Examining public librarians' information literacy, self-directed learning readiness, and e-learning attitudes: A study from Taiwan

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ABSTRACT

The purpose of this study was to explore the current situation of public librarians' information literacy, self-directed learning readiness and e-learning attitudes in Taiwan. It also sought to identify the relationships among the three variables and the predictive ability of information literacy and self-directed learning readiness on e-learning attitudes. This study employed a survey questionnaire that contained the following: information literacy scale, self-directed learning readiness scale and e-learning attitude scale. The subjects were 385 public librarians from three cities: Taipei, Taichung and Kaohsiung. The research results showed that, public librarians' perceptions toward information literacy, self-directed learning readiness, and e-learning attitudes were positive. Statistical analysis revealed that public librarians' who hold a library science degree performed significantly better than those who had graduated from non-library science departments on three sub-factors of information literacy (information querying, information organisation and information evaluation). Respondents who had received more training had better information evaluations and love of learning scores. The stepwise regression analysis indicated that the information evaluation was the strongest predictor in determining public librarians' e-learning attitudes followed by creative learning, love of learning, and independent learning.

Keywords: Public libraries; Information literacy; Self-directed learning readiness; E-learning attitudes; Adult learners

INTRODUCTION

The emergence of information and communication technology (ICT) has made significant impacts on the provision of services by public libraries. Public libraries are facing intensified challenges to integrate new technologies into their existing services, and there is a need for public librarians to enhance their information literacy (IL) skills in order to provide quality and efficient service to meet the information needs of library patrons. Harding (2008) indicates that one of the essential services that public libraries need to take responsibility for is to promote IL education and support lifelong learning. Stern and Kaur (2010, p.69) furthermore articulate that "librarians are needed more than ever to guide patrons to finding reliable and valid information" because most patrons demand to retrieve information effectively and to skillfully use knowledge relevant to their work or study through searching the Internet and electronic databases. Thus, public librarians, as IL providers, need to constantly update their IL skills, and it is important to understand and evaluate public librarians' IL skills for the purpose of designing appropriate training programmes for them.

In addition to formal training programmes, fostering informal learning skills through self-directed learning (SDL) in particular, has been identified as an important approach to enable adults to become lifelong learners (Merriam, Caffarella and Baumgartner 2007). Adult learning theories indicate that adult learners who are equipped with a certain level of self-directing and independent learning capabilities (Knowles 1980; Merriam, Caffarella, and Baumgartner 2007), and teachers or training instructors who can organise learning activities and provide resources can boost and maximize adult learners' SDL potentials. Related research (Hiemstra 2006; Lema and Agrusa 2009; Hung et al. 2010) proposes that the Internet is a valuable resource and platform supporting adult learners to develop and expand their SDL ability. Public librarians, as adult learners and information professionals, are deeply affected by technology innovations, and it is critical to investigate how the Internet technology impacts public librarians' SDL preparedness. On the other hand, many developed and developing countries have recognised the importance of developing an effective public sector workforce in order to keep up with the fast changing world, and significant amounts of money have been invested to build e-learning portals and design online courses to train the vast body of public servants. Public librarians are also public servants, and their working environment is especially suitable for receiving training via digital means. It is then helpful to explore public librarians' attitudes toward e-learning with the aim of designing better e-learning environments for them and furthermore to develop their IL and job-related competencies.

There is much discussion on the potential of IL and SDL in digital learning environments; however research such as those by Beitler and Mitlacher (2007), Shinkareva and Benson (2006) and Silén and Uhlin (2008) has put emphasis on the strategies and assessment of skills in secondary and higher education sectors. There have been very few studies on the issue of librarians' SDL and e-learning attitudes and there is also a lack of discussion addressing the relationships of IL, SDL, and e-learning attitudes. The present study focuses on investigating public librarians' information literacy (IL), self-directed learning readiness (SDLR), and e-learning attitudes in Taiwan. It also sought to identify the relationships of the three variables and the predictive ability of IL and SDLR on public librarians' e-learning attitudes.

LITERATURE REVIEW

The most popular definition of IL is that of the American Library Association (ALA) (Probert 2009). The ALA (1998) defines IL as an ability in which individuals can locate, evaluate, and use effectively the needed information. With the rapid progress in information technology, IL has become a critical factor in developing one's lifelong learning skills and, on the whole, in reducing the digital inequalities within and among countries and people (Ashoor 2005; Edzan and Saad 2005; Horton and Keiser 2008). In 2003, an international colloquium organised by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) affirmed the importance of IL in the 21st century, and six principles were proposed during that meeting. One of the principles articulates that IL skill "is a prerequisite for participating effectively in the information society, and is part of the basic human right of lifelong learning" (Horton and Keiser 2008, p. 9). One of the main missions of public libraries is to promote the development of IL and to foster lifelong learning for their patrons, and librarians have realised that just providing computers and electronic databases to patrons does not necessarily mean that the best information to solve a problem will be located quickly or applied in an appropriate manner (Harding 2008; Horton and Keiser 2008). Therefore, librarians' IL-related competencies need to be constantly updated and reassessed in order to better assist library patrons to use information effectively in their workplace and in their daily lives. Moreover, according to an empirical study conducted by Hartmann (2001) based on the IL framework defined by ALA (1998), assessment of one's IL skills can be evaluated based on four aspects: using information, evaluating information, locating information, and recognising a need for information. In this study, public librarians' IL was investigated through examining their abilities of locating information, organising information, and evaluating information.

Self-directed learning (SDL) is an important characteristic of adult learners, and it has become one of the key thrusts in the adult education research field (Merriam et al. 2007). In 1968, Knowles first proposed the concept of *Andragogy* illustrating that adults should be equipped with a certain level of self-direction in their learning process, and Knowles commented on the nature of adult learners writing that they "can participate in the diagnosis of their learning needs, the planning and implementation of the learning experiences, and the evaluation of those experiences" (Merriam, Caffarella and Baumgartner 2007, p. 85). Previous research (Brockett and Hiemstra 1991; Garrison 1997; Grow 1991; Knowles 1975; Tough 1971; Spear 1988) further categorised the process of SDL into three models: the linear model, interactive model, and instructional model. In Brockett and Hiemstra's (1991) Personal Responsibility Orientation model, an episode of the interactive model, illustrated that educational agents or resources play facilitating roles in helping learners to do needs assessment, locate learning resources, and choose instructional methods and evaluation strategies (Merriam, Caffarella and Baumgartner 2007). This argument suggests that learners need support and well-organised resources from educators/training instructors to assist them in achieving effective learning outcomes through SDL. In order to better understand learners' SDL capabilities, many quantitative surveys have been developed to assess adults' SDL readiness (SDLR). The most popular and comprehensive instrument for evaluating adults' SDLR as a personality trait is the Self-Directed Learning Readiness Scale (SDLRS) originally developed by Guglielmino (1977). Numerous studies have adopted the SDLRS to investigate adult learners' SDL preparedness and the associations of SDLRS scores with other variables (Merriam, Caffarella and Baumgartner 2007). Another study (Beitler and Mitlacher 2007) found that adults who had higher SDLR scores tend to share more information online. Chu and Tsai (2009) also discovered that adult students' who had higher SDLR scores developed better problem solving skills and had more creative ideas in doing Internet activities. These findings imply that enhancing adult learners' IL might boost their SDL nature, and further assist them to reach good performance in online settings.

Learners' attitudes, learning approaches, and academic performance are the main components that need to be considered in evaluating online courses' effectiveness (Svirko and Mellanby 2008). Liaw, Huang, and Chen (2007) indicated that personal attitudes are the critical factor shaping learners' behaviors in using ICT tools, and, in online learning settings, learners' attitudes toward e-learning must be understood in order to create effective learning conditions for them. Liaw (2007) developed a three-tier technology use model (3-TUM), which is based on the concept of the Technology Acceptance Model (TAM) proposed by Davis, Bagozzi and Warshaw (1989), to examine users' attitudes toward information technologies. The results of Liaw's (2007) study showed that individuals who

had positive attitudes in using the Internet tended to learn computer and Internet applications contentedly in their job. Additionally, according to Liaw et al. (2007), self-paced learning, multimedia instruction, and instructor-led learning environments are the important dimensions that need to be included in assessing learners' e-learning attitudes. They also discovered that these three factors significantly predicted users' e-learning attitudes on e-learning as an effective learning environment.

Recent IL studies related to public librarians (Stern and Kaur 2010; Hart 2008; Julien and Hoffman 2008; Lai 2011a) have focused more on the descriptions of the significance of IL education and the development of IL training programmes. Through a review of the literature in the preceding section, relationships among IL, SDLR, and e-learning attitudes are explicable. However, there is little research from the online learning literature that test these three variables. As more public libraries recognise the importance of developing their staffs' IL skills and increasingly design online instructional materials to train library staff, investigations related to public librarians' IL and other factors are strongly in need, especially in the online learning context. This study attempts to fill that gap by exploring the patterns of public librarians in terms of their e-learning perceptions for online learning environments, as based on the observations of their IL competencies and SDLR.

In Taiwan, since 2007 all public servants have been required to take at least 5 hours of online courses each year, and learning portals have been launched to offer a variety of training courses and to manage public servants' learning records (Taiwan Central Personnel Administration 2007). At the time of this study, the national central library of Taiwan offers over 100 online courses for library professionals and patrons through its web portal—NCL E-leaning campus. Some of the courses are exclusively for public librarians. For this reason, it is definitely valuable and important to understand public librarians' ICT abilities and their psychological states in the online learning process.

OBJECTIVES AND METHOD

The primary objective of this study was to explore the current situation of public librarians' IL, SDLR, and e-learning attitudes in Taiwan. This study also sought to identify the relationships among the three variables and the predictive ability of IL and SDLR on public librarians' e-learning attitudes. Specifically, the following research questions were investigated in this study:

a) What are the current conditions of public librarians' IL, SDLR, and e-learning attitudes?

b) Are there any gender, age, educational background, academic major, and training hour differences in public librarians' IL, SDLR, and e-learning attitudes?
c) What is the relationship between public librarians' IL, SDLR, and e-learning attitudes?
d) What is the predictive ability of public librarians' IL, SDLR on their e-learning attitudes?

The hypotheses for the study are highlighted below:

a) There is a significant difference in public librarians' IL, SDLR, and e-learning attitudes between genders.
b) There is a significant difference in public librarians' IL, SDLR, and e-learning attitudes among age groups.
c) There is a significant difference in public librarians' IL, SDLR, and e-learning attitudes among different educational backgrounds.
d) There is a significant difference in public librarians' IL, SDLR, and e-learning attitudes between academic majors.
e) There is a significant difference in public librarians' IL, SDLR, and e-learning attitudes among acquired training hours.
f) There is a significant relationship between public librarians' IL, SDLR, and e-learning attitudes.

The participants in this study were 385 public librarians from three major cities in Taiwan: Taipei, Taichung and Kaohsiung. The demographic variables included gender, age, educational background, academic major, working experience, and training hours acquired within a year. There were more female respondents (286, 74.3%) than male (99, 25.7%). Regarding their age, 75 (19.5%) respondents were 30 and below, 137 (35.6%) were aged from 31-40, 108 (28.1%) were from 41-50, and 64 (16.6%) were over age 50. Most respondents (286, 74.3%) were college graduates, 31 (8.1%) had master or doctoral degrees, and 67 (17.4%) had only high/vocational school diplomas. Of the respondents, 66 (17.1%) had graduated from library science related programmes, and 319 (82%) had diplomas or degrees from other non-library science programmes. Regarding their working experience in the library profession, 191 (49.6%) respondents had less than 5 years of working experience, 80 (20.8%) identified themselves as having 6-11 years of experience, 42 (10.9%) had 11-15 years experience, 34 (8.8%) had 16-20 years experience, and 38 (9.9%) had over 21 years experience. Regarding the training hours acquired within a year, 197 (51.2%) attended 10 hours or less of training courses, 37 (9.6%) had 11-15 hours, and 151 (39.2%) received 16 or more hours of training.

The paper-based survey consisted of demographic information and measures of IL, SDLRS, and e-learning attitudes, with wordings revised for the target participants based upon 5 panelists' opinions. All three scales were validated by prior research studies. Public librarians' IL was assessed using revised IL scale from Lin (2006) and Hung (2003), which contains three sub-dimensions: information querying, information organisation, and information evaluation. In this study, an abridged SDLRS based on the Chinese version of the SDLRS developed by Teng (1995) was used to obtain the respondents' self-reported SDL preparedness. The SDLRS includes four aspects of learning: love of learning, creative learning, independent learning and efficient learning. Also, public librarians' e-learning attitudes were examined through the e-learning attitude scale derived from a study conducted by Liaw, Huang and Chen (2007). In this part, the librarians were asked to identify their perceptions when they took e-learning courses, and three aspects of the e-learning environment: self-paced learning environment, multimedia instruction environment, and instructor–led learning environment, were investigated in the e-learning attitude scale. All items in the scales of IL, SDLRS, and e-learning attitudes were measured with a 5-point Likert-type questionnaire, with 1 as "strongly disagree" and 5 as "strongly agree".

Cronbach's alphas were calculated for the three main dimensions of the survey, and each dimension contained sub-dimensions of question items. All constructs were satisfied to the criteria of reliability (alpha coefficients ranged from 0.847 to 0.941), indicating good reliability for the scale items measuring each dimension (Vogt 2001).

FINDINGS

Public Librarians' Scores on the Scales

Table 1 details the mean (M) scores and standard deviations (SD) of all respondents' IL, SDLR, and e-learning attitudes. All public librarians' average scores related to the different dimensions ranged from 3.56 to 4.09, indicating these participants' scores toward the three main factors.

Table 1: Mean and Standard Deviation of Variables

Scale	Sub-scale	# of items	M	SD
Information literacy (IL)	Information querying	4	3.91	0.62
	Information organisation	4	3.76	0.77
	Information evaluation	4	3.74	0.63
Self-directed learning readiness scale (SDLRS)	Love of learning	7	4.09	0.29
	Creative learning	4	3.69	0.40
	Independent learning	4	3.61	0.40
	Efficient learning	6	3.82	0.36
E-learning attitudes	Self-paced learning	5	3.69	0.67
	Multimedia instruction	5	3.70	0.65
	Instructor-led learning	3	3.56	0.64

Gender, Age, Educational Background, Academic Major, and Training Hour Differences on the Three Dimensions

The data were further analysed along with the dimensions of participants' gender, age, and educational background, academic major, and training hours. Assumptions were tested before data were analysed. The normality assumptions were met. The Levene's F tests were not significant, which indicated agreement with the assumption of equal variance. To test for gender differences in the sub-constructs of the three major dimensions, t-tests were performed and no significant differences between males and females were found. One-way ANOVA was used to detect the mean difference among the different age groups on the variables, and significant effects were discovered on the two sub-dimensions of IL. The ANOVA results showed that public librarians' age significantly influence their perceptions of information querying ($F = 3.44$, $p < 0.05$) and information organisation ($F = 13.28$, $P < 0.001$). Follow-up tests were conducted to evaluate pairwise differences among the means. Participants aged 30 and below performed better on information querying than those who were above 50. The mean score of the age group of 30 and below was significantly higher than the rest of age groups on information organisation.

Regarding the statistical differences among participants' educational backgrounds, ANOVA again was conducted to test the mean difference among participants' educational backgrounds (high/vocational school diploma, college graduate, master or doctoral degree) and all sub-dimensions of IL, SDLR, and e-learning attitudes. Significant differences were found in the mean scores of the three sub-dimensions—information querying ($F = 6.14$, $p < 0.01$), information organisation ($F = 6.97$, $p < 0.01$), and information evaluation ($F = 4.21$, $p < 0.05$) of IL; the three sub-dimensions—creative learning ($F = 4.57$, $p < 0.05$), independent

learning (F = 6.16, p < 0.01), and efficient learning (F = 3.53, p < 0.05) of the SDLRS; and the two sub-dimensions—self-paced learning (F = 3.09, p < 0.05) and instructor-led learning (F = 4.45, p < 0.05) of the e-learning attitudes. Post-hoc comparisons revealed that participants' who had master or doctoral degrees rated their perceptions significantly higher than those who were college graduates, or held only high/vocational school diplomas. This study also analysed the relationships between public librarians' academic majors (library science and non-library science) and sub-dimensions of IL, SDLRS, and e-learning attitudes. The results of the t-tests indicated that respondents' academic majors made significant differences in all sub-dimensions of IL (significant at p <0.01). The mean scores of librarians with a library science major were greater than mean scores of those with non-library science majors. The data further analysed participants according to their training hours acquired within a year and all sub-dimensions of the scales. Public librarians with more training hours (16 hours or above) tended to have better scores in information evaluation and love of learning.

Pearson Correlations

Pearson correlation coefficients were calculated among the variables from the survey data. The results of correlation analyses are presented in Table 2. Significant correlations were found among variables, meaning a high degree of linear relationship existed between all test variables.

Table 2: Correlation Analysis of Variables

	Variables	1	2	3	4	5	6	7	8	9
1	Information querying	—								
2	Information organisation	0.71**	—							
3	Information evaluation	0.83**	0.72**	—						
4	Love of learning	0.49**	0.43**	0.54**	—					
5	Creative learning	0.52**	0.47**	0.60**	0.74**	—				
6	Independent learning	0.61**	0.57**	0.70**	0.60**	0.78**	—			
7	Efficient learning	0.51**	0.47**	0.63**	0.73**	0.82**	0.79**	—		
8	Self-paced learning	0.59**	0.54**	0.66**	0.512**	0.58**	0.61**	0.58**	—	
9	Multimedia instruction	0.47**	0.46**	0.50**	0.49**	0.48**	0.49**	0.46**	0.73**	—
10	Instructor-led learning	0.48**	0.43**	0.56**	0.50**	0.56**	0.56**	0.52**	0.81**	0.84**

**Correlation is significant at the 0.01 level (2-tailed).

Regression Models

Multiple regression was conducted to determine which independent variables were primary predictors of public librarians' e-learning attitudes. The assumptions underlying

multiple regression, linearity of the phenomenon, normality, and independence of observation were tested. No violation was found. The linear combination of the three IL factors (information querying, information organisation, and information evaluation) and the four SDLR factors (love of learning, creative learning, independent learning, and efficient learning) was significantly related to the respondents' e-learning attitudes, R^2 = 0.46, F = 44.89, p < 0.01. The results of multiple regression analysis revealed that 46% of the variability in the dependent variable, public librarians' e-learning attitudes, was explained by the following predictor variables: information evaluation, love of learning, and independent learning.

Stepwise regression revealed that information evaluation was the strongest factor influencing public librarians' e-learning attitudes, R^2 = 0.359, F = 216.27, p <0.001. This model (model 1) accounted for 35.9% of the variance in the significance of respondents' e-learning attitudes. The combination factors (model 2) of information evaluation and creative learning accounted for 43% of the variance in the dependent variable. The third model, which included information evaluation, creative learning, and love of learning, accounted for 44.4% of the variance of the respondents' e-learning attitudes. The fourth model, which added independent learning to the third model accounted for 45.1% of the variance in the independent variable. A summary of the regression models is illustrated in Table 3.

Table 3: Summary of Stepwise Regression Model for Variables Predicting Public Librarians' E-Learning Attitudes

Model	Variables	B	SE B	β	t	F	R^2
1	Information evaluation	21.98	2.24	0.60	14.71***	216..27***	0.359
2	Information evaluation	0. 82	0.10	0.60	7.10***	48.72***	0.430
	Creative learning	0.69	0.10	0.34	6.98***		
3	Information evaluation	0.77	0.10	0.37	7.68***	101.57***	0.444
	Creative learning	0.48	0.13	0.23	3.88***		
	Love of learning	0.21	0.07	0.16	2.77**		
4	Information evaluation	0.66	0.11	0.32	5.87***	77.99***	0.451
	Creative learning	0.31	0.15	0.15	2.04**		
	Love of learning	0.21	0.07	0.16	2.87***		
	Independent learning	0.53	0.25	0.15	2.11**		

**p<0.01 ***p<.001

DISCUSSIONS

This study aimed to understand public librarians' perceptions of IL, SDLR, and e-learning attitudes in Taiwan. The descriptive analyses showed that, public librarians' IL skills, SDLR, and e-learning attitudes were positive. Love of learning was the component that received the highest score from the participants' responses. This result is consistent with Lai's (2011b) findings on IL skills of civil servants, implying that public librarians' enjoy learning new knowledge from their work, and the library working environment might help them to develop satisfactory SDL attitudes. Kek and Huijser (2011) indicated that the learning environment directly influenced approaches to self-directed learning readiness. In a study involving employees in the casino industry, Lema and Agrusa (2009) proposed that employee's learning experience with technologies can be enhanced through supportive environments. Current library services rely heavily on Internet technology which has great potential to foster librarians' need for self-direction in their learning process. This study also reveals that younger public librarians were equipped with better IL skills than their older colleagues. This finding suggests that careful attention needs to be paid to those older librarians while designing staff training courses, especially in IL-related subjects.

Educational backgrounds seem to make differences in public librarians' IL, SDLR, and e-learning attitudes. In the current study, respondents who had master or doctoral degrees exhibited significantly greater scores in most sub-dimensions of IL, SDLRS, and e-learning attitudes than those who received lower levels of formal education. The possible reason is that public librarians who hold postgraduate degrees obtained more training in doing academic research through online resources, and they might be more confident in their computer and IL-related skills. They also exhibited better SDL ability. Moreover, public librarians who graduated from library science programmes exhibited better IL skills than those who were non-library science majors. It is understandable that respondents with library science degrees had taken many IL-related courses at school; therefore, they were more familiar with the fundamental backgrounds of IL and technical skills than respondents with non-library science concentrations. This result suggests that managers of public libraries may consider giving positions first to job seekers with library science related degrees when they hire new employees. In addition, this survey also clearly indicates that training does help public librarians to judge online information and enjoy the autonomous learning process. Stern and Kaur (2010) asserted that training librarians can enable them to become effective IL experts and instructors "because they are [the] gateway to reliable information sources and can guide others to follow valid paths for problem-solving and information gathering" (p. 71). Therefore, providing structured training programmes to librarians via classroom and online settings certainly can be a great help.

Regression analysis results showed that public librarians' e-learning attitudes were predicted by the information evaluation, love of learning, and independent learning. The most effective predictor was the information evaluation. This provides support for the contention that IL skills and SDLR plays a significant role in shaping public librarians' e-learning attitudes. This finding suggests that facilitating librarians to develop the ability to recognize important information on the Internet can enhance their online learning attitudes while taking online courses. Thus, providing online courses in IL and instructional skills might be an important dimension for human resource development departments at public libraries to consider. Heinrichs and Lim (2009) articulated the importance of arranging information technology instructions to train librarians' computer skills. Training not only enhances public librarians' IL competencies, but also helps them to feel confident in providing IL education to the public (Lai 2011a). The design of online training programmes can especially target these issues to helping public librarians to become efficient IL experts and trainers.

Another noteworthy finding, according to the regression analysis, is that the variance of learners' e-learning attitudes was also explained by three SDLR factors, creative learning, love of learning, and independent learning, which implies that online learning environment should offer learners with opportunities to cultivate their creative and self-instructional skills. A study conducted by Chu and Tsai showed that learners who were equipped with better SDL preparedness developed better problem solving skills and creative ideas in doing Internet activities. Nikitenko's (2009) study also revealed the importance of SDLR in facilitating adult students' performance and increasing course satisfaction with web-enhanced learning settings. Based upon the above arguments and SDL theory, training coordinators at public libraries need to provide strong support to help staff to diagnose their learning needs, to formulate learning goals, to identify human and material resources and to choose appropriate learning strategies, in the e-learning environment (Merriam, Caffarella and Baumgartner 2007; Muirhead, 2007).

CONCLUSION

The primary value of this study is to document current conditions of and relationships between public librarians' IL, SDLR, and e-learning attitudes in Taiwan. These issues have not been studied to date. The research findings show that public librarians' IL, SDLR, and e-learning attitudes were positive. Significant differences were found between or among participants' demographics (age, educational background, academic major and training hours) and the investigated variables.Of particular significance is that the librarians' IL skills

and SDL preparedness notably influenced their e-learning attitudes. Specifically, the information evaluation competence, one of the IL factors, was the crucial element in determining public librarians' online learning achievements. This has implications as public librarians with better IL skills and SDLR tend to be more effective IL educators and furthermore they become lifelong learners.

The results of this study have implications for human resource departments at public libraries. While designing and delivering online learning materials for staff, providing IL training and supporting SDL environments and conditions are necessary. Stern and Kaur (2010) contended that librarians can advance professionalism and their patrons if they understand the coherent principles of IL, instructional design, and andragogy. The present study provides further support of the importance of enhancing public librarians' IL and SDL preparedness. Further research may need to reassess public librarians' IL skills periodically and to investigate practical solutions in order to help librarians to become better IL professionals and self-directed learners. Studies related to public librarians on these issues are certainly merited.

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REFERENCES

American Library Association. 1998. *Introduction to information literacy.* Available at: http://www.ala.org/ala/mgrps/divs/acrl/ issues/infolit/overview/intro/index.cfm.

Beitler, M. A. and Mitlacher, L. W. 2007. Information sharing, self-directed learning and its implications for workplace learning: A Comparison of business student attitudes in Germany and the USA. *Journal of Workplace Learning,* Vol. 19, no. 8: 526-536.

Brockett, R. G. and Hiemstra, R. 1991. *Self-direction in adult learning: Perspectives in theory, research, and practice*. New York: Routledge.

Chu, R. J. C. and Tsai, C. C. 2009. Self-directed learning readiness, Internet self-efficacy and preferences towards constructivist Internet-based learning environments among Higher-Aged Adults. *Journal of Computer Assisted Learning,* Vol. 25, no. 5: 489-501.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. 1989. User acceptance of computer technology: A Comparison of two theoretical models. *Management Science,* Vol. 35, no. 8: 982-1003.

Garrison, D. R. 1997. Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly,* Vol. 48, no.1:18-33.

Grow, G. O. 1991. Teaching learners to be self-directed. *Adult Education Quarterly,* Vol. 41 no. 3:125-149.

Guglielmino, L. M. 1977. *Development of the self-directed readiness scale*. PhD dissertation, University of Georgia.

Harding, J. 2008. Inormation literacy and the public library. *APLIS,* Vol. 21, no. 4:157-167.

Hartmann, E. 2001. Understandings of information literacy: The perceptions of first year undergraduate students at the University of Ballarat. *Australian Academic & Research Libraries,* Vol. 32, no. 2:110-122.

Heinrichs, J. H. and Lim, J. S. 2009. Emerging requirements of computer related competencies for librarians. *Library & Information Science Research,* Vol. 31, no. 2:101-106.

Hiemstra, R. 2006. Is the internet changing self-directed learning? Rural users provide some answers. *International Journal of Self-directed Learning,* Vol. 3, no. 2:45-60.

Horton, F. W. Jr. and Keiser, B. E. 2008. Encouraging global information literacy. *Computers in Libraries,* Vol. 28, no. 10: 6-11.

Hung, M. L., Chou, C., Chen, C. H. and Own, Z. Y. 2010. Learner readiness for online learning: Scale development and student perceptions. *Computers & Education,* Vol. 55, no. 3:1080-1090.

Hung, S. Y. 2003. *A study of elementary school administrators' information literacy and school performace in Kaohsiung county.* Master thesis, National Kaohsiung Normal University, Kaohsiung, Taiwan.

Julien, H. and Hoffman, C. 2008. Information litearcy training in Canada's public library. *Library & Information Science*, Vol. 27: 281-301.

Kek, M. and Huijser, H. 2011. Exploring the combined relationships of student and teacher factors on learning approaches and self-directed learning readiness at a Malaysian university. *Studies in Higher Education,* Vol. 36, no. 2:185-208.

Knowles, M. S. 1975. *Self-directed learning*. New York: Association Press.

Knowles, M. S. 1980. *The modern practice of adult education: Andragogy vesus pedagogy*. New York: Cambridge Books.

Lai, H. J. 2011a. Information literacy training in public libraries: A case from Canada. *Journal of Educational Technology & Society,* Vol. 14, no. 2: 81-88.

Lai, H. J. 2011b. The influence of adult learners'self-directed learning readiness and network literacy on online learning effectiveness: A study of civil servants in Taiwan. *Journal of Educational Technology & Society,* Vol. 14, no. 2: 98-106.

Lema, J. D. and Agrusa, J. 2009. Relationship of WWW usage and employee learning in the casino industry. *International Journal of Hospitality Management,* Vol. 28, no. 1:18-25.

Liaw, S. S. 2007. Computers and the Internet as a job assisted tool: based on the three-tier use model approach. *Computers in Human Behavior,* Vol. 23, no. 1: 399-414.

Liaw, S. S., Huang, H. M. and Chen, G. D. 2007. Surveying instructor and learner attitudes toward e-learning. *Computers & Education,* Vol. 49, no. 4:1066-1080.

Lin, G. L. 2006. *A study on the relationships of elementary school administrative managers' technology literacy and school management performace in Kaohsiung*. Master thesis. National Kaohsiung Normal University, Kaohsiung, Taiwan.

Merriam, S. B., Cafferella, R. C., Baumgartner, L. M.2007. *Learning in adulthood*. 3rd ed. San Francisco: Jossey-Bass.

Muirhead, B. 2007. Integrating creativity into online university classes. *Journal of Educational Technology & Society,* Vol. 10, no. 1: 1-13.

Nikitenko, G. 2009. *Correlational analysis of adult students' self-directed learning readiness, affective learning outcomes, prior electronic learning experience, and age in hybrid and online course-delivery formats*, PhD dissertation, The University of San Francisco.

Probert, E. 2009. Information literacy skills: Teacher understandings and practice. *Computers & Education,* Vol. 53, no. 1: 24-33.

Shinkareva, O. and Benson, A. 2006. Learning instructional technology for an online course: An analysis of the relationship between adult students' self-directed ability and instructional technology competency. Availabe at: http://www.eric.ed.gov/ PDFS/ED492787.pdf

Silén, C. and Uhlin, L. 2008. Self-directed learning - a learning issue for students and faculty! *Teaching in Higher Education,* Vol. 13, no. 4: 461-475.

Spear, G. E. 1988. Beyond the organizing circumstance: A search for methodology for the study of self-directed learning. In Long, H.B. and Associates (eds.), *Self-directed learning: Application and theory*. Athens, Georgia: Department of Adult Education, University of Georgia.

Stern, C. and Kaur, T. 2010. Developing theory-based, practical information literacy training for adults. *The International Information & Library Review,* Vol. 42, no. 2: 69-74.

Svirko, E. and Mellanby, J. 2008. Attitudes to e-learning, learning style and achievement in learning neuroanatomy by medical students. *Medical Teacher,* Vol. 30, no. 9 -10: e219-e227.

Taiwan Central Personnel Administration. 2007. *Training and development*. Available at: http://www.cpa.gov.tw/cpa2004/ftrain/ download/EXTR96071202.doc.

Teng, Y. L. 1995. *Adult instruction and self-directed learning*. Taipei, Taiwan: Wu Nan Publication.

Tough, A. 1971. *The adult learning projects: A fresh approach to theory and practice in adult learning*. Toronto: Ontario: Ontario Institute for Studies in education.

Vogt, P. W. 2001. *Dictionary of statistics and methodology*. 2nd ed. London: Sage.