Information Literacy Skills of Pre-service Teachers: A Case Study

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Abstract: This study aimed at evaluating the information literacy skills of 29 pre-service teachers. Information literacy skills include five essential areas: the ability to (1) identify the information needs; (2) select information sources; (3) locate information; (4) evaluate information; (5) synthesize information. These areas are essential life-long learning skills for pre-service teachers to cope with the rapid change in the information age. In the present research, information literacy skills were measured by questionnaire, multiple choice knowledge test and task-based information problem. The findings indicate that the majority of participants lacked information literacy skills. It is concluded that instructional support to foster pre-service teachers' information literacy skills is essential.

Keywords: Information literacy, teacher training, information skills

1. Introduction

In the 21st century, students use Internet to retrieve and use information for solving problems or completing their assignments (Kolikant, 2009).Students should know how to search, evaluate and organize information from the Internet, which are the essential life-long learning skills and key elements of information literacy. However, there is little attention in schools. Teachers assume students can develop the skills spontaneously (Walraven, 2008). In Hong Kong, only one university offers a credit course on Information Literacy. Researches have shown that all age groups have problems in solving information-based problems (Argelagos & Pifarre, 2012; Probert, 2008; Walraven, Brand-Gruwel & Boshuizen, 2008). Teachers should help their students to develop their information literacy skills. An information literate pre-service teacher can search and use effective learning and teaching resources. They can also help their students to gain information literacy skills. When pre-service teachers lack information literacy skills, they have no confidence to educate their students (Demiralay & Karadeniz, 2010). It is important for pre-service teachers to have information literacy skills. We investigated the current status of information literacy skills of pre-service teachers in a self-financed university in Hong Kong. It examined pre-service teachers' ability to: (1) identify the information needs; (2) select information sources from the Internet; (3) locate information from the Internet; (4) evaluate information from the Internet; and (5) synthesize information by using internet tools.

2. Review of the literature

2.1 Defining information literacy

The term information literacy was first introduced by Paul Zurkowski in 1974. It was not related to the education. The first and most widely cited definition of the information literacy in education was proposed by American Library Association (ALA):

> *"To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information." (ALA, 1989, n.p.).*

Some professional organization like the Association of College and Research Libraries (ACRL), the Society of College, National and University Libraries (SCONUL), Australian New Zealand Institute for Information Literacy (ANZIIL) have developed the framework of information literacy for Higher Education. In regards to teacher training, the Education and Behavioral Science Section (EBSS) in the Association of College and Research Libraries has developed an information literacy framework for teacher education. Some frameworks were developed prior to the shocking rise of social media and online community (Mackey & Jacobson, 2011). It does not fully address the information knowledge required in this new Internet environment.

2.2 Assessment of information literacy

A number of information literacy assessment strategies have been developed based on the information literacy framework. Abdullan (2010) categorized the information literacy assessment data as perception data and evidence-based data. The perception based data are collected from the self-rated questionnaire while the evidence-based data are collected from the performance of specific tasks and tests. McCulley (2009) also pointed out the assessment approaches of information literacy. It included survey, knowledge tests and performance assessment.

Surveys measure how the respondents feel about their performance, rather than the actual performance of information literacy. It is a good method to assess the student confidence and perceptions of information literacy. OuYang (2007) developed an evaluation instrument of information problem solving skills on Internet resources for pre-service teachers. It included the developmental level and confidence level of pre-service teachers' information problem solving skills.

Knowledge tests include a list of questions for students to answer, which measure what students know. It provides baseline information about students' information literacy skills (McCulley, 2009). There are several standardized information literacy tests such as Tool for Real-time Assessment of Information Literacy (TRAILS) and Project Standardized Assessment of Information Literacy Skills (SAILS). In regards to teacher education, Beile (2009) developed the information literacy assessment scale for education, which is designed for teacher students. It included 22 multiple choice questions that reflect cognitive dimension of information literacy.

Performance assessments require students to integrate what they have learned, to think critically and to solve the problem (McCulley, 2009). Brand-Gruwel, Wopereis & Walraven (2009) designed an information task to the undergraduate students by using neutral topic, such as how to deal with food that is out of date. Argelagos & Pifarre (2011) developed 15 web-based information problem solving activities. It included technology, mathematics, social sciences and sciences. On each activity, some guided questions on each information literacy area were provided. For example, on the area "defining the problem", students were required to write down the specific information that you need to solve this problem.

3. Methodology

3.1 Data collection and data analysis

The study included a group of 29 final year pre-service teachers who were studying in the first author's institution. All participants were required to take a module "Information Technology for Teaching". Information literacy skills were assessed by using questionnaire, multiple choice skills test and information task on the first week of this module, which provide the comprehensive assessment of information literacy.

Questionnaire is the most popular method to assess the information literacy skills (Walsh, 2009). The purpose of the questionnaire was to understand the perception on the information literacy skills of pre-service teachers. The questionnaire items were adopted by OuYang(2007) 's instrument for measuring information problem solving skills for pre-service teachers . It consisted of 28 likert-type questions and it is mapped to the five essential abilities (identify information needs, select information sources, locate information, evaluate information and synthesize information).

The questionnaire did not really assess pre-service teachers' actual performance. In order to check their actual performance, the researcher provided multiple choice skills test and information task

to all participants. The purpose of the multiple choice skills test was to assess the ability in selecting information sources, locating and evaluating information. It consisted of 19 multiple choice questions. The multiple choice items were revised based on Beile (2009)'s Test of Information Literacy for Education and Neely (2006)'s assessment items. Information task provided the most comprehensive measures of their actual performance. The participants required to solve specific information problem with several guided sub-questions.

4. Results and discussions

4.1 Questionnaire

We used a set of 28 items to understand the perception on the information literacy skills of pre-service teachers. The findings of the questionnaire were similar to OuYang's (2007) results. In general, participants had confidence in using information to solve problem, but they lacked confidence in some technical issues. For example, the use of online database and the ways of managing the data. Table 1 and 2 show the lowest and highest score items on each area respectively.

Table 1: Questionnaire – low score items.

Area	Item	Mean	SD
Identify the information needs	I am able to handle the requirements of the assignment or problem.	3.34	0.769
Select information source	I understand how to use online database	3.45	0.686
Locate information	I understand how to revise the search results	3.31	0.930
Evaluate information	I am able to evaluate the quality of information	3.24	0.872
Synthesize information	I am able to manage the data effectively	3.07	0.923

Table 2: Questionnaire – high score items.

Area	Item	Mean	SD
Identify the information needs	I know the required information to solve the problem	3.73	0.782
Select information source	I understand how to select the best information source to solve the problem	3.59	0.825
Locate information	I am able to use appropriate keywords on my search statement	3.72	0.649
Evaluate information	I am able to evaluate the reliability of data	3.55	0.948
Synthesize information	I am able to summarize information obtained from the Internet.	3.86	0.875

4.2 Multiple Choice Skills Test

We used 18 multiple choice questions to assess the ability in selecting information sources, locating and evaluating information. Table 3 shows the correct percentage of each question. According to table 3, more than half of the participants got a correct answer on six items (Q4, Q9, Q11, Q12, Q15 and Q17) only. The highest three items were "check accuracy of webpage" (82.76%), "URL meaning" (72.41%) and "Use of keywords" (65.52%). The lowest three items were "Determine the best information source" (13.79%), "Use of truncation" (17.24%) and "select appropriate operators" (20.69%). On the other hand, the correct percentages of all items on the area of selecting information source were below 50%. On the area of locating information, participants were familiar with the keywords setting but they did not know how to revise the search results. Multiple choice skills test indicated that they were lack of knowledge in using advanced search and operators. It may affect their performance on revising search results. In addition, the results showed that there was a contradiction between perception and actual skills on the item "determine best information source". They believed that they could select the best information source on questionnaire but they could not determine the best information source on the multiple choice skills test.

Table 3: Results – Multiple Choice Skills Test.

Area	Item	Correct %
Select information source	Q1: Use of information source (find a good journal)	34.48%
	Q2: Use of specific journal database (topic in ERIC)	27.59%
	Q3: Determine best information source (get brief information)	13.79%
Locate information	Q4: Use of keywords (best set of terms for specific question)	65.52%
	Q5: Advanced search (Use of advanced search)	41.38%
	Q6: Use of operator (1) (Select appropriate operators)	20.69%
	Q7: Use of operator (2) (Meaning of asterisk*)	41.38%
	Q8: Use of operator (3) (Use of truncation)	17.24%
	Q9: Search strategy (1) (best way to find related article)	62.07%
	Q10: Search strategy (2) (revised strategy to retrieve more results)	48.28%
	Q11: Search strategy (3) (retrieve fewer results)	55.17%
Evaluate information	Q12: Website evaluation (1) (Evaluation criteria)	51.72%
	Q13: Website evaluation (2) (Identify objective information)	37.93%
	Q14: Website evaluation (3) (Identify currency information)	44.83%
	Q15: Website evaluation (4) (URL meaning)	72.41%
	Q16: Website evaluation (5) (Identify reliability information)	31.03%
	Q17: Website evaluation (6) (check accuracy of webpage)	82.76%
	Q18: Website evaluation (7) (check authority of webpage)	44.83%

4.3 Information Task

In order to understand the actual performance, we used information task in this research. We adopted Brand-Gruwel's (2009) information problem – "How must we deal with perishability of food? Can we consume food that is out of date? Or must we rely on our senses?" and ten guided sub-questions were asked.

We analyzed the performance of the participants on all sub-questions by using rubrics. This research adopted Diller & Phelps's (2008) categorization of the performance in information literacy. It included Emerging (1 mark - limited recognition of the skills), Developing (3 marks - demonstrate appropriate skills) and Integrating (5 marks - demonstrate full understanding of the skills). In order to improve the inter-scorer reliability, two markers were employed to mark the same script. The reliability coefficients of all items were higher than 0.85. Table 4 shows the assessment items and descriptive statistics on each item. It ranged from 1.31 to 2.07. Results indicated that participants demonstrated limited information literacy skills. Section 4.3.1 to 4.3.5 discuss the performance on each area and compare the results between information task and questionnaire.

Table 4: Information task – descriptive statistics

Area	Assessment items	Mean	SD
Identify the information needs	Identify information needs	2.00	0.627
Select information sources	Information source and its contribution	2.00	0.916
	Best information source with reasons	1.74	0.545
Locate information	Use of keywords	1.90	0.632
	Use of search statements	1.47	0.581
Evaluation information	Use of website evaluation criteria	1.50	0.641
Synthesize information	Use of tools to manage information	1.72	0.493
	Ability to synthesize data	1.31	0.660

4.3.1 Identify the information needs

The research found that pre-service teachers were not able to identify the information needs. Low ability pre-service teachers responded "Ingredient of food", "food" (participant 21) whereas high ability pre-service teachers responded "We need the information of the usage of perishable food and how to identify whether the food is out-of-date or not" (participant 15). In fact, the low-ability participants were not able to solve the information problem by using this information needs. There was a contradiction between information task and questionnaire. They believed that they knew the required information to solve the problem but they could not identify the information needs.

4.3.2 Select information sources

The pre-service teachers listed a limited number of information sources. 16 participants (or 55.17%) listed "relevant websites" as information sources. Only 8 participants (or 27.59%) mentioned journal as one of the information sources.

In regards to the number of information sources that they could provide, the average number of information sources was 1.41. The majority of participants (51.7%) were able to write down one information sources only. The maximum number of information sources that they could provide was 4, only 6.9% of participants listed it.

On the assessment item "best information sources with reasons", 24.1 % of participants were not able to provide the best information sources. For those who were able to provide the best information sources, 27.59% of participants believed that the best information sources was websites (It included general websites, official website or government website) and only 17.24% of participants believed that journal provide the best information to solve problem. It matched with the questionnaire data. However, they did not provide any reasons to explain it.

4.3.3 Locate information

On the assessment item "use of keywords", 41.38% of participants were able to write down one or two keywords only and 45% of participants were able to write down more than two keywords. However, many of them used the original wordings on the information problem. 37.93% of participants used "perishability" as one of the keywords. Only two participants (or 6.89%) were able to provide relevant keywords other than the wordings on original problem. For example, participant 15 provided a series of keywords like "food poisoning, food spoilage, bacteria, fungous spore, decay of food, food preservation". Refer to the above results, it did not match the results on questionnaire. They believed that they were able to create appropriate keywords but they used the original words only.

On the assessment item "use of search statement", 41.4% of participants were able to use single search statement and 31.0% of participants were able to provide more than one search statements. Similar to the assessment item "use of keywords", they were able to provide some simple statement from the original problem. For example, participant 22 provided the statement "How to deal with perishable food?" and participant 26 provided the statement "Perishability of food". In fact, only 4 participants (or 13.79%) were able to use search operators on the search statement.

4.3.4 Evaluate information

Over half of the participants were able to use "authority" (16 participants or 55.17%) and "currency" (15 participants or 51.73%) as website evaluation criteria. Some of them used "objectivity" (11 participants or 37.93%), "reliability" (8 participants or 27.59%) and "coverage"(5 participants or 17.24%). However, some participants used wrong evaluation criteria, like "Ranking", "Readable", "Easy to search" and "Common Sense".

4.3.5 Synthesize information

The majority of participants used Microsoft Word (14 participants or 48.28%) and browser bookmarking services (12 participants or 41.38%) to manage information. It was not a good strategy to

manage information and it matched with the results on the questionnaire. They knew how to summarize information but they were not able to manage the data effectively.

On the assessment item "Ability to synthesize data", 31.03% of participants were able to respond to the information problem. Some participants were able to respond to each sub-question by using table or concept map, but some participants used one or two sentences to synthesize information. For example, participant 18 used "Expired food --> high germ production (from relevant biologist) --> Harmful --> Do not eat!!!".

5. Conclusion

This paper reports the information literacy skills of pre-service teachers in the first author's institution. By using questionnaire, multiple choice skills tests and information tasks, it investigated the perception and performance of information literacy skills of pre-service teachers. Results showed that participants had confidence in their information literacy skills but they had limited knowledge of information literacy. However, the relatively small sample size in a particular program limits the generalizability of the findings to other pre-service teachers who are studying education programmes in other institutions. Further studies can systematically investigate how to foster pre-service teachers' information literacy skills in teacher training curriculum.

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