Quantitative Analysis of Information Literacy Competence by Self-Determination On-Line Platform

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ABSTRACT   *The information literacy competence level in terms of information management knowledge and information management skill was measured quantitatively by adopting Self-Determination On-line Learning Platform (SDOLP) on the subjects from universities in Taiwan. The performance of information literacy competence level of 454 subjects was analyzed based on the school type (public and private universities) and field (information technology major and non-information technology major). The findings of performance distributions based on different school types and fields drove the enhancement of instruction course design for university education.*

Introduction

Many researches related to information literacy explored how to educate and cultivate students with certain level of information literacy in the past few years(Aroyo&Dicheva, 2004 ; Chang et al., 2009 ; Coletta et al., 2008 ; Eisenberg et al., 2004 ; Joana et al., 2012 ; Jou et al., 2010 ; Kitchenham et al., 2010 ; Liu & Lin, 2010 ; Singh &Ritzhaupt, 2006).Most of the previous researches were conducted by qualitative and statistics analysis. But very few researcheswere conducted by quantitative analysis. Therefore, the subjects' information literacy competence level was converted into quantitative data through Self-determination on-line learning platform (SDOLP) that was applied on the subjects during the courses(Hsu, et al., 2013). The results from the questionnaires of SDOLP conducted by subjects weretaken as the quantitative data to measure the information literacy competence performance in this study.

The quadrant diagrams were generated by the performance distributions of information literacy competence based on different school types and fields for further analysis.

Literature Review

1   Self-Determination Theory

In the application of education context, self-determination theory emphasizes how the factors that strengthen and damage intrinsic motivation in society influence individual self-determination behavior, which focus on the promotion effect of intrinsic motivation and learning behavior for students(Deci & Ryan, 2009).

2   e-Decision Making Thinking Competence

Effective daily problem solving through strategic analysis and knowledge utilization is the important factor of competition ability according to the applications of Information Communication Technology (ICT), resource literacy and strategic

making thinking(Andrew, 2005;Peter & Jeanne, 2004; Rebecca, 2007).

Subjects and Tool

1   Subjects

454 subjects cover the students of Information Technology field and non-Information Technology field from two public universities and two private universities in Taiwan.

2   Tool

SDOLP (Hsu, et al., 2013) is a powerful tool applied for online learning and which is developed according to self-determination theory (Chen & Jang, 2010; Jou&Shiau, 2012;Sorebo, et al., 2009). SDOLP (Hsu, et al., 2013)developed by this study is applied on the subjects during the courses. The results from the questionnaires of SDOLP conducted by subjects are taken as the data for this study. The content of the questionnaire includes basic student data (such as gender, age, university and department) and e-decision making thinking competence indicators (such as information definition ability, information access ability, information assessment ability, information management ability, information consolidation ability, information innovation ability, information propagation ability). The main goal aims to assess learning effectiveness through the indicators of e-decision making thinking competence. SDOLP simulates the contexts of questions in order to have subjects conduct correct decision making thinking through properly utilizing information ability. The design and interface of SDOLP fulfills self-determination learning theory. The cluster arrangement is adopted to develop the questions in order to design the context and examples for the question accordingly. Meanwhile, the experts from the related fields are invited to review the design of questionnaire and evaluate questions in order to ensure the questions of questionnaire fulfill the requirements of teaching context. By the development of website SDOLP, the experiment can be remotely applied through the terminals with browsers and internet modems.

Data Processing

The information literacy competence level is measured by the e-decision making thinking competence. The quantitative rating of each e-decision making thinking competence indicator for individual subject is generated through SDOLP.The total quantity of questions with correct answers for the e-decision making thinking competence indicators in terms of information definition ability, information assessment ability and information innovation ability is taken as the variance Y1 for information management knowledge cluster. Then the total quantity of questions with correct answers for the e-decision making thinking competence indicators in terms of information access ability, information management ability, information consolidation ability and information propagation ability is taken as the variance Y2 for information management skill cluster. The coding for "school type" (Z1) is 1 for public universities and 0 for private universities. The coding for "field" (Z2) is 1 for information technology major and 0 for non-information technology major. The coding for "gender" (Z3) is 1 for male and 0 for female. The coding for "work experience" (Z4) is 1 for with experience and 0 for without experience. Two quadrant diagrams in terms of "Y1/Y2 vs. Z1" and "Y1/Y2 vs. Z2" are generated based on the quantitative data distribution of information literacy competence level collected from SDOLP.

Discussion

1   Variance Analysis

ANOVA is applied for the analysis of the factors in terms of school type, field, gender, and work experience to verify whether they will influence students' information literacy competence. Refer to Table 1 for the result of ANOVA, which represents significant influence.

Table 1.Result of ANOVA

	df	SS	MS	F	Significance	F
Regression	4	0.528484	0.132121	5.827	0.000141	
Residual	449	10.1809	0.022675			
Total	454	10.70938				

Refer to Table 2,

Table 2.Result of Linear regression for Dummy variable

Variables	Coefficient	Standard error	t value	P-value
Interception	0.714	0.024	29.301	2.8E-6
Z1	0.037	0.018	1.995*0.046*	
Z2	0.071	0.028	2.539*0.011*	
Z3	-0.064	0.025	-2.591*0.010*	
Z4	-0.075	0.015	-2.450*0.015*	

*denotes significant at 5% level

● The factors of school type, field, gender, and work experience significantly influence subjects' information literacy competence.

● Female subjects without work experience have better information literacy competence.

● The subjects from public universities and major in information technology have better information literacy competence.

2   Information literacy competenceperformance distribution vs. School type

The performance distribution of information management knowledge (Y1) and information management skill (Y2) for the subjects from different school type (Z1) in terms of public universities and private universities is shown in Fig. 1 according to the information literacy competence level of the subjects that was measured by SDOLP.
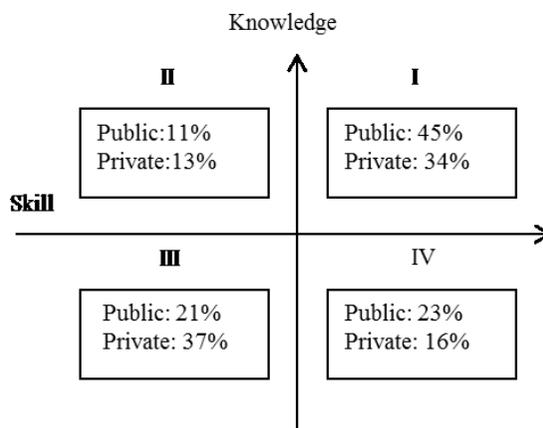

Fig 1 The distribution diagram of information management knowledge and information management skill for the subjects from public universities and private universities

Refer to Fig. 1,Quadrant I represents both information management knowledge and information management skill are higher than average performance. Quadrant II represents higher performance in information management knowledge but lower performance in information management skill. Quadrant III represents both information management knowledge and information management skill is lower than average performance. Quadrant IV represents lower performance in information management knowledge and higher performance in information management skill. The finding represents:

- The subjects from public universities have better performance (45%) in both information management knowledge and information management skill than the subjects from private universities (34%).

- The subjects from private universities have worse performance (37%) in both information management knowledge and information management skill than the subjects from public universities (21%).

- The subjects from both public universities and private universities require to enhance information management knowledge.

- The subjects from public universities have better performance in information management skill.

3   Information literacy competence performance distribution vs. Field

The performance distribution of information management knowledge (Y1) and information management skill (Y2) for the subjects from different field (Z2) in terms of information technology major and non-information technology major is shown in Fig. 2 according to the information literacy competence level of the subjects that was measured by SDOLP.
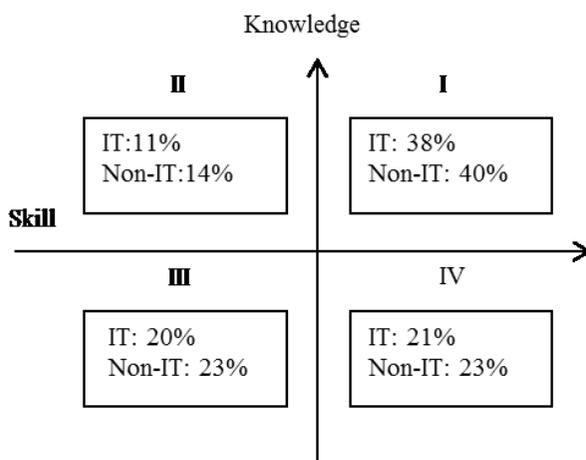

Fig 2 The distribution diagram of information management knowledge and information management skill for the subjects major in information technology (IT) and non-information technology (Non-IT)

Refer to Fig. 2, the definition for Quadrant I, II, III, and IV is the same as the one for Fig. 1. The finding represents:

- The subjects major in information technology and non-information technology have no significant performance difference (2% difference) in both information management knowledge and information management skill.

- The subjects major in information technology have worse performance (20%) in both information management knowledge and information management skill than the subjects major in non-information technology (23%).

- The subjects major innon-information technology have better performance in information management knowledge.

Conclusions

The students from public universities have better performance in the higher ranking level of both information management knowledge and information management skill than the students from private universities.The students major in non-information technology have better performance in both information management skill and information management knowledge than the students major in information technology. The differences of the information technology courses between information technology major and non-information technology major are that non-information technology major covers business management and information technology major focus more on software design technique. Therefore, the information innovation ability and information propagation ability of the students major in information technology can be enhanced by adding business management courses in their learning programs. In summary, information literacy competence can be overall promoted through enhancing business management courses for public universities and software design technique courses for private universities.

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Education is a better safeguard of liberty than a standing army.

~ Edward Everett