10,000 > Equal and more than 10,000
Less than10,000 persons	188	55.71	6.45			
Equal or more than 10,000 persons	128	53.84	5.98			
Computer facility and on-line hardware in health centers						
Yes	209	55.78	6.32	2.88	0.004**	
No	120	53.70	6.33			

*$p<0.05$, **$p<0.01$, ***$p<0.001$.

that web-based learning is difficult. It also tends to produce a negative attitude toward web-based learning, such as that this kind of learning has a high burden but low effect. Apart from PHNs' poor computer competence, negative attitudes might also limit PHNs access to this learning model, which is easy to neglect or reject. It thus appears very important for health administrators to provide relevant and effective computer training programs relating to web-based learning beyond professional software (PHIS in this study). Therefore, establishing a user-friendly environment on-line is an important consideration to attract PHNs engaging in web-based learning.

The PHNs' work place (the type of health centers) revealed a significant relationship with their attitude toward web-based learning. Firstly, PHNs who work in village health centers had a more positive attitude than those in urban centers. This result is similar to that of Hendrickx (1998), indicating that nurses in villages have a higher interest in using computers as a tool for in-service education. This may be because the nurses in urban health centers have more alternative channels and opportunities to receive in-service education, so they are less aware of the importance of web-based learning. Then, compared to nurses in mountain/island centers, PHNs who work in village health centers also revealed a

significant positive attitude. The reason might be because village PHNs have a heavier workload and less opportunity to receive in-service education, leading to a more positive attitude toward web-based distance learning. On the other hand, PHNs who work in mountain/island health centers might receive less information about in-service training or might have less equipment and resources in the availability of personal computer and Internet connection, which could lead to their slightly more negative attitude than village PHNs.

In our study, nurses responsible for a population of more than 10,000 had a more negative attitude than those providing services to a population of less than 10,000. The reason for this might be that with a larger population (the service load should be 1:5000 according to WHO recommendation) under one nurse, there will be higher workload and more possibility that web-based learning will be considered an additional burden.

Finally, stepwise regression analyses were conducted to test the contributions of the three variables which significantly correlated to attitude, with respect to their influence on the attitude toward web-based learning. However, no predictors were found. This implies that some other factors may exist, influencing the attitude toward web-based learning. Since there are no related studies in this field, further studies should examine this issue.

5. Conclusion and suggestion

This is the first study to explore the attitude of PHNs toward web-based learning in Taiwan. However, the findings of this study could provide suggestions for spreading web-based learning in other areas because e-learning must be the future trend for nurses' in-service training. The results showed that most PHNs had a positive attitude toward web-based learning, implying that such learning methods may be used as a new in-service educational method for PHNs. The basic computer competence of PHNs should be considered in future promotions, since it influences the attitudes toward web-based learning. Therefore, it is necessary to provide computer training before web-based learning. Additionally, this study indicates that web-based learning is a significant new way of in-service learning because it can overcome some limitations of traditional learning. In connection with PHNs' positive attitudes, this study shows the strengths, which are also the guidelines in developing web-based learning model to PHNs, including high flexibility in time, low limitation in space, greater learning choice, and diverse content. In contrast, the negative attitudes of PHNs provide a direction in improving low participation and low learning effect.

6. Limitation

Questionnaires were used in this study to collect data. We took some preventive measures to avoid low returns and had an excellent return rate. However, it is still possible that the subjects misunderstood the meaning of the questions, limiting our results. Additionally, there are very few evidence-based studies about basic computer competence and the attitude of PHNs toward web-based learning, so shortcomings may exist in the discussion and analysis. We suggest that further studies be conducted.

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