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Chapter 10

The Applications of Information and Communication Technologies in Adult and Continuing Education

Preface

In this workshop, a wide spectrum of research or practical topics relating to the usage of ICTs in adult education or continuing learning will be explored and discussed. The aim of this workshop is to provide a forum in which international participants can share knowledge, experiences and concerns regarding the application of ICTs for adult and continuing education and for professional development, and explore directions for future research collaborations. In addition, there are twelve articles from four countries (***Malaysia, New Zealand, Singapore and Taiwan***) in this workshop and hope to build on the fruitful results to bring about innovative advancements in adult education and continuing learning.

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Analyzing Knowledge Construction Behavior of a Project Based Online Discussion Instructional Activity Using Facebook – An Example of Art Course of Adult and Continuing Education

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Abstract: Social networking service (SNS) is known for its ability to facilitate people's interaction and build connections. Recent research also showed students' interest in learning activity using SNSs. Besides, few studies have also investigated the effect of adopting SNSs in learning activity. However, studies that examine knowledge construction behaviors in asynchronous online discussion using SNSs in adult and continuing education are quite limited. The purpose of this study is to explore the knowledge construction behavior in an art course which involved a project-based learning activity using a popular SNS, Facebook, as a discussion tool. Participants are comprised of 62 students in the school of continuing education of a university in northern Taiwan. The results show that students primarily share knowledge and information when discussing online. The diversity of knowledge construction is limited in the context of this study. In addition, further analysis on the relationship between students' individual differences and knowledge construction and the extent of participation suggests that there is a gender difference in and correlation between age and knowledge construction behavior. Implications and limitations are discussed while pedagogical suggestions for instructors using SNS as an online discussion tool for teaching activity in adult and continuing education are also proposed.

Keywords: Social Networking Service, Adult education, Continuing education, Knowledge construction, project-based learning, Facebook

Introduction

The maturity of networking environment and information technology facilitates the applications which implement web 2.0 concepts in various fields. Among web 2.0 applications, social networking service (SNS) is known to be the most popular one. On a SNS, people can easily share information in forms of text, picture, audio and video. Regarding its popularity, SNS has attracted experts across fields in exploring its practical implications, applications and users' behavior [2].

Facebook is known to be a popular SNS in the world. According to the statistics from Checkfacebook.com, Facebook now has over 700 million users worldwide. In Taiwan, there are over 10 million Facebook users. Most of the users in Taiwan are of age between 18 ~ 34 years (65% approximately). Witnessing Facebook's highly social interactive and multi-media features, researchers also centered their focus on investigating the possibilities and effectiveness of using Facebook in teaching activity [1][14][19]. Gray (2010) points out that students are interested in learning activities involving Facebook [6]. However, it is not

addressed in their work whether the discussion process on Facebook can achieve meaningful interaction and knowledge construction. It needs further investigation.

Adult learners have special characteristics other than traditional college students; for example, they have a wide span of age, most of them have to play multiple roles in whether work or home, etc. These characteristics may thus constrain the commitment or time that adult learners can devote themselves to learning [18]. Homberg (1995) suggest that incorporating information and communication technology (ICT) in support learning help address time and location constraints [8]. Moreover, adult learners are usually more experienced and may have more individual differences. Through intensive interaction among learners, instructors and learning environment, adult learners may be able to collaboratively construct deeper understanding which leads to meaningful learning [17-18]. LeNoue et al. (2011) suggest that a well-designed SNS could provide opportunities for learners to broadly and intensively interact with each other which allow them to work collaboratively in discovering, processing information and learning with multiple styles [18].

Previous research has investigated adult social activity on Facebook [25]. However, studies that further examined the effect of using SNSs in adult and continuing education with online discussion are quite limited. Moreover, despite the fact that many studies investigated the application of online discussion to teaching [5][10][13], very few studies have conducted further analysis over learners' knowledge construction in online discussion using SNSs.

To understand the knowledge construction of adult learners in asynchronous online discussion using SNSs, this study seeks to adopt Interaction Analysis Model (IAM) [7] as coding scheme to quantitatively analyze students' online discussion content on SNS. The distribution of knowledge construction phases is to be explored in this study. Moreover, Payne and Monk-Turner (2006) suggested that each learner has his own preferred approach of learning [23]. This diversity of preferences may come from individual differences, such as gender, age, or race etc. Justice and Doman (2001) pointed out that older students are more likely to adopt higher level learning strategies. Meanwhile, older female students exhibit higher cognitive monitoring ability than their male counterpart [16]. Bye et al. (2007) suggested that age is a significant predictor of cognitive maturity and learning styles for university students [3]. Besides, previous studies have also shown there are differences in learning approach, motivation, cognitive ability and learning performance among learners of varied ages and genders [3-4][20-21].

Adult learners are known for their diversity of individual differences. Knowing the relationships among adult learners' individual differences and their knowledge construction behavior and the extent of participation in online discussion may be helpful in designing better pedagogical methods. Therefore, this study seeks to further explore the potential differences of knowledge construction phases and the extent of participation in learners of different ages and genders. Concluding from above, the objectives of this study are presented as follows:

1. To explore the distribution of different knowledge construction phases in an online discussion activity using Facebook among adult learners.
2. To explore the gender difference in knowledge construction and the extent of participation in an online discussion activity using Facebook among adult learners.
3. To explore the relationship between age and knowledge construction behaviors and the extent of participation in an online discussion activity using Facebook among adult learners.

The implications of the results are to be discussed. Furthermore, practical pedagogical suggestions and future research for adult education are also presented in this study.

Method

1. Participants and procedure

Participants of this study are comprised of 62 students from school of continuing education of a university in northern Taiwan. All students have either full-time or part-time jobs. 40, or 64.52%, of participants are female while 22(35.48%) of them are male. These students are of wide span of age from 20 to 43. The course that students were enrolled is "Appreciation of Arts and Design Aesthetic". The primary purpose of this course is to introduce major, famous, and influential artists or ideology. A project-based learning (PBL) activity that incorporated Facebook online discussion was arranged in the course. Students were divided into twelve groups with 2-7 members in each group. This project required students to jointly collect data of an artist, ideology or art movement, and collaboratively complete the project with an electronic slide for oral presentation in the classroom.

In order to understand the knowledge construction of students in Facebook discussions, closed discussion groups, i.e. secret group of Facebook, were set up by the first author for each group. Members of each discussion group are comprised of students in the same group, instructor, and the first author of this study. Students can only assess the content of their respective secret group. The course required students to discuss their project in the secret group in two weeks. Besides, after in-class oral presentation, students were also asked to reflect on both of their own and other group's project in another two weeks. The instructor only made announcement at very beginning stage of discussion in secret group. The instructor didn't participate or provide guidance in the subsequent discussions to avoid the instructor's subjective guidance.

2. Coding Scheme and Data Analysis

To explore the students' knowledge construction in the online asynchronous discussion process, the study adopted the IAM as the coding scheme [7]. IAM have been widely adopted as coding scheme to analyze the knowledge construction of online discussions (e.g., [9-12][15]). As shown in Table 1, the IAM coding scheme is divided into five phases (C1 -C5). Each phase represents a type of knowledge construction of discussion content while C6 refers to those not relevant to knowledge construction.

The unit of coding is a single message that students post or reply in the secret group. 585 messages in total were retrieved for content analysis. One of the authors coded each messages based on IAM as shown in Table 1. To ensure the reliability of coding, another experienced coder independently coded all messages. The Kappa of the two coders is 0.91 ($p < 0.01$) which indicates high inter-coder reliability. The results of coding were thus used for further analysis.

Table 1: Interaction Analysis Model (Gunawardena, Lowe & Anderson's, 1997)

Code	Phase	Content
C1	Sharing or comparing of information about discussion topics	Statement of observation or opinion; statement of agreement between participants
C2	Discovery and exploration of dissonance or inconsistency among participants	Identifying areas of disagreement, asking, or answering questions to clarify disagreement
C3	Negotiation of meaning or construction of knowledge	Negotiating the meaning of terms and negotiation of the relative weight to be used for various agreement
C4	Testing and modification of proposed synthesis or co-construction	Testing the proposed new knowledge against existing cognitive schema, personal experience, or other sources
C5	Agreement statement(s) or application of newly constructed meaning	Summarizing agreement and metacognitive statements that show new knowledge construction

C6	Off Topic	Discussion that irrelevant to knowledge construction

Results

Among the 585 message codes, the distribution of each code is as shown in figure 1. The result indicates that knowledge construction in students' discussion process was primarily C1 (sharing or comparing information about discussion topics) (86.7%). Besides, few C2 (discovery and exploration of dissonance or inconsistency among participants) was also found in students' discussion. C3 (Negotiation of meaning or construction of knowledge), C4 (Testing and modification of proposed synthesis or co-construction), and C5 (Agreement statement(s) or application of newly constructed meaning) were not observed in the discussions and thus excluded in the subsequent analysis. Moreover, the result also shows a fair proportion of C6 (off topic discussion) (12.82%).

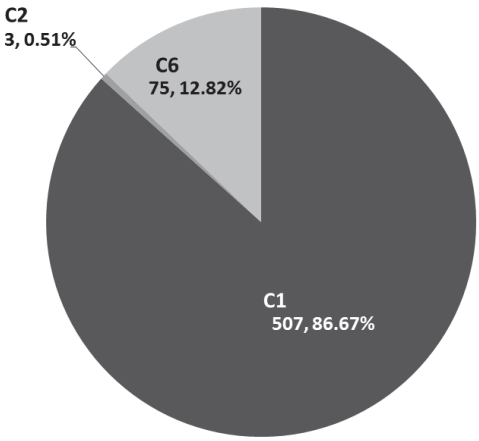

Figure 1: Pie chart of the coding of knowledge construction in the online discussion

To explore the possible gender differences of knowledge construction, this study conducted a t-test on the average number of C1, C2, and C6 between different genders of participants. As shown in Table 2, the results suggest that, in average, females have more off topic discussions (C6) than males do.

Table 2: Results of t-test for mean difference in knowledge construction in gender

	Gender		
	Female (n=40)	Male (n=22)	
Code	M (SD)	M (SD)	t
C1	8.70(6.91)	7.23(7.63)	- .77
C2	.05(.22)	.05(.21)	- .08
C6	1.53(1.93)	.64(1.09)	-2.31*

*p<.05

To understand the relationship between students' age and knowledge construction, this study employed Pearson correlation analysis of students' age and C1, C2, C6 code respectively. The results show that students' age is significantly correlated with C2 ($r = .341$, $p < 0.01$) and C6 ($r = 0.309$, $p < 0.05$).

The extent of students' participation, i.e. the number of posts of each student, in online discussion and its relationship with students' age and gender were further examined. The

extent of participation was assessed by classifying the 585 messages into new posts (i.e. posts that initialize a new discussion thread) and reply posts (i.e. posts that reply others' messages) for each student. In addition, students' total posts refer to the summation of their respective total number of new posts and reply posts. The higher the number is, the higher the extent of a student's participation in online discussion is. Table 3 exhibits results of t-test of the extent of participation in different genders. The results show that there is no significant difference between females and males in terms of participation. Moreover, the Pearson correlation analysis of age and the extent of participation was conducted. The results showed that age has no significant correlation with whether new posts, reply posts or total posts. Interpretation and discussion of the results are to be presented in the following section.

Table 3: t-test of mean differences in the extent of participation in genders

	Gender		
	Female (n=40)	Male (n=22)	
Post categories	M (SD)	M (SD)	t
Total posts	10.28(7.71)	7.91(8.20)	.96
New posts	6.73(7.10)	4.59(4.88)	.22
Reply posts	3.55(3.11)	3.32(5.67)	.14

*p<.05

Discussion and Conclusion

The purpose of this study is to explore students' knowledge construction in the context of incorporating SNSs to support asynchronous online discussion in adult and continue education. Facebook, a popular SNS, was chosen to support a project based discussion activity for 62 students enrolled in the course - Appreciation of Arts and Design Aesthetics. A total of 585 messages which discuss the assigned PBL activity in the course were retrieved for content analysis.

As the results of content analysis show, students' knowledge construction is primarily knowledge and information sharing (C1=507, 86.7%), little exploration of inconsistency among participants (C2=3, 0.5%) was observed during the online discussion. Negotiation of meaning or construction of knowledge (C3), testing and modification of proposed synthesis or co-construction (C4), and agreement statement(s) or application of newly constructed meaning (C5) were not found in this study. Consistent with previous studies, in the context of incorporating asynchronous online discussion, students' knowledge construction is mostly knowledge and information sharing [7][15].

However, the results from related studies, which adopted college students as participants, showed fair proportion of C2 and C3 [10][13]. These findings are not found in this study. One possible explanation is that the time for students to discuss was not ample enough. Schering (2011) points out that the ample time for online groups to discuss and reach a consensus of the project is necessary considering the characteristics of distance learners [24]. Adult learners usually play multiple roles in both work and home which may constrain their time and effort in learning [18]. Therefore, to achieve richer multiplicity of knowledge construction, they may need more time to reflect and give feedback to the project discussion than traditional college students do. All participants in this study have either full- or part-time jobs; therefore, deeper and increasing diversity of knowledge construction may not be achieved within few weeks.

Another plausible reason could be the topics of project are not controversial. Paulus (2005) pointed out the type of group project could influence students' decision on working the project

cooperatively or collaboratively [22]. According to Paulus (2005), project designed for collaborative learning requires student working collaboratively in reaching a consensus. On the other hand, project designed with cooperative approach, students may be able to distribute the workload to each member. They could thus work independently instead of collaboratively reaching a consensus. The project activity in this study required students to collect and present information of specific artists. Meanwhile, the instructor didn't give obvious rubrics or guideline of the project's final presentation. Therefore, student may distribute the project work by assigning each group member to collect specific data. In this way, students may relatively not need to seek a consensus or negotiate on the dissonance between members' ideas, which in turn, lead to the lack of depth and diversity in knowledge construction behavior.

To further explore the relationship of adult learners' individual differences with knowledge construction and the extent of participation, this study conducted mean difference and correlation analysis of knowledge construction phases and the extent of participation in students of different ages and genders. The results suggest that females show more off topic discussions than males do. Besides, correlation analysis shows that student's age exhibits significant positive correlation with discovery and exploration of dissonance or inconsistency among participants (C2) and off topic discussion (C6). For C2, one possible explanation could be that older adults have better metacognitive knowledge and ability which may be influenced by past academic or life experience [4]. Thus, they were able to discover the dissonance or inconsistency of other members' ideas. For off topic discussion (C6), previous research suggests that older learners relatively more appreciate the opportunities and experiences of learning. Furthermore, they would apply various strategies in compensating the compressed time due to commitment in work or family [4]. This situation may drive them to participate in online discussion more often than younger students, even off topics.

Monk-Turner and Payne (2004) found gender differences in perceptions of group project [20]. Despite the fact that females are more likely to perceive that they did more work than males did, they are less likely to perceive that they devote meaningful contribution to the group project than males are. In this study, females, comparing to males, might be more likely to post encouraging messages or report the current status of project which were coded as off topic discussion (C6) in content analysis. This phenomenon may serve as a plausible explanation for gender difference in C6.

Previous studies showed gender differences in perception of participation of group project [20] and higher participation in class discussion of non-traditional, i.e. older, students than traditional college students [4]. However, in this study, the extent of participation has neither statistically differences in genders nor correlation with students' age. One plausible explanation could be that the project-based activity in this study asked students to collect information about artist(s). Besides, the instructor also asked all group members to join the discussion in the Facebook. In this information age, people can easily surf the internet and retrieve abundant information. Students may have brief discussion of distribution of work. Each group member could then collect data of a specific part of the whole project and post them on the Facebook. Therefore, all group members, regardless of their gender and age, may exhibit certain extent of participation in terms of posting collected information. This phenomenon might explain both the majority of C1 in knowledge construction codes and the insignificant results of statistical analysis.

Suggestions for pedagogical practice

Based on the research findings, this study proposes suggestion for pedagogical practice as following:

1. **Allowing ample time for project discussion**: Regarding to the multiple roles that adult learners may play, they may not be able to promptly give response or feedback to the

discussion content. Thus, relatively longer time for the discussion might be necessary for adult learners to achieve meaningful online discourse.

2. **Setting controversial topic and clearly specifying the goal of project**: For example, comparing the achievements of artists in the same era or ideology with their influence over the subsequent thinking of art; in this way, students have to collaboratively achieve the consensus over the project topic instead of working cooperatively but independently. A richer multiplicity of knowledge construction is expected to be shown in the interactive process of students' reaching a consensus.
3. **Increasing the structure of online discussion activity**: Gilbert and Dabbagh (2005) suggest that providing criteria or structural guideline, such as addition of posting protocols or evaluation rubrics, is helpful in achieving meaningful online discussion [5]. Thus, this study suggests that the instructors should give the guideline or evaluation rubrics as scaffolds for student to post their messages.
4. **Focusing on developing effective pedagogical strategies**: Among current SNSs, this study adopted Facebook, which has the largest user base, as the discussion tool. Most of the students have experiences in using Facebook to interact with others and are familiar with its interface. However, incorporating technology itself doesn't automatically drive meaningful learning [17]. Rather, a well-designed pedagogical strategy, which utilizes the benefits of SNSs, could be a key to foster effective learning. Gray (2010) pointed out it could be a challenge for both students and instructors when incorporating Facebook in the learning process [6]. Therefore, the focus should be placed on how to design pedagogical strategies which can improve the depth and multiplicity of students' knowledge construction.

Research limitations and future research

This study investigates students' knowledge construction phases in asynchronous online discussion process of the Art introductory course which incorporates Facebook as a discussion tool. The characteristics of the art course may limit the generalization ability of this study. Therefore, future research could further apply Facebook in supporting students' discussion in various courses or disciplines other than Art related courses. In addition, future studies are suggested to explore students' cognitive phases and knowledge structure in the process of online discussion. Furthermore, integrating advanced analysis techniques could help depict a clearer picture of adult learners' asynchronous online discussion behavior using Facebook. For example, a sequential analysis of adult learners' online discussion behavior in Facebook could advance the understanding of their behavioral patterns in discussion process. Also, a qualitative analysis of students' discussion content is also helpful in exploring the patterns and meaning of their discussion. Lastly, the multiplicity of knowledge construction is not observed in this study, the lack of ample time for online discussion could be the possible reason. Future research is suggested to investigate into the relationship between the length of time for discussion and the multiplicity of knowledge construction.

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The differences on the information commitments toward online medical information between people in the hospital and general public

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Abstract: The purpose of present study is to explore peoples' online medical information commitments (MIC) and to compare peoples' online MIC between different groups. A Medical Information Commitment Survey (MICS) was employed to investigate peoples' evaluative standards of assessing online medical information and their searching strategies used on Internet. Two groups, including 247 samples from the group of people in hospital and 293 samples from the group of people in general public, were surveyed. The results showed that the MICS was a sufficiently reliable tool to assess peoples' MIC. It was also found that for seeking more credible online medical information, people would tend to employ both basic and sophisticated evaluative standards (i.e. mixed standards) for judging online medical information, and to utilize "elaboration," the advanced searching strategy, as well. Especially for people in hospital, they showed higher tendencies to use mixed standards and "elaboration" searching strategy than people in general public.

Keywords: Information commitment, medical information, Internet

1. Introduction

With the exploration of online information in recent years, Internet has become a preferred source of medical information (Lemire, Pare, Sicotte, & Harvey, 2008; Morahan-Martin, 2004). Many people around the world accustom themselves to search medical and health information on Internet (McMullan, 2006; Renahy, Parizot, & Chauvin, 2010). The abundant online information plays the role that provides people to have more opportunities to manage their own health problem and to make decision about medical issues (Morahan-Martin, 2004; Renahy, et al., 2010).

However, the plentiful medical information on Internet not only makes people feel overwhelming, but also suffers its low credibility (Metzger, 2007; Morahan-Martin, 2004). The quality of online health information varies dramatically. Most of them are inaccurate and incomplete (Metzger, 2007). The quality of online medical information is one of the issues that has received considerable attentions (Hanif, Read, Goodacre, Chaudhry, & Gibbs, 2009; Lemire, et al., 2008). The questionable quality of online medical information has resulted in potential dangers related to its unsuitable use (Benigeri & Pluye, 2003).

Therefore, understanding how people search online medical information and evaluate their credibility has become an essential issue.

For investigating peoples' online information evaluative standards and searching strategies, Tsai (2004) has interviewed with a group of web users and then proposed a theoretical framework called as "Information commitments" (IC). The IC framework includes two components: a set of *evaluative standards* for assessing the web-based material and the information *searching strategies* on Internet. According the framework, an Information Commitment Survey (ICS) was developed and confirmed as a reliable tool for investigating students' information commiment by previous studies (Liang & Tsai, 2009; Wu & Tsai, 2005, 2007). Therefore, for understanding peoples' information commiment (i.e. evaluative standards and searching strategies) toward online medical information, a Medical Information Commitment Survey (MICS) was developed, and the validity and credibility would be assessed in this study.

Moreover, Wu and Tsai (2005) have suggested that peoples' information commitments might vary across individuals. In other words, different information searchers may possess various evaluative standards and searching strategies. For example, web users with more health consciousness and perceived health risk showed tendency to search medical information online (Yun & Park, 2010). Further, Eysenbach (2003) indicated that most patients will seek explanatory information about their diseases or treatments before or after their consulting with doctors. If they or their relatives were diagnosed with a medical condition, most people will seek information from multiple websites on the Internet (Morahan-Martin, 2004). These results imply that people in such a context (i.e. people in hospital) might have a higher information need for accurate and abundant medical information. Consequently, when seeking online medical information, they might use different evaluative standards and searching strategies from those in general public. This present study attempts to compare information commitment toward online medical information possessing by these two different populations.

In sum, two research questions will be investigated in this study:

- Is the MICS as a sufficient tool to measure people's information commitments toward medical information on Internet?
- Is there any difference on medical information commitment on Internet between these two groups, patients in the hospital and people in general public?

2. Method

2.1 Participants

The participants of this study were 540 volunteers, ranging in age from 30 to 69 years (M= 45.1 years), who all had experiences toward online medical information searching in Taiwan.

For investigating the online medical information commitment in different context, relevant information was collected from two groups: 247 people in hospital (135 males and 112 females) and 293 people in general public (140 males and 153 females). The people in former group, including patients or, patients' relatives and friends, were surveyed when they were in hospital, while the people in latter group were volunteers in general population who showed interests to this survey.

2.2 Instrument

In order to investigate people's evaluative standards and searching strategies, a questionnaire called "Medical Information Commitment Survey (MICS)" was employed in this study. The MICS, which was modified from Wu and Tsai's (2005) ICS, comprised three scales: (1) standards for accuracy, (2) standards for usefulness, and (3) searching strategy. Each scale contains two orientations. The six orientations which include 30 items construct the main structure of the MICS:

- *Multiple sources as accuracy scale (Multiple sources) with 4 items*: measuring the extent to which web users will validate the correctness of unknown online medical information by various sources. *Sample item*: *I will try to find more websites to validate whether the medical information is correct.*
- *Authority as accuracy scale (Authority) with 5 items*: assessing the extent to which web users will examine the accuracy of unknown online medical information by the 'authority' of the websites or sources. *Sample item: I will believe in its accuracy if the medical information appears in some websites recommended by experts.*
- *Content as usefulness scale (Content) with 5 items*: measuring the extent to which web users will assess the usefulness of the online medical information by the relevancy of its content. *Sample item: If it can provide more related links, the medical information for me is useful.*
- *Technical issues as usefulness scale (Technical) with 4 items*: assessing the extent to which web users will judge the usefulness of the online medical information by the ease of retrieval, the ease of searching or the ease of obtaining information. *Sample item: If it does not take much time to be retrieved, the medical information is useful for me.*
- *Elaboration as searching strategy scale (Elaboration) with 6 items*: measuring the extent to which web users will have purposeful (metacognitive) thinking or integrate online medical information from several websites to find the best fit that fulfills their purpose. *Sample item: I can integrate the medical information obtained from a variety of websites.*
- *Match as searching strategy scale (Match) with 6 items*: investigating the extent to which web users will apt to start searching from single searching engine, or find only a few websites that contain the most fruitful and fitted information when they search for online medical information. Their strategy is oriented towards matching the purposes of their search. *Sample item: If I find the first relevant medical information website, I will not search others.*

The MICS in present study employed a six point Likert-scale which statements were presented with bipolar strong disagree/strong agree (from strong disagree=1 to strong agree=6). As aforementioned, the three scales ("Multiple sources", "Content", and "Elaborate") which experts commonly used are categorized as sophisticated information commitments while the others ("Authority", "Technical", and "Match") which novices commonly utilized are categorized as less sophisticated.

The modified items are all examined by experts. The reliabily and validity of the MICS will be examined through EFA in this study,and further adopted to investigate people's information commitment toward online medical information.

3. Results

3.1 Factor analysis

To clarify the structure of MICS for exploring people's medical information commitment, a series of exploratory factor analysis by principle component analysis with varimax rotation were used. The results of EFA revealed that a total of six factors were extracted with eigenvalues exceeding 1.0: "Multiple sources", "Authority", "Content", "Technical", "Elaborate" and "Match." These factors accounted for 61.11% of variance. The factors and responding factor loadings of items are presented in Table 1. Moreover, the reliability (alpha) coefficients for these factors are 0.74, 0.80, 0.87, 0.79, 0.86, and 0.86 respectively, and overall alpha is 0.86. Therefore, the MICS were suggested as a sufficiently reliable tool for assessing people's online medical information commitment.

Table 1. Factor loadings and Crobach's α values for the six scales of the MICS (n=540)

Item	Factor1:	Factor2	Factor3	Factor4	Factor5	Factor6
Factor 1Multiple sources: α=.74 (4 items, mean= 4.96, SD= .53)						
Multiple sources 1	.64					
Multiple sources 2	.73					
Multiple sources 3	.76					
Multiple sources 4	.68					
Factor 2: Authority α=.80 (5items, mean= 4.67 SD= .69)						
Authority 1		.61				
Authority 2		.61				
Authority 3		.82				
Authority 4		.78				
Authority 5		.70				
Factor 3: Content α=.87 (5 items, mean= 4.99, SD= .59)						
Content 1			.72			
Content 2			.80			
Content 3			.81			
Content 4			.72			
Content 5			.68			
Factor 4: Technical α=.79 (4 items, mean= 4.60, SD= .80)						
Technical 1				.73		
Technical 2				.70		
Technical 3				.79		
Technical 4				.72		
Factor 5: Elaboration α=.86 (6 items, mean= 4.75, SD= .66)						
Elaborate 1					.68	
Elaborate 2					.80	
Elaborate 3					.80	
Elaborate 4					.67	
Elaborate 5					.76	
Elaborate 6					.70	
Factor 6: Match α=.86 (6 items, mean= 3.91, SD= .96)						
Match 1						.68
Match 2						.76
Match 3						.80
Match 4						.79
Match 5						.80
Match 6						.74
% of variance	7.62	9.29	11.42	8.79	12.04	11.96
Eigenvalue	2.29	2.79	3.43	2.64	3.61	3.59

3.2 Scores on the six scales

For further investigate people's information commitment toward online medical information, Table 1 also shows people's average scores and standard deviations of the six scales of the MICS. The people scored highest on the "Content" (an average of 4.99), followed by "Multiple sources" (an average of 4.96), "Elaboration" (an average of 4.75), "Authority" (an average of 4.67), "Technical" (an average of 4.60), and "Match" (an average of 3.91).

People's average scores in the first four scales (i.e. evaluative standards) are all higher than four points and the average scores in "Multiple sources" and "Content" almost close to five points. It implied that people in this study might apt to employ all these evaluative standards, so-called as a "mixed standards" tendency. Moreover, using "Multiple sources" and "Content", which are considered as more sophisticated evaluative standards, are much preferred.

Regarding to the part of searching strategies, people showed a neutral preference to employ "Match" as a searching strategy (M=3.91). Nevertheless, using "Elaboration" as a searching strategy is much preferred (M=4.75).

3.3 Group differences on information commitments

For comparing the differences on online medical information commitments between the two groups (people in hospital and people in general public), a series of t-tests were used. Table 2 shows the results of comparisons on MICS scales identified by t-tests. The results indicated that, on the one hand, the people in hospital are more oriented towards using "Multiple sources" (t=2.53, p<.05), "Authority" (t=4.44, p<.001), "Content" (t=4.15, p<.001), "Technical" (t=2.86, p<.01) as evaluative standards. On the other hand, they tend to employ "Elaboration" (t=2.47, p<.05) as searching strategy to seek online medical information, and to show less orientation toward using "Match" (t=-3.90, p<.001) than people in general public.

Table 2. Groups' comparison of the ICS Scales between the group of General publication (n=293) and Hospital (n=247)

Scale	Groups	Mean	t value
Multiple sources	Hospital	5.03	2.53*
	General	4.91	
Authority	Hospital	4.80	4.44***
	General	4.55	
Content	Hospital	5.10	4.15***
	General	4.90	
Technical	Hospital	4.71	2.86**
	General	4.51	
Elaboration	Hospital	4.82	2.47*
	General	4.69	
Match	Hospital	3.73	-3.90***
	General	4.05	

*p< .05; **p<.01; ***p<.001

Regarding to the evaluative standards, people in hospital would show a higher tendency than people in general public on all standards for judging the accuracy and the usefulness of online medical information. In other words, people in hospital might much prefer to filter the online medical information with mixed standards. Moreover, in terms of searching strategies, their search strategy is more oriented to "Elaboration" which is commonly used by experts, and less oriented to "Match" which is commonly held by novices.

4. Discussion and Conclusion

In this study, MICS is confirmed as a sufficiently reliable tool to measure people's information commitments toward online medical information by exploratory factor analysis. The structure of MICS in the present study is consistent with the results from Wu and Tsai's (2005; 2007) and Liang and Tsai's (2009) studies. Accordingly, the framework proposed by Tsai (2004) is also adequate for assessing people's information commitment toward online medical information in this study.

From the scores of each scale in MICS, people in this study apt to judge the online medical information with mixed standards. The results from Benotsh and Kalichman's (2004) research indicated that inaccurate or misleading information found on Internet might have potentially negative impacts on the medical decision making. For seeking accurate online medical information, people have to verify the information carefully. Therefore, using mixed standards for assessing online medical information might be one of the possible tendencies.

Due to the specific situation people encounter when searching medical information on Internet, the evaluative standards which are commonly held by novices might play as "basic" standards. When searching online medical information, people commonly confront medical terminologies. These terminologies might be some key words as good start points for online medical information searching, but they are also obstacles for impeding the comprehension of health information (Liu & Lu, 2010). Moreover, the Internet is a huge database with explosive information. Too much medical information retrieved also causes information overload (Zeng et al, 2004). By using these basic evaluative standards, for example, people could find preliminary understandings toward a medical terminology from a website organized by governments. Hence, these standards would provide basic assistances for helping people to interpret the medical terminologies and to reduce the information overload as well.

Most importantly, in this study, people still show higher orientations to employ "Multiple sources" for the accuracy of, and "Content" for the usefulness of online medical information. Tsai (2004) has indicated that these evaluative standards which are commonly held by experts would lead to an effective information seeking, and be helpful for seeking adequate online medical information. Therefore, people could find medical information with more credibility with these advanced evaluative standards.

In addition, people in this study showed a strong preference for using "Elaboration" as a searching strategy which is also preferred by university students and medical students in previous studies (Wu & Tsai, 2007; Liang & Tsai 2009). "Elaboration" is categorized as an advanced searching strategy and commonly expressed by experts (Tsai, 2004). As known as the abundant unreliable information online, using "Exploration" should be a preferred searching strategy for exploring useful and adequate online medical information.

By comparing the means of MICS, there are significant differences on the evaluative standards and searching strategies between the people in hospital and people in general

public. First, people in hospital have higher scores on the four evaluative standards than people in general. In other words, people in hospital show a higher orientation to employ "mixed standards" to judge online medical information than people in general do. Second, people in the hospital also have higher tendency to use "Elaboration" as a searching strategy than people in general do. For deeply and carefully understanding the diagnoses and the information of their diseases, people in hospital would summarize and compare the online medical information they found.

People in hospital (patients or their relatives) often encounter a more critical medical problem than people in general public. They have a higher need for seeking most credible medical information as references to deal with the medical problem. Therefore, using mixed standards and elaboration as a searching strategy for verifying online medical information they found is more expectable for people in hospital.

5. Implications and future study

MICS, the tool developed in this study, might be a reliable tool for exploring people's information commitment toward online medical information. More related studies are suggested to be conducted for extending our understanding toward different groups. And the reliability and validity could be confirmed by using advanced statistical methods, such as Confirmatory Factor Analysis (CFA). Furthermore, due to the crucial influences of online medical information on peoples' health, people (especially for people in hospital) would tend to employ mixed information commitment when searching online. For helping people get more credible online medical information, some instructional courses should be presented. People might have chances to cultivate their information commitment. It would be helpful for them to hold advanced information commitment toward online medical information, and to find reliable information for dealing with their medical problems.

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Evaluation of DM-Tutor, an ITS for Training on Plantation Decision Making

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Abstract: Over the years many Intelligent Tutoring Systems (ITSs) have been used successfully as teaching and training tools with proven results through evaluation studies. Even though ITSs are effective in providing individualized tutoring to many students at the same time, very few attempts have been made to embed them with existing systems. This area of research has a lot of potential in providing life-long learning and work place training anytime and anywhere. We present the evaluation of DM-Tutor, an ITS that provides training on plantation decision making. DM-Tutor has been embedded with a Management Information System (MIS) to provide scenario-based training using real life operational data and actual plantation conditions. The pilot study conducted in February 2011 shows that DM-Tutor is an effective teaching tool; the performance of the participants on the post-test was significantly higher than their performance on the pre-test. The questionnaire responses show that the participants found the system easy to use and useful.

Keywords: Intelligent tutoring systems, embedded ITSs, management information system, scenario-based training.

Introduction

Rapid technological advances have created profound implications for all levels of education and training around the world. Intelligent Tutoring Systems (ITSs) have become an important class of educational technology that is capable of playing a crucial role helping learners of any age acquire the skills needed to succeed. ITSs have been developed and effectively used for teaching and learning for many years and have been proven in the past to be successful in providing tutoring to any number of students through highly interactive environments [8]. The ultimate goal of ITSs is to achieve the learning gain of 2 standard deviation, the same level achieved by master human tutors in one-to-one interactions with students [5]. Over the years many ITSs including LISP tutor [3], Andes [22], PUMP

Algebra Tutor [11] and others have been effectively used in many teaching and learning domains. SQL-Tutor [13], NORMIT [14], KERMIT [21], UML Tutor [4] and J-Latte [9] are among the many constraint-based tutors (CBT) [15] that have been developed and successfully implemented by the Intelligent Computer Tutoring Group.

Even though ITSs have been proven as effective teaching tools, there have been very few attempts to embed them within other systems. ETS (Embedded Training System) [6], Macsyma Advisor [10], Geometer Sketchpad Tutor [20], Excel Algebraic Tutor [12] and PAT (Personal Access Tutor) [19] are some of the attempts made to embed ITSs into existing systems. Macsyma Advisor was developed to assist users in using Macsyma, the algebraic manipulation system. Macsyma Advisor focused on assisting rather than training, which meant the user, may not have learned how to solve problems unassisted in the future. Although various parts of Macsyma Advisor were implemented, they were not combined into a full working system; and evaluation studies were not carried out to assess the effectiveness of Macsyma. Excel Tutor provided descriptive explanations and interactive guidance for students to solve excel problems and Geometer Sketchpad Tutor taught students how to sketch geometric diagrams. For Geometer Sketchpad Tutor and Excel Algebraic Tutor, users' actions were observed and monitored through the system's interface. Initial evaluations showed that Excel Tutor provided a higher learning outcome for students. However, to our knowledge no detailed empirical evaluation was done to analyze students' interactions with the system. The tutors were not assessed for their effectiveness as educational systems. ETS was developed and integrated with an existing Complex Information System for military tasks and operations. The goal of ETS was to train users on military based scenarios. ETS however was not robust enough to handle a variety of student's actions and behaviors within the system. Evaluation studies were not conducted for the system and the learning outcome was also not evaluated. PAT was added into MS Access to help students build reports and forms. Although the students seemed to like PAT, the system has not been fully evaluated.

In this paper, we present DM-Tutor (Decision-Making Tutor) [1], an ITS that provides training on plantation decision making for the palm oil domain. We aim to make several significant contributions in our research. This will be the first attempt to embed a CBT with an existing system. Secondly, we will investigate the benefits of providing on-the-job training through this integration. Thirdly, we aim to develop a framework for embedded ITSs and prove its research contribution through the development of DM-Tutor and its integration with the MIS for palm oil.

DM-Tutor has been embedded with a Management Information System (MIS) [18] that is currently being used to manage palm oil plantations in Malaysia and Indonesia. The MIS for palm oil contains operational data of yield records and plantation cultivation details. As the information contained is highly domain specific, managers who are new to the domain or to the MIS face difficulties in making accurate operational analyses and this affects the decisions they make at the palm oil plantations. As DM-Tutor is embedded within the MIS for palm oil, users will be able to practice plantation decision making using real-life operational data from the MIS. The goal of DM-Tutor is to help users apply theoretical concepts of plantation analyses into real-life plantation decision making.

This paper is organized as follows. In section 1 we describe the architecture and components of DM-Tutor. Section 2 describes the evaluation study conducted for DM-Tutor and in section 3 we present conclusions and future work.

1. DM Tutor

To the best of our knowledge, there has not been an ITS for plantation decision making, and DM-Tutor is novel in that respect. It is also the first CBT to be embedded with an existing system. DM-Tutor was developed using ASPIRE [16], an authoring system and deployment environment for constraint-based tutors. DM-Tutor is a procedural based tutor. This means that problem solving is divided into several steps and student's solution is evaluated at every step. Students will not be able to continue to the next problem solving step before submitting the correct solution for the present step. Figure 1 presents the overall architecture of DM-Tutor. DM-Tutor consists of a student model, pedagogical module, interface module, constraints that represent domain knowledge and a database of problems and solutions [2].

Student model contains information of student's knowledge and is updated every time the student uses DM-Tutor. Constraint based modeling [17] is used to model the domain and the student. The student's solution is matched to the constraints in order to identify any mistakes, and the student model is updated. The pedagogical module selects instructional actions relevant to the scenario-based problem solving strategy used. It also has the role of providing helpful feedback to users when they submit an incorrect solution.

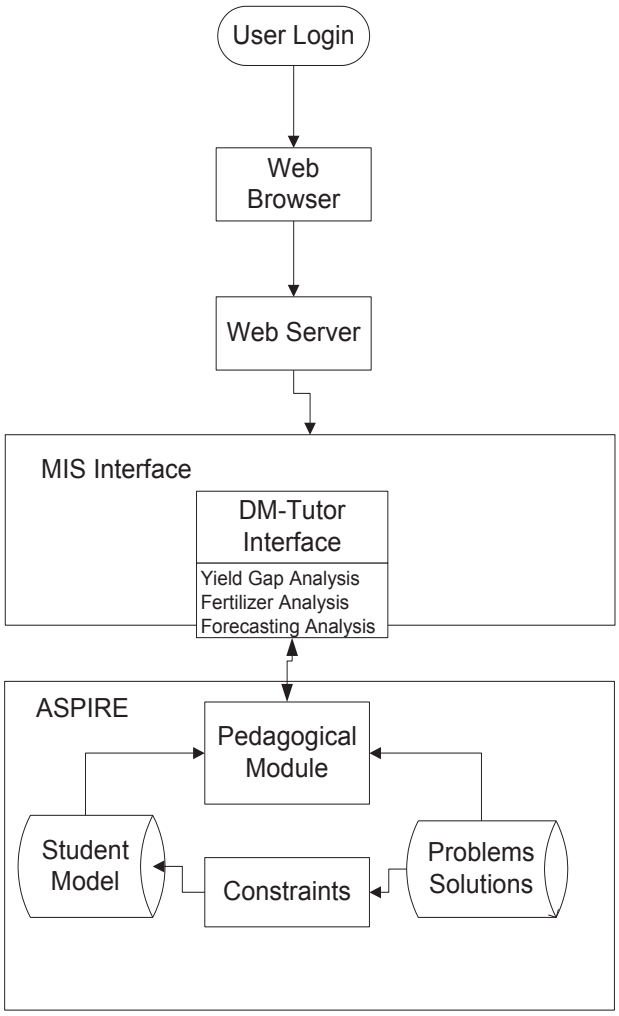

Figure 1: DM-Tutor Architecture

The interface module presents the student interface of DM-Tutor. The problems and solutions component focuses on *Yield Gap Analysis*, *Fertilizer Management* and *Yield Forecasting*, three main analyses for palm oil plantation management [1]. DM-Tutor's interface is designed to reduce the cognitive load so that the student could concentrate on how to solve the problems rather than trying to understand the interface. The interface is developed using Java applets. In order to solve problems presented in DM-Tutor, users need to access relevant reports from the MIS. DM-Tutor logs information on the MIS reports that users accessed. This enables the system to provide helpful feedback about student mistakes.

The MIS is a web-based system and is accessed via a web browser. When users log into the MIS, they would see a menu on the left side of the screen. The menu consists of the various information that MIS contains. This includes maps, graphs and various reports, including yield analysis, upkeep and cultivation analysis, store analysis and vehicle management analysis. An MIS user would access the type of information she/he needs by selecting the type of analysis required, estate name, year and month to view the particular

report she/ he needs to work with. Figure 2 illustrates the MIS interface, with the menu of information on the left pane, and a sample of analysis showing *Yield Analysis* for a particular estate on the right. When user selects to view a particular report, a window opens up showing the report (center window of right pane).

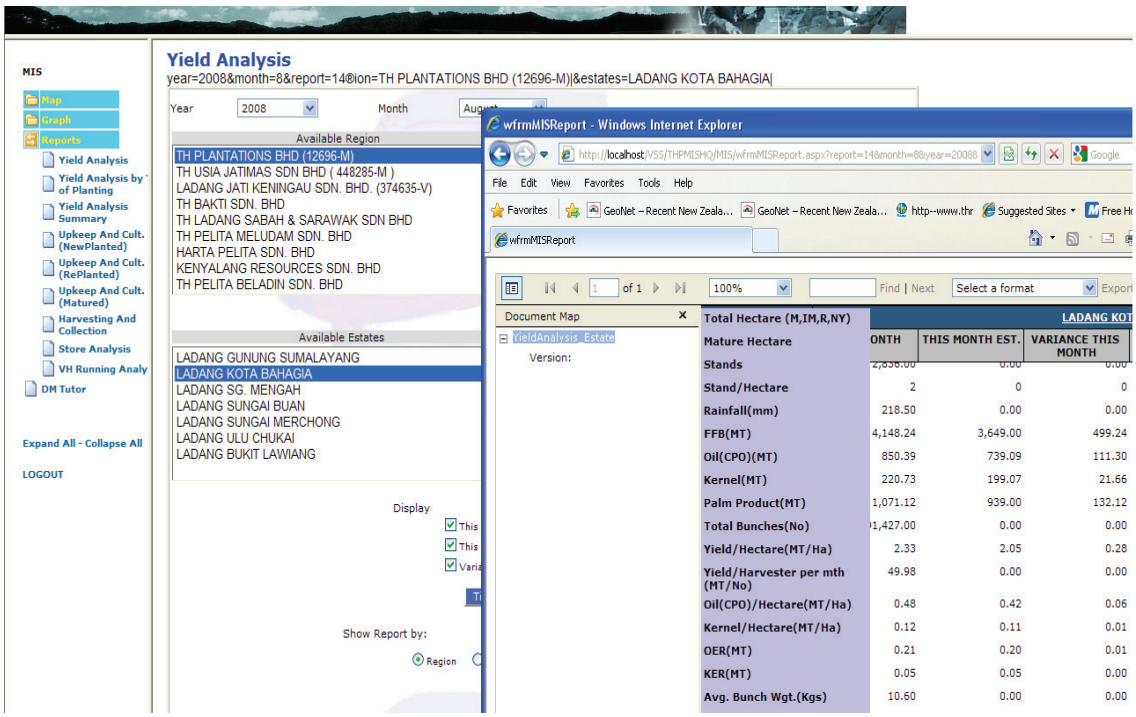

Figure 2: MIS Interface showing a yield analysis report

MIS was modified to allow the integration with DM-Tutor. The menu pane of MIS was changed by adding a selection button (visible in Figure 2) for DM-Tutor. When the student clicks on this button, he/she will be logged into DM-Tutor automatically. The tutor is served by ASPIRE, which assigns a user ID to the user. The interface of DM-Tutor is displayed in a separate window. Once logged in, DM-Tutor users are presented with the three tasks within DM-Tutor: *Yield gap analysis, Fertilizer management analysis* and *Forecasting analysis*. The tasks posed by DM-Tutor contain real life plantation situations and problems. Each task in DM Tutor focuses on one area of the plantation management's concern and requires students to access various plantation areas and specific reports from the MIS in order to answer the questions in DM Tutor. Students also need to use the correct formulas for each analysis.

For *Yield gap analysis* [23], students first have to identify relevant plantation areas and their potential yield in the MIS. Next they need to calculate yield gap between plantation areas using the correct formula. Lastly, they need to give their recommendation on how to improve yield of that particular area. The focus of this task is to train students on how to focus management's efforts on improving conditions in plantation areas that needs management attention the most.

For *Fertilizer management analysis* [7], students need to calculate the *partial factor productivity* (PFP) and *agronomic efficiency* (AE) for a given plantation area in the MIS using a formula. They need to select the accurate nutrition combination required for the palm trees based on the age of the tree (identified from the MIS). Lastly, they need to solve a fertilizer management problem to improve yield for the given plantation location. This task teaches users on how to efficiently manage plantation nutrition.

For *Forecasting analysis* [23], students are required to calculate a future yield value based on the present yield value of a given plantation area in the MIS. They will then need to provide their solution to a given plantation scenario problem where yield losses have occurred due to various plantation conditions. This task teaches students to plan the plantation area's future yield based on current yield conditions.

When students select a task, they are presented with the window that shows the problem and solution workspace. DM Tutor evaluates the student's solution step-by-step, immediately after the student submits his/her solution for the current step. If the submitted solution is incorrect, DM-Tutor provides various levels of feedback that guides the student towards the correct solution. Only when the solution is correct, the student is allowed to move to the next step of the problem. Figure 3 shows a screen shot of a problem step in the Forecasting Analysis task in DM-Tutor.

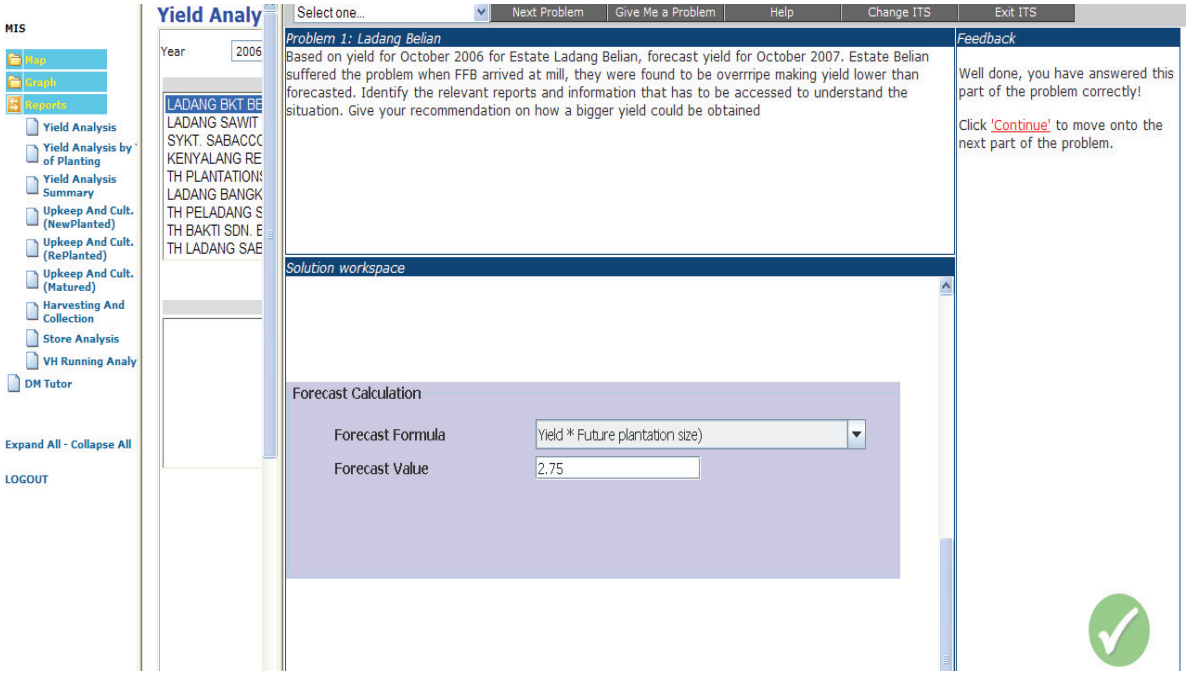

Figure 3: MIS interface with DM-Tutor's problem-solution workspace

In the example shown in Figure 3, the student has selected the correct formula to calculate yield forecast and has calculated the forecast accurately. As a response, DM-Tutor has provided a feedback message for the student to continue to the next problem step in Forecasting analysis task. The MIS and DM-Tutor frame can both be resized by the student at any time to allow more visibility for either system. All of the user's actions within DM-Tutor are recorded and used to model the student's knowledge of the domain. Once the student has completed a problem correctly she/he can choose to practice another problem or a different analysis.

2. Evaluation Study

Evaluation of ITSs should focus on the educational impact on students. We conducted a pilot study of DM-Tutor in February 2011 with the goal of evaluating its effectiveness as a teaching and training tool for the palm oil plantation decision making domains. We also wanted to identify any technical issues, interface problems and system usability concerns

that needed to be solved. The study was conducted with a group of 22 employees working for a palm oil plantation company in Kuala Lumpur, Malaysia. All the participants were already familiar with the MIS for palm oil as they use a similar version of the system for their everyday work, so their knowledge of the MIS system was not evaluated.

We provided the participants with a demonstration on DM-Tutor, describing the different tasks contained inside DM-Tutor, problem selection and the various levels of feedback messages available. They were informed during this demonstration that their participation in the study was on a voluntary basis. The participants were given a pre-test before interacting with the system. The pre-test contains three questions, one for each task of DM Tutor. Each pre-test question is a shorter and simpler version of the actual problems in DM Tutor. Participants spent 15 minutes doing the pre-test, after which they interacted with the system for one hour. Lastly, they worked on the post-test for another 15 minutes and also completed the questionnaire. The post-test also consisted of three questions, of similar complexity to those in the pre-test. Out of the 22 participants who initially volunteered, only 19 stayed through the whole study. Table 1 presents the basic statistics about the participant's interaction with DM-Tutor.

Table 1: DM-Tutor Interaction Results

User log data from DM-Tutor	Mean (sd)
Interaction time (min)	27.20 (24.43)
Number of problems attempted	2.85 (1.23)
Number of problems solved	2.05 (1.05)
Number of submissions made	38.05 (8.96)
Number of feedback messages seen	19.80 (8.25)
Pre-test result (%)	50 (16)
Post-test result (%)	78 (21)
Gain (%)	28 (0.15)

Only three participants interacted with DM-Tutor for one hour or more. On average, the participants interacted with the system for about 27 minutes. The possible reason for this could be that the study was held during office hours and the participants had to complete their pre-assigned daily work load as well. The number of problems attempted by participants is higher than the number of problems they managed to solve. To solve the given problems, the participants made around 38 submissions of answers to DM-Tutor (please note that a submission is a partial answer, which covers only the current step of the task). From Table 1, we can observe that the participants have utilized the feedback messages in DM-Tutor to help them to solve the given problems.

Out of the 19 participants, only 8 completed both the pre-test and post-test for this study (the others completed only one test). Therefore, we only report the pre/post test results for those 8 participants in Table 1. We found that the performance on the post-test is significantly higher than the performance on the pre-test ($t= 1.89$, $p= 0.005$, $df=7$). From the pre-test and post- test results we could observe that the participants' knowledge in palm oil plantation decision making increased after using the system; the amount of increase is strongly correlated with the time the participants spent with the system ($r=0.92$).

From the 19 questionnaire responses obtained, we found out that 74% of the participants thought that DM-Tutor was easy to use. 52% of the participants found the feedback messages in DM-Tutor to be helpful in answering the questions. When they were asked if they liked DM-Tutor's interface, 63% of the participants said that they did. One of the participants commented that he liked this new version of the MIS. When asked if DM-Tutor was able to teach them any new palm oil plantation decision making analyses, all

the participants answered 'yes'. One participant said that DM-Tutor helped to teach her how to use the information in the MIS to make better decisions. Another participant said that she knew now what yield gap analysis and fertilizer efficiency were, after using DM-Tutor. When the participants were asked if they felt that by integrating the Management Information System (MIS) with DM-Tutor they were able to learn the plantation analyses better? All of them answered 'yes'. One participant said that he liked to see the MIS and the teaching system together. Another participant stated that she liked the idea that she could stop learning and continue to work with MIS when she needed to and another participant was happy that she could choose the analyses that she needed to learn and that she could check the analysis again if she was not sure.

3. Conclusions and Future Work

ITSs have proven to be successful in many instructional domains. ITSs are better than computer-based training or multimedia-based training methods that only present information and test recall of factual information through multiple choice questions. ITSs are effective in providing individualized one-to-one teaching or learning to many people at the same time. By embedding DM-Tutor, a constraint-based tutor, into a MIS for palm oil we hoped to provide scenario-based training (SBT) on palm oil plantation decision making using real life operational data and actual plantation conditions. Our goal was to make several significant contributions through this research. DM-Tutor is the first CBT embedded within an existing live system. Through this research we aim to develop a framework for embedded ITSs. We aimed to investigate the benefits of providing training through this integration. We hoped to prove our research contribution through the development of DM-Tutor and its integration with the MIS for palm oil.

From the pilot study, we found that the users have interacted well with DM-Tutor. They have used the information from the MIS to answer the questions posed by DM-Tutor. The participants have also utilized the feedback messages in DM-Tutor to help them answer the given questions. From the pre- and post-test results it is proven that the users have improved their knowledge of palm oil plantation decision making after using DM-Tutor. It was also very encouraging to get positive comments on DM-Tutor from the participants of the study. However, our study was small in terms of the number of participants, and therefore more evaluation is needed.

Currently, we are making further enhancements to DM-Tutor. We have modified the MIS to automatically send information about which reports the user has looked at in MIS directly to DM-Tutor, thus making interaction easier for users (as they do not have to type report details). We plan to conduct a full evaluation study of DM-Tutor in 2011 with a group of students currently enrolled in the Master's in Plantation Management program at the Putra University of Malaysia. We believe that our research has many potential benefits. Apart from the research contributions discussed above, DM-Tutor also has the potential benefit of providing life-long workplace learning, anywhere and anytime.

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Professional Development Needs of Singaporean Teachers for the 3rd ICT Master Plan

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Abstract: This paper reports the current implementation status of the ICT masterplan 3 in Singapore schools. The focus is on teachers' use of ICT to promote self-directed learning and collaborative learning among students in primary and secondary schools. We employed a mixed method: an online survey complemented by focus group discussions (FGDs) and interviews. The survey was administered on 50 primary and 50 secondary schools across Singapore. FGDs and interviews were conducted with teachers and school leaders from 12 participating schools. The survey indicated that teachers perceived a low use of ICT for SDL and CoL. FGDs revealed that they faced problems of time constraint, mindset issue and students' ability when delivering lessons with ICT. Interviews with school leaders indicated that teachers need to enhance their understanding of the concepts and ICT tools. In moving forward with the reform directions, we proposed professional learning community among teachers to co-construct curriculum-based usage of ICT for the two strategic foci (SDL and CoL).

Keywords: ICT, teachers' perception, SDL, CoL

Introduction

The rapid advancement of information and communication technology (ICT) has led to many developed countries implementing educational reforms for the integration of ICT in education [1]. In Singapore, the Third Masterplan for ICT in Education (mp3) was launched in August 2008 to take schools forward in the use of ICT for enhancing 21st century learning. This educational reform seeks to enrich and transform the learning environments of students in Singapore schools and equip them with the critical competencies and dispositions for self-directed learning (SDL) and collaborative learning (CoL) through the effective use of ICT [2]. In the following year, a longitudinal (5 years) evaluation study was commissioned by the Ministry to assess the implementation status. The study aims to find out the possible impact of mp3 on school leaders and teachers and students as well as how schools implement mp3 and the possible contributing factors leading to the outcomes over the five years. This paper reports the findings over the first three years (2009 to 2011). The focus is on the teachers' use of ICT to promote self-directed learning and collaborative learning among students in primary and secondary schools.

1. Literature Review

1.1 SDL and ICT

According to Knowles [3], self-directed learning can be defined generally as a process in which individuals take the initiative with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying resources and learning strategies, implementing the plan and evaluating outcomes. SDL stresses on personal autonomy, self management and control and the independent pursuit of learning [4]. It regards learners as responsible owners, managers and regulators of their own learning process [5]. Therefore, self-directed learners should possess various traits which include motivation, goal orientation, locus of control, self-efficacy, self-regulation and metacognition [6].

Recent research evidence has revealed that ICT is an important medium for students to develop SDL competencies. Vonderwell and Turner [7] held that online learning environment provide more control of the instruction to the learners and thereby could enhance aspects of SDL in areas such as students' responsibility and initiative towards learning. Likewise, Song and Hill [8] reported that in an online environment, self-directed learners demonstrate control, critical reflection and responsibility.

1.2 CoL and ICT

Collaborative learning refers to the social process whereby students interact for the purpose of learning [9]. CoL emphasizes co-construction of knowledge within social contexts of learning such as negotiation and group processing [10]. Besides, successful collaborative learning environments entails positive interdependence and individual accountability in a group setting [11]. Technology is increasingly providing new possibilities for collaborative learning [12]. For example, social software such as Blogs, Wikis, or other collaboration systems, has the unique effect of spurring online interaction, which is the foundation for cognitive development, teaching, and social presence [13]. More importantly, research studies [14] have reported positive learning outcomes of collaborative Internet projects: increased student motivation and understanding of learning as students learn in groups through the use of ICT.

1.3 Research gap

The affordances of ICT to facilitate SDL and CoL have been well-documented in the past decade. However, teachers' use of ICT for these two strategic foci in Singapore schools appears less informed. In this paper, we report the teachers' perceptions of their use of ICT for SDL and CoL in Singapore schools.

2. Methods

The study adopts a mixed-method design by including survey data (quantitative) and FGDs with teachers and classroom observations (qualitative). This paper reports the survey results on teachers' perceptions on the use of ICT for SDL and Col as well as the key findings from the FGDs and leaders interviews. The survey was administered online while the semi-structured FGDs and interviews were conducted face-to-face with teachers and school leaders. Each FGD or interview session lasted 40 to 60 minutes and was audio-recorded. Transcripts of the recorded audios were analysed. Sample items of survey and FGD/interview questions are provided in the appendixes.

3. Participants

The survey was administered in 50 primary and 50 secondary schools. Random sampling was employed in the first year and the same schools were studied over the 5 years. A total of 1684 primary and 1899 secondary teachers participated in the online survey in 2009. The 2010 and 2011 survey respondents included respectively: 1654 primary and 1899 secondary teachers; 2049 primary and 2121 secondary teachers. The FGDs were conducted in 6 Primary and 6 Secondary schools. Sampling was purposive: based on their level of ICT use for SDL and CoL drawn from the 2009 baseline survey results. In each school, one FGD with 6 to 8 teacher participants was conducted.

4. Findings and Discussion

4.1 Survey findings

A mid-point of 3.50 was chosen based on a likert scale of 1 to 6, with 1 as "not at all" and 6 as "all the time". Results on teachers' engagement in promoting SDL and CoL among students were generally positive. The overall mean responses from 2009 to 2011 were 4.26 for engagement in SDL and 4.28 for engagement in CoL, both above the mid-point over the 3 years. However, the overall mean responses for use of ICT for SDL (SDLT) were below the mid-point over the 3 years (M=3.09 for the three years). The results indicated a less desirable use of ICT from teachers in promoting SDL among students. Similarly, the overall mean response for use of ICT for CoL from 2009 to 2011 is 3.43, slightly below the mid-point, which indicated a less desirable use of ICT among teachers for fostering CoL in the class.

4.2 FGDs findings

Data collection for current year is ongoing hence we present findings from year 2009 and 2010. The FGDs revealed 3 key obstacles that teachers faced in using ICT for promoting SDL and CoL among students. These problems were common to both primary and secondary school teachers. First, teachers interviewed felt that time constraint was a key obstacle for them to infuse ICT into their lessons. They elaborated that these constraints were imposed by a need to rush for the syllabus; lack of time to explore ICT resources and technical problems associated with computer use.

> Time is actually the factor that… influences the use of ICT during my lessons. Because we still need to rush for the syllabus… so… not every single lesson is actually possible to infuse the ICT tool… (Secondary school teacher)

> MOE (Ministry of Education) do give us resources like edumall, and also the sharing portal within the cluster and in the cluster. I think that is a very good platform for us to actually look for resources. But one thing we don't have is… the time to go and search for resources which is like thousands… of them (Primary school teacher)

Next, the teachers interviewed reported mindset problems. Some believed that they "might not see the full potential for IT" because they are "not… IT-savvy" or "not familiar with the software". Others felt that the use of ICT may not "adds value" or "enhances the lesson" and

these teachers are less motivated to "go through the trouble to try to do it". Instead, they preferred to stick to the pen and paper.

> The reason why I use ICT is to… enhance the learning. But if pen and paper can do a better job then I might as well use pen and paper… (Secondary school teacher)

The third obstacle teachers faced was related to the students' ability in using ICT for SDL and CoL. Teachers were cognizant of irresponsible students and they felt that lessons using ICT for SDL or CoL were less effective to engage them.

> Students can just go to internet and copy a whole chunk of thing and they can say that they have researched and they have found the answer. But we question them we realize that they don't know anything. (primary school teacher)

> When teachers bring [students] to the class then they would prefer to go to internet to surf and go to sites that excite them rather than follow the lesson… (Secondary school teacher)

4.3 Interviews findings

Findings from the school leaders corroborated with that reported from the teachers. The leaders also reported obstacles to mp3 implementation associated with teachers' mindset and time constraints imposed by syllabus coverage.

> Some people might feel that, chalk and talk, the old traditional method will get it done. So why should I bother. So mindset change is an issue for some. (Primary school principal)

In addition, the leaders felt that teachers could enhance their capacity to use ICT for pedagogical purposes. Most leaders reported that their teachers were competent in the use of ICT tools but they have yet to integrate ICT into pedagogy effectively. One primary school principal described, "sometimes the technology does not really adds value to the lesson" and "the focus is on the technology rather than the pedagogy". Another key concern among the leaders was related to the understanding of SDL and CoL. The leader generally agreed that the understanding of these concepts need to be enhanced and regulated among teachers.

> mp3 is calling for self directed, a very high level. But if your HODs, the level heads and all do not know, then how will it carry out. I think the training that has to be provided… probably more of a collaboration with them implementing it in the school (Primary school principal)

> You have got to figure out what it means first, perhaps take away the ICT and understand what CoL is in terms of the pedagogy itself, the understanding of what the students are supposed to develop at the end. And after we can figure out and are quite consistent in our understanding of what the idea is, then we ask what does SDL and CoL look like when we have IT in use in the lessons, so that we have a common understanding of what these phrases mean and in the classroom in terms of lesson design, that has to be sorted out. (Secondary school principal)

The findings from the FGDs and interviews suggested that there is a considerable level of challenge for both primary and secondary school teachers in using ICT to promote SDL and CoL among students. To help teachers in moving forward with the reform goals, school

leaders could consider more support structures for ICT integration. For example, infusing some form of curriculum space for teachers to plan ICT-based lessons and creating more professional development opportunities for teachers to enhance their ICT and pedagogical competencies. As a suggested way forward, schools might adopt teacher professional learning communities (PLC) [15] to co-construct curriculum-based use of ICT for SDL and CoL. Through PLC, leaders and teachers could collaborate to set the directions for the school to bring about positive student outcomes related to mp3. Moreover, PLCs within schools enable teachers from the same level and teaching the same subjects to regularly share best practices and learn from one another. Such continuous professional dialogue and feedback could help teachers enhance their understanding of ICT tools and pedagogy and hone their own classroom practice for using ICT for 21st century learning.

5. Conclusion

The implementation of mp3 aims to bring about 21st century learning through the use of ICT in Singapore schools. Specifically, schools are called to integrate the use of ICT for SDL and CoL among students. From this study, we concluded that the integration of ICT into lessons for developing students' SDL and CoL competencies among teachers is less pervasive. Teachers are still caught up with problems related to time constraints and mindset issues. These findings were corroborated with those from the leader interviews. It is perhaps useful for schools to adopt more implementation strategies. Schools for example are encouraged to form teacher PLCs to co-construct curriculum-based used of ICT for the two strategic foci. This is hoped to promote better awareness and understanding on the use of ICT for SDL and CoL among teachers and help them to hone and align teaching practices toward the reform directions.

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Appendix 1

Sample items of online survey questions for the teachers' use of ICT to promote SDL and CoL among students

	Sample items
SDL	I get my students to use ICT as part of their schoolwork in the following ways: a. Share their thoughts and ideas about their schoolwork (e.g. through multimedia storytelling, voice-recording, blogs) b. Find out more information on the Internet on their own to understand their lessons better
CoL	I get my students to use ICT as part of their schoolwork in the following ways: a. Work with their group members to complete a project b. Share their thoughts with their group members on how they can work better together.

Appendix 2

Sample questions for FGDs and Interviews

Teachers

1. Can you describe the most recent ICT–integrated lessons that you have conducted in class?
2. How do you promote or encourage self-directed learning in your lessons?
3. How do you promote or encourage collaborative learning in your lessons?
4. Can you describe some factors that influence your use of ICT to facilitate teaching and learning at a class level?

School leaders

1. Can you describe some plans/goals for the use of ICT in your school currently?
2. What are the directions you give to your staff concerning the use ICT for teaching and learning?
3. What are the processes in place to promote ICT integration and use among staff?
4. What are some key problems that you have encountered in promoting and implementing ICT use? How did you overcome the problems?

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Exploring college students' perceptions of classroom learning in a knowledge building environment

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Abstract. This study examined students' perceptions of classroom learning in a knowledge building environment. The participants were 48 college students in Taiwan, who participated in a course titled "Introduction to Natural Sciences." The course was implemented based on knowledge building pedagogy. The online learning environment, Knowledge Forum, was employed to help engage students in collaborative knowledge building. A questionnaire (SPOCK) on the perceptions of classroom learning and knowledge building was employed to assess how students' viewed their learning activities in class. The findings indicated that the students involved in a knowledge-building environment perceived stronger student-centeredness for their classroom learning than those who were not involved in a knowledge-building class. Further analyses on students' online discourse will be conducted to better understand students' perceptual change.

Keywords: knowledge building, Knowledge Forum, perception of learning.

Introduction

Traditional instruction tends to be more teacher-centered in which learning usually emphasizes knowledge assimilation, rather than knowledge construction. However, with recent advances in computer-supported collaborative learning (CSCL) environments, more creative learning and knowledge construction have become possible [1][2]. Nevertheless, despite the widespread use of CSCL environments, less attention has been given to learners' perception of CSCL environments. Tsai [3] argues that students' conceptions and attitudes of web-based learning are important prerequisites to effective web-based instruction. If students thought that learning is an individualistic activity, they will be less likely to involve in collaborative learning. On the contrary, if students are often engaged in environments that emphasize knowledge sharing and co-construction, their conception of learning will be more group-oriented. Given the increasing importance of CSCL in today's education, it is timely to investigate students' perceptions of online learning environments.

Knowledge building theory

In the present study, we are interested in investigating students' perceptions of a knowledge building class. Whitehead [4] argues that learning should not be regarded as a process of accumulation of knowledge; instead, we have to take an innovative viewpoint that highlights the reproduction and transformation of knowledge in education and emphasizes learning as active, critical and creative activities. From a knowledge building perspective, knowledge can be changed or improved through continual idea generation and improvement [1][5. The concept of knowledge building theory was originally proposed by Scardamalia and Bereiter [5]. According to them, knowledge and ideas should not be seen as personal properties, but should be treated as public, social epistemic entities, which can be continuously improved via community members' collaboration, interaction, elaboration, and innovation of ideas. When engaged in knowledge building, members of a community are guided to address authentic problems, and to facilitate the exchange and transformation of ideas, in order to achieve the goal of collective knowledge advancement.

To facilitate knowledge building, Scardamalia [6] proposed a set of 12 principles to help conceptualize the complex social dynamics involved in knowledge building environments. They include authentic problem; improvable ideas; idea diversity; rise above; epistemic agency; community knowledge; democratizing knowledge; symmetrical knowledge advances; pervasive knowledge building; constructive uses of information; knowledge-building discourse, and concurrent assessment (see [6] for detailed explanations). These principles are intended to help teachers better understand the process of knowledge building so as to support the process of classroom knowledge work among student learners. Empirical research has demonstrated positive effects of knowledge building pedagogy on depth of inquiry, collaboration, and co-construction of knowledge, both from Western and Eastern cultures [5], [7], [8].

Researchers studying classroom climate have demonstrated the classroom climate which teachers construct has effects on students' learning [9][10]. To date, at least two broad types of learning environments have been identified. One is a teacher-centered learning environment, which usually focuses on lecturing and instilling textbook knowledge, and hopes that students' academic achievement can be improved by means of direct knowledge delivery [11]. In Taiwan, teaching is often presented this way, emphasizing on the importance of knowledge acquisition and neglecting students' creative capacity for knowledge creation. Another is a student-centered environment, which in contrast pays more attention to students' innovative learning processes and needs, with the role of teachers as someone who provides support to help students learn in a more self-initiated and self-directed manner. Pratt [12] argues that the student-focused learning environments provide students with more encouragement to build mutual confidence between teachers and students. Therefore, it is important to create more student-centered learning environments and we envisage that engaging students in a collaborative knowledge building environment should have positive effects on their views of classroom learning. Yet, such assumption remains to be tested (especially in an Eastern cultural context). As such, this study investigates the effect of implementing knowledge building pedagogy in shaping students' perception of classroom learning.

Method

The Participants in this study included 48 college students (26 females) in a top Taiwanese university (these students were ranked above the 95th percentile nationwide). Learning from textbook for the purpose of achieving high scores in standardized tests are considered as a cultural norm in the nation. As such, the adoption of knowledge building pedagogical approach represents a novel instructional approach. The study took place in a class titled "Introduction to Natural Sciences" over a period of an 18-week semester. Knowledge-building pedagogy and Knowledge Forum technology were implemented in the class to provide students a learning environment that emphasized collaborative learning and knowledge creation. To facilitate the adoption of knowledge building pedagogy and technology, a tutorial workshop was given in the beginning of the semester (e.g., students learned how to create, and build-on to others' notes). The instructor was familiar with knowledge building pedagogy, and had 6 years of experience of using Knowledge Forum at the time this study was implemented. Some instructional activities included reading papers, class discussion, watching videos, and online threaded discussion. Knowledge Forum was used to support knowledge building activities (e.g., helping students generate deeper ideas for solving practical problems through sustained generation, interaction and elaboration of ideas). Figure 1 shows a screenshot of a Knowledge Forum 'view' (a discussion board).

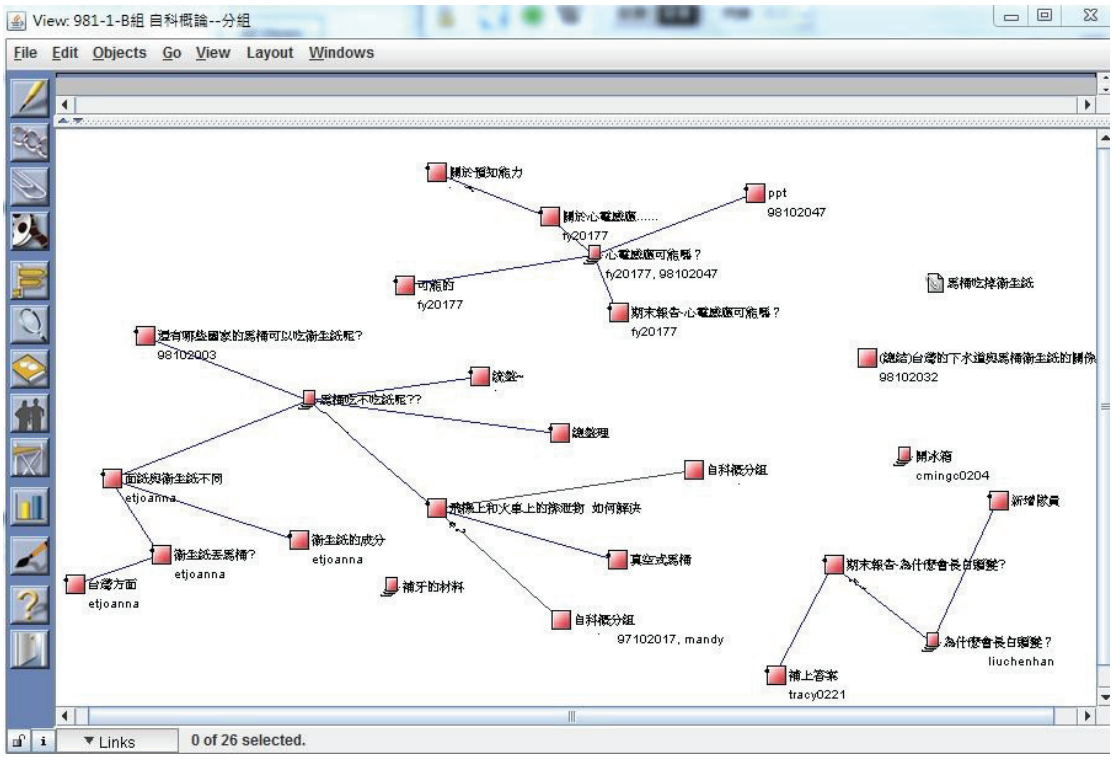

Figure 1. A screenshot of a Knowledge Forum 'view'

The data of this study came mainly from student's online performance; in addition, this study employed a 5-point Likert survey called Student Perception of Classroom Knowledge Building (SPOCK) [13]. The survey measures six aspects of student' perceptions in class: (a) Self-Regulation (nine questions; e.g., in this class, I take notes and jot down questions when I am reading the class materials); (b) Knowledge Building (10 questions; e.g., in this class, I think about different approaches or strategies I could use for studying the assignments); (c) Question Asking (three high-level questions, e.g., in this class, I ask questions about things I am

curious about, and four low-level questions, e.g., in this class, I ask questions so that I can be sure I know the right answers for tests); (d) Lack of Initiative (10 questions; e.g., in this class, I rely on someone else to tell me what to do); (e) Cooperative Learning (five questions; e.g., in this class, my classmates and I actively share ideas); and (f) Teacher-Directed Classroom (seven questions; e.g., in this class, I get most of the information from the textbook and the instructor).

Coefficient alpha reliability estimates for SPOCK were consistent with those obtained for similar instruments, such as the Motivated Strategies for Learning Questionnaire (MSLQ) and LASSI [14][15]. The Cronbach's alpha for SPOCK for this study was .93. At the end of the semester, the students were asked to use the SPOCK survey to report their perceptions of learning in this particular knowledge building class. As it is only sensible to assess class climate after a class is finished, no pre-test was conducted; to compensate, an additional survey was made to the same students by asking their learning perceptions in other non-knowledge-building classes in the school, using the same survey. The results derived from the knowledge-building and the non-knowledge-building environments were then compared, by means of a paired-sample *t*-test.

Results

Table 1 shows data regarding basic knowledge building activities (derived from the Analytic ToolKit) which was used to show the intensity of collaborative learning activities over the semester (two phases,. each last for nine weeks, were divided using midterm exam as a separating point). Overall, paired-sample t-tests indicate that there were no significant differences between the two phases in all the knowledge building activities. The number of notes generated and worked-on, the number of notes being read, and the number of notes being built-on/linked indicate that the classroom community can be regarded as fairly active and collaborative (see for example, [16]). The findings suggest that the time and effort spent on learning and using the KF for discussion is equally distributed between the two phases. Table 2 further shows that there were significant correlations among most of basic KB activities, indicating that the more active the participants were in a KB activity, the more likely they would be actively engaged in another activity.

Table 1. Basic knowledge building activities

Activity	Phase 1	Phase 2	t-value
	M(SD)	M(SD)	
# of notes created and worked	14.27(12.45)	11.44(7.17)	1.58
# of notes read	162.17(111.64)	171.73(127.96)	-0.47
# of notes built-on	11.08(11.77)	8.21(6.66)	0.10
# of Reference	3.27(3.58)	1.96(3.85)	1.78
# of scaffolds used	10.81(13.05)	7.50(7.83)	1.88
# of annotation	0.13(0.44)	0.67(2.29)	-1.61

Table 2. Correlations among knowledge building activities in Knowledge Forum

KB activity	1	2	3	4	5

1. # of notes created/worked	-				
2. # of notes read	.488**	-			
3. # of notes built-on	.734**	.460**	-		
4. # of Reference	.27	.320*	.25	-	
5. # of scaffolds used	.676**	.578**	.85**	.28	-
6. # of annotation	-.00	.04	.09	-.06	.06

* $p < .05$. ** $p < .01$.

SPOCK analysis. Table 3 further shows a comparison between students' perceptions of learning in the knowledge building class and their overall perceptions of learning in non-knowledge classes in the school. Of the six aspects of SPOCK, it was found that students in a KB class were more likely to engage in knowledge building activities (M=3.94>3.50), in asking higher-level questions (M=3.68>3.21), and in working collaboratively (M=3.98>3.44). They are also less likely to be lack of self-initiative (M=3.12<2.93) and they perceived lesser teacher directedness in their classroom learning (M=3.69<3.07). On the other hand, students in a KB class were less likely to engage in a self-regulatory mode (M=3.40<3.65). Overall, the results suggested that students in a KB class tended to perceive their class as a more constructivist-oriented, student-centered classroom.

One thing to note is that the rating of students' perceived "Self-Regulation" is low in a KB class. This may be because the questions asked in the survey were mainly about the routine class assignments (e.g., a question item asked, "In this class, I think about the best ways to study each assignment."), rather than working for the purpose of knowledge building that was pedagogically designed for this class (e.g., asking whether students would become more self-directed learners in producing ideas for solving real-life, rather than textbook, problems). Thus, it is not surprising to see lower ratings in this aspect. Further, the reason why the lower-level questioning behaviors did not differ significantly as expected was perhaps because most students tended to use lower-level questions as a basis fundamentals to gradually build up to higher-level questions. To sum, the findings indicate that engaging students in knowledge building activities did help them perceive their class as more collaborative and interactive for the advancement of knowledge.

Another thing to note is that a significant correlation (r=.0297, p<.05) was found between the total number of notes created/contributed/worked in the KF and the combined SPOCK score (which was computed by adding all the average ratings of the positive dimensions and subtracting that of all the negative dimensions). This suggests that in general, the more activities students engaged in KF, the more likely they would perceive the class as student-centered. Whether this also represents a causal relationship, however, remains to be examined.

Table 3. Differences in terms of aspects of students' perception of classroom

Aspect	Non-Knowledge building environment *M (SD)*	Knowledge building environment *M (SD)*	*t*-value
Self-Regulation	3.65 (.52)	3.40 (.49)	3.35**

Knowledge Building	3.50 (.48)	3.94 (.46)	-6.70***
Question asking			
Lower level	3.31 (.72)	3.27 (.59)	0.44
Higher level	3.21 (.70)	3.68 (.82)	-4.67***
Lack of Initiative	3.12 (.38)	2.93 (.51)	2.91**
Cooperative Learning	3.44 (.61)	3.98 (.51)	-5.70***
Teacher Directed Classroom	3.69 (.48)	3.07 (.65)	5.22***

** $p < .01$. *** $p < .001$.

Discussion

In summary, the findings in the present study showed that engaging students in knowledge building activities was helpful to change how they perceived learning in many important aspects. For one, as compared with non-knowledge-building classes, students engaging in a knowledge building class tended to ask more high-level questions. Second, through the process of idea interaction and knowledge creation, students were more likely to see collaboration as part of their learning processes. Third, they also tended to perceive learning as student-centered rather than teacher-directed. Overall, engaging students in knowledge building activities seemed to help them develop more positive perceptions towards knowledge building practices.

Learning and teaching are not independent of each other. To make a learning environment more effective, it is important to bridge the gap between them. One way to mitigate this gap is to help teachers better understand students' perceptions of class learning. Doing so is helpful for teachers to figure out how to improve their instructional processes in order to help students develop more positive and enthusiastic perceptions of learning.

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Mobile technology and CAD technology integration in teaching architectural design process for producing creative product

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The purpose of this research is to examine the effect of integrating the mobile and CAD technology on teaching architectural design process for Malaysian polytechnic architectural students in producing a creative product. The website is set up based on Caroll's minimal theory, while mobile and CAD technology integration is based on Brown and Campione's technology of learning theory. This study utilized a quasi-experimental method. Final semester students from four (4) polytechnics being used as research samples where sixty (60) students are in the treatment group and another sixty (60) students are in the control group. The final products being evaluated by the experts in architectural field using an instrument based on Creative Product Analysis Model (CPAM). The inferential statistics namely T-Test and Pearson Correlation Analysis with a significant level p = 0.01 were utilized. Research outcome shows that there is a significant difference between the treatment group product (M=79.1) and control group product (M=70.5). This research contributes to the use of real case in the development of an architectural website, in the use of mobile technology as media information sources, the use of CAD technology integration in designing process and in the construction of validated instrument which is used to evaluate creative architectural products.

Keyword: real case, mobile technology, CAD technology, design, creative product

1.0 Introduction

Architectural design is a complex and open process. Designing process starts from abstract which had a problem to be developed stage by stage until a level where it can be produced as a product. Lawson (2007) states that architectural design is a process where an architect produces space, place and building which has a big amount of effects on human life quality. This research concentrates on schematic stage of design process which involves sketching and schematic design. As a conclusion, the beginning stage of design process involves collecting the information needs in the design process and producing new ideas. Technological development nowadays, has given chances for mobile and CAD technology to be integrated in design process. Mobile technology gives chances for students to have access to the information without time and place limits. Websites referring to real cases provide opportunity to gather quick information for design process purpose. CAD technological development in three dimensional digital model and computer simulation can provide new methods for designers to find more solution in schematic design process.

1.1 The purpose of the research

The purposes of the research are to identify the interest of the student in finding informations need in the design process through web mobile or conventional method, to study the effect of integrating mobile technology at the analysis stage in the design process , to study the effect of integrating CAD technology at the synthesis stage in the design process , to study the effect of integrating CAD technology at the simulation stage in the design process, to study the effect of integrating mobile and CAD technology in producing the final product of architectural design and to see the relationship between the integration of mobile and CAD technology in the design process with the creative product of architectural design

1.2 Conceptual framework

The conceptual framework for this research was built based on Carroll's minimal theory (1995), Brown's and Campione's learning with technology theory (1996) and creative product analysis matrix model (CPAM), Besemer dan Treffingger (1981). This conceptual frame consists of two independent variables and one independent variable. Two independent variables are the use of web mobile in obtaining design's information and the use of CAD technology in creating new ideas activities whereas the independent variable is the creative product from the design process. For this research the design project programme prepared by the researcher. The web mobile for gathering information activity had been developed by the researcher based on Carroll's minimal theory (1995). The intergration of CAD technology in the design process occurred at the synthesis stage, the simulation stage and before producing final creative product. Evaluation instruments created by the researcher being used to evaluate product from analysis stage, synthesis stage and simulation stage. The final products had been evaluated using the instrument that built by researcher based on CPAM model. The products from each stage compared by researcher to study the effect of integrating mobile technology and CAD technology in design process.

2.0 Research methodology

This research consists of two main activities in the design process which is designs' information development activity and creating new ideas activity. Information searching for design purposes on web site based on real case is provided by researcher using mobile device while for creating new ideas activity, CAD technology is used. The web site used in this research developed by the researcher using Caroll's minimal theory. In applying Carroll's Minimalist theory when developing the web site the researcher follows the recommendations by Kearsley (1994) which are to allow learners to start immediately on meaningful tasks to minimize the amount of reading and other passive forms of training by allowing users to fill in the gaps themselves and to make all learning activities self-contained and independent of sequence. The web site that had been developed for this research can be referred at http://www.kajian_senireka.param.mobi. The integration of the web mobile and CAD technology in the design process for this research is based on Brown and Campione (1996) learning with technology theory. With this theory the integration should be done with the latest equipments required to get the accurate results. Through this study, researcher wants to see the differences in final product designed using mobile and CAD technology integration with the final product build using conventional method. Researcher also wants to see upon how is the effect of integrating web site based on mobile device in the design information

development activity. This is a quantitative research to study the effects of mobile and CAD technology integration in the design process to produce architectural creative product. Quasi experimental method is used to study mobile and CAD technology integration effects in design process.

2.1 Research Samples

Research has been made on final semester students of diploma architecture from four (4) polytechnics. The students have the basic skill for using ACAD 2007 and 3D Studio viz software. Research duration is for six weeks involving one hundred twenty students (120) students as research samples. In this research, research samples have been asked to design a kindergarten. Sixty (60) students from POLIPD and PMM were selected to design with the integration of mobile and CAD technology and they are used as treatment group while the other half of the students are from PUO and POLISAS perform the design process using conventional method and they are used as control group. All the four polytechnics selected are using the same curriculum for diploma in architecture which being developed by the Malaysian ministry of higher education. This research has been conducted by two lecturers from each polytechnic selected. Design process for treatment group and control group has been conducted simultaneously. Products for every activity from both of the design processes have been evaluated by selected lecturers using the research instruments provided.

3.0 Findings

The finding for this research being divided into five categories which are identifying students interest in finding design information, inferential data to compare design information created through analysis activity, inferential data to compare design product from synthesis and simulation activity and inferential data to compare final design product through conventional method compare to integrated method.

3.1 Student interest in finding information

In identifying student interest to find information needed in designing process whether it is via mobile technology based website or via conventional method, research outcomes show in Table 1.

Table 1 Descriptive statistics in finding information activity

No	Name of polytechnic	Finding information activities (Frequency)
1	POLIPD	204
2	PMM	188
	Total	392
	Mean	6.53
1	PUO	80
2	POLISAS	98
	Total	178
	Mean	2.97

This outcome clearly shows that student searching activities increased with web site integration related to real case based on mobile technology.

3.2 Comparing the product of analysis activity

This outcome comparing the quality of designs' information being created from analysis activity consists of two methods which are design information created through conventional method and design information created through integrated method. Research outcome shows in the Table 2.

Table 2 Finding on comparing design information produced in analysis activity

t-test	n	mean	s.d	t	p
Analysis Activity					
Treatment	60	81.2	5.13	18.369	0.000
Control	60	65.5	4.19		

The significant different on the product being produced in analysis activity proves that the integration of web site based on mobile technology helps the students to produce quality design information in analysis activity.

3.3 Creating new ideas in synthesis activity

In determining student skills at synthesis stage in design process with CAD integration, research has been made to decide whether students using CAD technology integration in synthesis stage has made more idea changes from two dimensional to three dimensional compared to students using conventional method in synthesis stage. The research outcomes of the synthesis activity in the design process show in Table 3.

Table 3 Finding on ideas produced in synthesis activity

No	Name of polytechnic	Conceptual diagram	Early ideas	2D to 3D
1	POLIPD	110	132	126
2	PMM	119	111	109
	Total	229	243	235
	Mean	3.82	4.05	3.92
1	PUO	69	70	61
2	POLISAS	81	80	66
	Total	150	150	127
	Mean	2.50	2.50	2.12

Research outcomes show that treatment group is actively involved in synthesis activity compared to control group.

3.4 Comparing the product of synthesis activity

The inferential finding data for synthesis activity are shown in Table 4. This inferential data will determine whether there is a significant different between the product being produced by treatment group at the synthesis stage compare to the product being produced by control group at the synthesis stage.

Table 4 T-test finding to compare mean between treatment group and control group product for synthesis activity in design process

t-test	n	mean	s.d	t	p
Synthesis Activity					
Treatment	60	80.6	3.72	17.184	0.000
Control	60	67.1	4.80		

Research outcomes show that the initial ideas being produced from integrated method better than the initial ideas being produced from conventional method.

3.5 Comparing the product of simulation activity

The inferential finding data for simulation activity are shown in Table 5. This inferential data will determine whether there is a significant different between the product being produced by treatment group at the simulation stage compare to the product being produced by control group at the simulation stage. The creative and quality product being produced at the simulation stage helps the students to produce a quality final design product.

Table 5 T-test finding to compare mean between treatment group and control group product for simulation activity in design process

t-test	n	mean	s.d	t	p
Simulation Activity					
Treatment	60	80.5	5.46	12.267	0.000
Control	60	66.9	6.68		

This outcome shows that the design idea that being produced from integrated method is better than the design idea being produced from conventional method.

3.6 Comparing the final product

In this research the creativity of the design product being determined based on CPAM model which are unique, practicality and detail. This inferential data will determine whether there is a significant different between the final product being produced by treatment group in the design process compare to the final product being produced by control group in the design process. The inferential finding data for comparing design product between treatment group and control group are shown in Table 6. This finding can prove positive effects on the

integration of mobile and CAD technology in the design process for producing creative product.

Table 6 T-test finding to compare mean between treatment group product and control group product based on CPAM model

t-test	n	mean	s.d	t	p
Unique Aspect					
Treatment	60	78.0	7.07	7.134	0.000
Control	60	68.5	7.63		
Practical Aspect					
Treatment	60	78.0	4.69	6.901	0.000
Control	60	73.1	5.97		
Detailing Aspect					
Treatment	60	81.5	4.57	11.076	0.000
Control	60	71.9	4.85		
Overall Creative Aspect					
Treatment	60	79.1	4.27	10.610	0.000
Control	60	70.5	4.61		

Overall, inferential outcomes show that there is a concrete effect on mobile and CAD technology integration in producing a creative architectural design. This research shows on how the integration of web site being built using the real case approach based on the mobile device help the students to get more design information at anytime and any place. The integration of mobile technology in the design process generates students' interests to be more active in searching design information during the design process. More design information being gathered by the students makes it easy to produce creative products. The integration of CAD technology makes it easy for the students to change their designs' ideas from two dimensional to three dimensional. Three dimensional models in the form of digital model make it easy for the students to get the overall view of the building they want to design at the early stage of the design process. CAD technology also allows the students simulate the real situation in their design process. This simulation activity makes it easy for the students to generate ideas in creating their final design products to solve the problem being given to them.

4.0 Conclusions and discussions

In this research, positive research results for mobile technology based website shows that learning approach using mobile technology can be a perfect replacement for computer based learning approach. Students and lecturer can gain benefits from easier and faster access of information sources. Mobile technology offers an ideal educational approach in providing a unique learning community based on technology. In the future, graphic resolution and screen size for mobile equipment is expected to be better build. From CAD technology design aspects, it is proven that CAD technology are able to give comfort for student to produce three dimensional digital model and also increases students understanding of space through good visual effect. This is because CAD technology enhances student creativity and it also encourage student to appreciate interior space when student are doing simulation using

different details and lighting into the same space. Student also get excited with produced space via simulation increment with different details and lighting towards their three dimensional digital model. Student understanding toward space is increased with the ability to run a simple interior animation. With the animation, student can look at the space from a different perspective. Student gives good response towards three dimensional digital model usage to produce good quality interior space design. Overall, CAD technology via three dimensional digital models helps student to produce a creative final product design. This research outcomes is also strengthen by Lawson (2007) research outcomes which states that architect Ian Ritchie has produced a creative gallery space in London Museum with the help of CAD technology integrated design. Lawson (2007) also says that the kindergarten design produced by kindergarten teachers with the help of CAD technology has higher esthetic value than the one produced by an architect using conventional method. From this research, it is concluded that CAD technology are able to help architectural student to produce a much more creative product design. CAD technology, specifically via three dimensional digital models can boost student understandings towards space while they are in designing process through the use of good visual impact.

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Adult Learners' attitudes toward web-based professional development and Internet self-efficacy in Taiwan

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Abstract: The purpose of this study was to investigate adult learners' Internet self-efficacy and attitudes toward web-based professional development. The sample consisted of 228 volunteer adult learners from a college in middle Taiwan. Two instruments, Internet self-efficacy (ISS) and attitudes toward web-based professional development (AWPD), were implemented for the investigation in this study. The results showed that the two instruments used revealed high reliability. The adult learners' Internet self-efficacy was positively related to their attitudes toward web-based professional development. In addition, adult learners of different ages or Internet experiences would express different attitudes toward web-based professional development.

Keywords: Adult learners, Internet self-efficacy, attitudes, web-based professional development

1. Introduction

Improvements in information and communication technology and the need for off-campus delivery have led to the increased use of web-based learning tools around the world. As the Internet is broadly used in the educational area, learners may have more opportunities to utilize web-based learning (Engelbrecht, 2005). The Web-based environment of learning focus on opening the access to education and training provision

for adult learners, thus freeing the adult learners from the traditional constraints of time and place (Huang, 2002). As there are more and more adult learners pursuing vocational training or lifelong learning through online programs, their characteristics in terms of web-based professional development should be highlighted by educational researchers.

Some studies have revealed that attitudes toward a new technology play an important role in its acceptance and usage (Lu, Zhou, & Wang, 2009). Over the past decade, researchers have explored learners' attitudes toward computers and the Internet (Oral, 2008; Tsai & Lin, 2004). However, comparatively fewer studies have been conducted to investigate adult learners' attitudes toward web-based learning or web-based professional development. Hence, one of the purposes of this study was to assess adult learners' attitudes toward web-based learning or web-based professional development.

Internet self-efficacy refers to learners' expectations of and confidence in using the Internet. As previous studies stated (Tsai & Tsai, 2003; Wu & Tsai, 2006), learners with higher Internet self-efficacy are most likely to succeed in web-based learning tasks. Therefore, this study also focused on gauging adult learners' Internet self-efficacy.

Hence, this study was conducted to examine adult learners' attitudes toward web-based professional development, their Internet self-efficacy, and the relationships between them. Also, the roles of age and Internet experience were investigated.

2. Method

2.1 Sample

The participants of this study were 228 volunteers from a college in middle region of Taiwan. All of them were adult learners who had registered in web-based programs to earn workforce credits or advanced degrees. 137 (60%) of them were female while the remaining 91 (40%) were male.

2.2 Instruments

To assess adult learners' Attitudes toward Web-Based Professional Development (AWPD) and Internet Self-Efficacy (ISS), two instruments were implemented in this study. The Attitudes toward Web-Based Professional Development (AWPD) was modified from Kao and Tsai (2009). As a result, the initial pool of items in the survey included a total of 27 items, which were presented by using a five-point Likert scale (ranging from 1, "strongly disagree" to 5, "strongly agree"). Five factors were designed for AWPD. The details of the five scales are as follows:

1. Perceived usefulness scale: measuring perceptions of the extent to which adult learners perceive that the impact of web-based professional development are positive and useful.
2. Perceived ease of use scale: measuring perceptions of the extent to which adult learners perceive that the web-based professional development are easy to use.
3. Affection scale: assessing perceptions of the extent to which adult learners express favorable feeling about web-based professional development.
4. Anxiety scale: assessing perceptions of the extent to which adult learners experience the anxiety about web-based professional development.
5. Behavior scale: assessing perceptions of the extent to which adult learners perceive actual practice and willingness to use web-based professional development.

The second instrument of this study, the Internet Self-efficacy Survey (ISS), was also modified from Kao and Tsai's (2009). The ISS employed in this study included two scales, and the items of the two scales were presented with bipolar strongly confident/ strongly unconfident statement on a five-point Likert scale. The details of the two scales are as follows:

1. Basic self-efficacy scale: measuring adult-learners' self confidence at a basic level of using the Internet, such as using Internet-related tools.
2. Advanced self-efficacy scale: measuring adult-learners' confidence of Internet-based interaction or advanced usages of the Internet.

2.3 Data analysis

To fulfill the main purposes of this study, the factor analysis, correlation and one-way ANOVA analyses were conducted as the statistical methods in this study. The factor analysis was utilized to reveal the scales of the instruments on the adult learners' AWPD and ISS. The correlation analysis was employed to examine the relationship between AWPD and ISS. Then through one-way ANOVA analysis, the adult learners' AWPD and ISS among different age groups and Internet experiences were compared.

3. Results

3.1 Factor analysis

To clarity the structure of the adult learners' attitudes toward web-based professional

development (AWPD), the principle component analysis was utilized as the extraction method, with the rotation method of varimax with Kasier normalization. An item was retained only when it loaded greater than 0.5 on the relevant factor and less than 0.5 on non-relevant factor. Thus, the initial 27 items were reduced to 13 items. The latest version of the AWPD consisted of 13 questionnaire items with three scales, namely, perceived usefulness, perceived ease of use, and behavior. The reliability coefficients for the three scales of the AWPD, respectively were 0.90 (perceived usefulness, 5 items), 0.88 (behavior, 4 items) and 0.73 (perceived ease of use, 4 items). The α value of the whole AWPD questionnaire is 0.84 and these factors explained 82.08 % of variance totally. Therefore, these scales are deemed to be sufficiently reliable for assessing adult learners' attitudes toward web-based professional development.

To clarify the structure of the adult learners' Internet self-efficacy, the same process of principle component analysis was utilized. As a result, the initial 16 items were reduced to 7 items, with two factors: "Basic self-efficacy (with 5 items)" and "Advanced self-efficacy (with 2 items)." 68.06 % variance was explained by these two scales. In addition, the α values for these two scales were 0.84 and 0.80, respectively, and 0.84 for the whole ISS questionnaire, indicating that these scales could be considered as adequately reliable for gauging adult learners' Internet self-efficacy.

3.2 Adult learners' scores on the scales

Adult learners' scores on three AWPD scales were all over 3 points on a five-point scale (see Table 1). They attained highest scores on the perceived ease of use scale (an average of 4.24 per item) on the 1-5 Likert measurement. Although they scored relatively low on the behavior scale, the average score (3.88 per item) was still higher than the mean of the 1-5 Likert scale (i.e. 3). The results indicated that the adult learners tended to focus more on the ease of use aspect of web-based professional development and appreciated the potential usefulness brought by web-based professional development courses. But their relatively low score on the behavior scale still implied that some of them might not be completely willing to exploit web-based professional development.

Table 1 also shows the adult learners' mean scores and the standard deviations on the ISS scales. The adult learners' had high scores on both ISS scales. They attained an average of 4.21 on basic self-efficacy scale and 4.22 on advanced self-efficacy scale. This result implied that the adult learners in this study tended to display high confidence of using the Internet for both basic and advanced purposes.

Table 1 Adult learners' scores on the scales of AWPD and ISS

Scale	Mean	SD

Attitudes toward web-based professional development		
Perceived usefulness	4.10	0.69
Perceived ease of use	4.24	0.97
Behavior	3.88	0.73
Internet self-efficacy		
Basic	4.21	0.62
Advanced	4.22	1.24

3.3 Correlation between attitudes toward web-based professional development and Internet self-efficacy

The Pearson correlation coefficients among the questionnaire scales are presented in Table 2. The relationships between the AWPD and ISS indicated that all of the variables were significantly positively correlated with each other. These results indicated that adult learners expressing high self-efficacy regarding the Internet would display more positive perceptions and frequent use toward web-based professional development. In particular, adult learners' responses on the behavioral scale were relatively highly correlated with those on the basic self-efficacy scale (r=0.50, $p<0.01$). It seemed that adult learners with higher basic self-efficacy regarding the Internet might tend to use web-based professional development more frequently.

Table 2 Correlation between the adult learners' attitudes toward web-based professional development and Internet self-efficacy

Scale	Perceived usefulness	Perceived ease of use	Behavior
Basic self-efficacy	0.30**	0.25**	0.50**
Advanced self-efficacy	0.37**	0.19**	0.38**

** $p<0.01$

3.4 The role of age groups and Internet experiences in adult learners' web-based professional development and Internet self-efficacy

In order to compare the possible differences derived from different age groups and Internet experiences, we categorized participants into three age groups (the less than 30 years group, the 31-40 years group and the more than 41 group) and seven Internet experience groups (the less than 3 hours group, the 3-6 hours group, the 6-12 hours group, the 12-18 hours group, the 18-24 hours group, the 24-30 hours group and the more than 30

hours group). The ANOVA tests followed by a series of post hoc tests (Scheffé tests) were performed. The results of these tests are presented in Table 3 and 6.

In table 3, the ANOVA test indicated that age groups played a role in adult learners' basic Internet self-efficacy and their perceived usefulness toward web-based professional development. Scores for the adult learners who are less than thirty years were higher than the corresponding scores of those who are more than forty years(F=6.01, p<0.01). Scores for adult learners who are between thirty and forty were higher than the corresponding scores of those who are less than thirty years old (F=5.29, p<0.01).

TABLE 3 Adult learners' Internet self-efficacy and attitude toward attitudes toward web-based professional development among different age groups

Age Group	(1) Less than 30 years (mean, SD)	(2) 31-40 years (mean, SD)	(3) 41+ years (mean, SD)	F(ANOVA) Scheffe Test
Basic self-efficacy	4.39(0.48)	4.18(0.64)	3.91(0.73)	6.01** (1)＞(3)
Advanced self-efficacy	6.05(1.21)	5.10(1.31)	4.91(1.41)	1.79(n.s.)
Perceived Usefulness	3.91(0.78)	4.22(0.58)	3.94(0.82)	5.29** (2)＞(1)
Behavior	5.51(0.98)	5.27(0.83)	5.30(0.74)	1.51(n.s.)
Perceived Ease of use	5.50(1.05)	5.21(1.05)	5.27(0.84)	0.61(n.s.)

** p <0.01.

In table 4, the ANOVA test indicates that Internet experience played a role in adult learners' behavior scale in their attitude toward web-based professional development. The scores for the adult learners' with Internet experience between eighteen and twenty-four hours were higher than those with less than three hours ((F=4.35, p<0.05).

TABLE 4 Adult learners' Internet self-efficacy and attitude toward web-based professional development among groups of different Internet experiences

Internet Exp.	(1) <3 hrs mean (SD)	(2) 3-6 hrs mean (SD)	(3) 6 -12 hrs mean (SD)	(4) 12 -18 hrs mean (SD)	(5) 18 -24 hrs mean (SD)	(6) 24 -30 hrs mean (SD)	(7) >30 hrs mean (SD)	F(ANOVA) Scheffe Test
Basic self-efficacy	3.57 (0.74)	4.07 (0.22)	4.25 (0.54)	4.35 (0.54)	4.43 (0.66)	4.19 (0.60)	4.36 (0.55)	1.61(n.s.)

Advanced self-efficacy	3.60 (1.07)	4.23 (0.76)	4.07 (0.71)	4.76 (2.90)	4.34 (0.76)	4.12 (0.78)	4.29 (0.60)	0.84(n.s.)
Perceived Usefulness	4.04 (0.54)	4.04 (0.85)	4.08 (0.76)	4.16 (0.59)	4.14 (0.72)	4.00 (0.66)	4.22 (0.52)	1.81(n.s.)
Behavior	3.35 (0.85)	3.83 (0.73)	3.87 (0.67)	4.06 (0.66)	4.25 (0.75)	3.84 (0.60)	3.88 (0.73)	4.35* (5) >(1)
Perceived Ease of use	3.95 (0.85)	4.19 (0.58)	4.29 (1.64)	4.30 (0.50)	4.32 (0.65)	4.12 (0.66)	4.38 (0.55)	0.01(n.s.)

* p <0.05.

4. Conclusion and Discussion

To explore adult learners' perspectives on web-based professional development, this study developed two questionnaires to assess adult learners' attitudes toward web-based professional development (AWPD) and Internet Self-efficacy (ISS). The results show that the AWPD and ISS developed in this study were deemed to be sufficiently reliable to assess the adult learners' attitudes toward web-based professional development and Internet self-efficacy. Moreover, through ANOVA analyses, the roles of adult learners' age and Internet experience were also revealed.

Adult learners in the present study scored high on perceived usefulness and ease of use scales, but relatively low on the behavior scale of web-based professional development. These results probably suggested that more things still need to be done to increase adult learners' willingness to take part in web-based learning activities. Thus, a better understanding regarding demands of adult learners and barriers faced by adult learners is needed to enable educators to have adequate planning to make web-based professional development more effective.

The mean scores of the ISS questionnaire revealed that the adult learners had both high basic Internet self-efficacy and advanced Internet self-efficacy. The AVONA tests showed that adult learners with different ages responded significantly differently on basic Internet self-efficacy and perceived usefulness scale. Adult learners with different Internet experience also displayed significantly different scores on the behavior scale of AWPD. Based on the results, the roles of age and Internet experience can be assured in adult learners' Internet self-efficacy and attitudes toward web-based professional development.

The results of this study are quite helpful to facilitate the understanding and implementation of adult learners' attitudes toward web-based professional development. By using the AWPD questionnaire, educators and researchers can assess and review adult learners' attitudes toward web-based professional development in a more effective way, with possibly higher validity. Previous studies (Donavant, 2009; Mak et al., 2001) have

described the advantages of web-based learning over traditional ways of learning for adults for their continuing education of professional development. Further study about adult continuing education could also base on the results of this study to investigate more interrelations between factors in adult learners' web-based professional development.

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The information commitments toward online financial information among Taiwanese adults

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Abstract: This paper is to utilize the Information Commitment Survey (ICS) that proposed by Wu and Tsai (2004) for investigation of participant's standard of judging online financial information, and their search strategies on the Web. The sample included 192 participants more than 24 years old in Taiwan. The results indicated that participants in this study held advanced information commitments than less sophisticated information commitments when they sought financial information online. The results revealed that searching behavior and searching strategies of participants in this study were affected by gender; namely, the female participants often more used 'Multiple sources' standard for accuracy and 'Elaboration' searching strategies than male participants. Moreover, participants with more Internet experiences tended to use 'Authority' standard for accuracy information on the Web.

Keywords: information commitments, online financial information, Taiwan

1. Introduction

Searching for information on the Web is a common activity for many hundreds of millions of people around the World. According to (Strader & Ramaswami, 2004) more and more investors are using the Web to get financial information. To understand about the information searching behavior on the Web, researchers have identified aspects of user behavior, search tasks, system capabilities, epistemological beliefs, and search outcomes as important factors in information seeking on the website (Bråten & Strømsø, 2006, Andrew, 2007; Yuelin & Nicholas, 2008). Besides, online database search experience, and task type influence users' search behavior on the Web (Kim, 2001). Many studies carried out indicated that successful learning is related to students' features such as cognitive style, preferences, learning style, information processing strategy (Yang and Tsai, 2008).

Furthermore, research in some studies has shown that perceived usefulness to the individual investor is affected most decision quality, while perceived ease of use is influenced equally by consistency and technical convenience (Lee, Chung, & Kang, 2008), other study found that web user priorities their coping strategies according to the importance of the search topic and their determination to fulfill the search successfully (Mansourian, 2007).

This study adopts the concept of 'information commitment' as a set of evaluative standards in which Web users utilize in order to assess the accuracy and usefulness of web-based materials, and these commitments are also relevant to searching strategies. Moreover, to make this study more theoretically sound and more practically robust, other variables, which have

proven academically important in influencing consumers' intention to use information technology or internet-based information systems, were added such as investment experiences, financial products and Internet usage. In this study, the crucial objective was to use the ICS to survey the group investors in Taiwan to probe their financial information commitment toward Web information. To be more specific, this paper addressed the following research questions:
(1) What are the investor's financial information commitments toward Web financial information in Taiwan?
(2) Is there significant difference between the males and females which affect financial information commitments on the website?
(3) What is the role of investment experience, and Internet experience in their information commitments?

2. Method

Participating in this survey were 192 individuals (111 males and 108 females). Participants were more than 24 years old in order to make sure adult participating. Tsai (2004) included that the first, the three information commitments, including 'Multiple sources,' 'Content' and 'Elaboration' were advanced information commitments, and the second, three others, including 'Authority,' 'Technical,' 'Match' were less sophisticated. Wu and Tsai (2005, 2007) have found that ICS is sufficiently reliable for assessing learners' information commitment toward Web information. A momentary description of the six categories is exposed below:
1. Multiple sources as correctness scale (Multiple sources*)*: such as other websites, prior knowledge, peers, or other printed materials to examine the accuracy of Web information.
2. *Authority as correctness scale (Authority)*: authority of the websites or sources as major indicator of correctness.
3. *Content as usefulness scale (Content)*: refer to the relevance of Web content.
4. *Technical issues as usefulness scale (Technical)*: refers to the functional and technical issues of the Web.
5. *Elaboration as searching strategy scale (Elaboration)*: indicates that learners may have purposefull thinking when navigative in the Web
6. *Match as searching strategy scale (Match)*: indecates theat learners may be eager to find only a few websites that contain the most fruitful and relevant information.
The questionnaire in this study included two parts: the first that is background information, such as respondent's gender, ages, working experiences, investment experiences, investing financial products (such as stock, bond, golden, option), online search financial information status, and Internet usage experiences). The second comprises 24 items of the ICS, based on a six point Likert-type scale, with anchors ranging from 'strongly agree' to 'strongly disagree'. The questionnaire was presented in Chinese and administered by paper-and-pencil survey.

3. Result

3.1 Participant's score on the ICS scales

According to Table 1, the highest score belongs to the 'Content' (an average of 4.87 per item). The lowest is 'Technical' (an average of 3.75 per item). The results indicated that participants

in this study, on average, did not agree that they often used the 'Technical' as the crucial tool to search financial information on the Web.

Table 1: Participants' scores on the ICS scales

	Mean	SD	Rank
Multiple sources	4.42	.67	3
Authority	3.98	.89	4
Content	4.87	.55	1
Technical	3.75	.70	6
Elaboration	4.49	.73	2
Match	3.96	.64	5

3.2 Gender differences on the financial information commitments

The result shows that the female participants in this study were more oriented towards using 'Multiple sources' (t-value = 2.10, $p < .01$) and 'Elaboration' (t-value = 2.73, $p < .01$) to look for information through the Internet. This finding judges that female participants often use 'Multiple sources' to estimate amount of correctness of the information. In addition, they usually use 'Elaboration' searching strategy to make sure the information they get will be the best things to fit their purpose. This behavior of female may be helping them reduce the risk which they will be taking in the future.

Table 2: Gender differences on the information commitments

	Female		Male		t-value
	Mean	SD	Mean	SD	
Multiple sources	4.53	.71	4.31	.62	2.10**
Authority	3.98	.87	3.98	.92	-.02
Content	4.90	.49	4.84	.59	.62
Technical	3.73	.73	3.76	.66	-.27
Elaboration	4.64	.65	4.34	.79	2.73**
Match	4.02	.65	3.90	.64	1.22

*$p < .05$; **$p < .01$

3.3 The role of investing behavior in financial information commitments

Results reveal that investment experiences hold crucial role in their used of 'Multiple sources' ($r = .21$, $p < .01$), 'Elaboration' ($r = .30$, $p < .01$), and there was a significant relationship between investing financial products and 'Multiple sources' ($r = .19$, $p < .05$), 'Content' ($r = -.18$, $p < .05$). The participants have more investing behavior tended to use the 'Multiple sources' like the best criteria to estimate online information and utilized the 'Elaboration'

searching strategy while they were more toward collected more information of any other sources. However, they are relatively low in terms of the correlation coefficients.

Table 3: The correlations between participants' scores on the six scales of the ICS and their investing behaviors

	Multiple sources	Authority	Content	Technical	Elaboration	Match
Investment experiences	.21**	-.14	-.04	.01	.30**	-.04
Financial products	.19*	-.00	-.18*	-.04	.79	.07

*$p < .05$; **$p < .01$

3.4 The role of Internet experience in financial information commitments

As Table 4 reveals, there was a significant relationship between online search financial information status and 'Multiple sources' ($r = .20$, $p < .05$) standard for accuracy, and 'Elaboration' ($r = .23$, $p < .01$) search strategy. In addition, there was a significant relationship between Internet usage and 'Multiple sources' ($r = -.34$, $p < .01$), 'Authority' ($r = .18$, $p < .05$), 'Elaboration' ($r = -.21$, $p < .01$) and 'Match' scales ($r = -.16$, $p < .05$). As can see from the results in Table 4, to participants have more use information on the Web, they tended to utilize 'Multiple sources' to standard for correct their information. But, within participants have more time to use internet, they tend to use 'Authority' standard for correctness financial information on the Web. However, this relationship has relatively low in these terms of correlative coefficients.

Table 4: The correlations between participants' scores on the six scales of the ICS and their Internet experiences

	Multiple sources	Authority	Content	Technical	Elaboration	Match
Search status	.20*	.02	-.04	.16	.23**	-.00
Internet usage	-.34**	.18*	.02	.01	-.21**	-.16*

*$p < .05$; **$p < .01$

4. Discussion and conclusions

This study attempted to enhance our understanding of financial information commitments on the Web. Furthermore, the results indicated that participants in this study held advanced information commitments than less sophisticated information commitments when they sought financial information online. The results revealed that searching behavior and searching strategies of participants in this study were affected by gender; namely, the female participants often more used 'Multiple sources' standard for accuracy and 'Elaboration'

searching strategies than male participants. Moreover, participants with more Internet experiences tended to use 'Authority' standard for accuracy information on the Web.
The practical implication of these findings score, those financial corporations and implications for research and practice in psychology, especially in the subfields of educational institutions, training and performance appraisal. To results can be explained with more generality, the questionnaire survey should be extended into several sorts of participant so that. Future studies are encouraged to explore the influence of the financial information commitments on the website on investor's decisions when they buy or sell financial products.

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Exploring teachers' concerns toward implementing Internet-based learning: The role of Internet self-efficacy

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Abstract: The purpose of this study was to unveil Taiwanese junior high school teachers' concerns toward the implementation of Internet-based learning with relations to their perceived Internet self-efficacy. The Stages of Concern (SoC) questionnaire and Internet Self-efficacy (ISS) Survey were utilized to assess teachers' current concerns toward Internet-based learning and their Internet self-efficacy, respectively. A total of 243 junior high school (grade 7 to grade 9) teachers in Taiwan were invited to complete the two above-mentioned instruments. The results show that, first, three distinct teacher clusters were found based on their SoC questionnaire scores via k-means clustering analysis. In addition, teachers with higher Internet self-efficacy showed their concerns toward implementing IBL on higher stages. More specifically, teachers who concerned more in the lower stages tended to possess higher basic Internet self-efficacy. However, only those who concerned more in the higher stages showed higher advanced Internet self-efficacy.

Keywords: Internet-based learning, Internet self-efficacy, stages of concern, teachers

1. Introduction

Although some studies have emphasized that teachers' attitude is one of the major factors that influence their adoption of technologies or implementation behaviors in the classroom (e.g. Sugar, Crawley, & Fine, 2004), limited research results have been reported regarding teachers' concerns toward implementation IBL in the classroom. The development of concern theory suggests that different teachers have different concerns and need different interventions. Therefore, identifying teachers' stages of concern is necessary in order to provide appropriate support and assistance to facilitate the adoption. Furthermore, the process of implementing IBL would be more effective and successful if teachers' concerns are considered and scrutinized. In addition, since the promising educational applications of IBL, more studies are needed to investigate teachers' concerns of implementing IBL. The Stages of Concern (SoC) was developed to explore the educators' and administrators' concerns of an educational innovation during the educational change process (Hall & Hord, 1977). Accordingly, the present study attempted to adopt the SoC theory to identify teachers' concerns toward IBL.

As Overbaugh and Lu (2008) pointed out, one of the determinant factors that relates to a teacher's stages of concern is his or her confidence, namely, self-efficacy in adopting an innovation. Several researchers have stressed that teachers' self-efficacy has more or less impact on their adoption or implementing related teaching practice (e.g., Lee & Tsai, 2010). In addition, only a handful of research results have explored the relationship between individuals' self-efficacy and their concerns of implementing an innovation in

educational contexts (e.g., Boz & Boz, 2010). It is implied that teachers' Internet self-efficacy may affect their concerns on usages of Internet-based learning in their implementation of Internet-based learning in the formal education. Therefore, one of the purposes in present study was to explore the relationships between teachers' Internet self-efficacy and their concerns toward implementing IBL.

In sum, the research questions in this study were as follows:

- What concerns toward implementation of IBL do the junior high teachers have?
- What are the relationships between the teachers' perceived Internet self-efficacy and their concerns toward IBL implementation?

2. Method

2.1 Participants

The sample of current study included 243 junior high school (grade 7 to grade 9) teachers in Taiwan. They came from eight different junior high schools across various demographic areas in northern and southern Taiwan and were chosen based on the percentages of the population distributions of the junior high school teachers in all city/county districts of Taiwan (Ministry of Education [MOE], 2010). Among these sample subjects, 72 (30.8%) were male and the remainder of 162 (69.2%) were female.

2.2 Instrument

The Stages of Concern (SoC) questionnaire designed by Hall, George and Rutherford (1977) was utilized to measure and understand teachers' current concerns toward Internet-based learning. Within each of the seven stages of concern, there are 5 statements, for a total of 35 items to which the participant responds. The wording of "the innovation" in each statement was replaced by the wording of "the Internet-based learning". For instance, one of the original statements "I am not concerned about the innovation (Stage 0, awareness)" was modified to "I am not concerned about the Internet-based learning". A five-point Likert scale of modified SoC questionnaire consisted of 35 items was administrated, ranging from "not true of me now" (1) to "very true of me" (5). The detailed descriptions of each stage and sample items are as follows:

- Awareness: teachers have little awareness or concern for IBL implementation.
- Informational: teachers have general or vague awareness of IBL implementation. Teachers may begin some information seeking to gain additional knowledge about IBL implementation.
- Personal: teachers' concerns are about the personal costs of implementation IBL.
- Management: teachers' concerns will focus around how to integrate the logistics of IBL into their daily jobs.
- Consequence: Teachers' concerns are mainly on the impact of the IBL on their students.
- Collaboration: teachers begin to have concerns about how they compare to their colleagues and how they can work with their fellow teachers on IBL implementation.
- Refocusing: teachers' concerns such as making adjustments, proposing alternatives and others to improve the current IBL practice.

In addition, for the further analysis and interpretations in the current study, the reverse items of the "Awareness (5 items)," "Informational (1 item)," and "Management (5 items)" scales were coded in reverse. Hence, teachers with higher scores in the above-mentioned three scales held higher awareness toward IBL (Awareness), were willing to know more about IBL implementation (Informational), and represented that they

can manage IBL-related issues well (Management). As for the "Personal," "Consequence," "Collaboration," and "Refocusing" scales, teachers with higher scores in these scales represent that they concerned more about the issues such as issue related to themselves while implementing IBL (Personal), the impacts on their students (Consequence), collaboration with others (Collaboration), and revising the current IBL practice (Refocusing).

Furthermore, in order to assess teachers' Internet self-efficacy, the second instrument, Internet Self-efficacy Survey (ISS), was utilized. The ISS was modified based on existing questionnaires (Kao & Tsai, 2009) including a total of 16 items and two scales: basic and advanced Internet self-efficacy scales. The items of each scale were presented with bipolar ranging from strongly confident (5) to strongly unconfident (1) statements on a five-point Likert scale. Teachers who scored higher in both scales of ISS represents that they perceived themselves as possessing higher basic Internet self-efficacy and advanced Internet self-efficacy. The detailed descriptions of two scales are as follows:

- Basic self-efficacy scale: measuring teachers' self-perceived confidence and abilities of operating basic Internet functions. One of the sample items in this scale is "I feel confident about searching for information on the Web using keywords'"
- Advanced self-efficacy scale: measuring teachers' self-perceived confidence to engage themselves in online interaction or advanced usage of the Internet. A sample item of this scale is "I feel confident about making payments on the Internet"

3. Results

3.1 Factor analysis

To validate SoCQ, an exploratory factor analysis with the varimax rotation method was performed to clarify its structure. An item was retained only when its factor loading was greater than 0.5. As a result, the participants' responses were grouped into six orthogonal factors, which were: "Awareness", "Personal", "Management", "Consequence", "Collaboration" and "Refocusing". Yet, "Informational" items were not grouped into the corresponding scale. The eigenvalues of each factor from the principle component analysis was larger than one and an item with a factor loading of greater than 0.50 was retained from the instrument. Therefore, the initial 35 items were reduced to 25 items. A total of 76.56% variance was explained by these six scales. The reliability coefficients for these six scales were ranging from 0.75 to 0.93 and the overall reliability coefficient was 0.86, suggesting that these scales are adequately reliable to measure teachers' concerns of implementation of IBL. Teachers attained highest score on the "Consequence" scale (M = 4.01, S.D. = 0.81), followed by "Personal" (M = 3.89, S.D. = 0.89), "Collaboration" (M = 3.83, S.D. = 0.78), "Refocusing" (M = 3.46, S.D. = 0.84), "Awareness" (M =3.45, S.D. = 1.01), and "Management" (M = 2.56, S.D. = 0.84).

To clarify the structure of ISS instrument, the same procedures and methods were used. Thus, the initial 16 items were reduced to 14 items, with two factors: "Basic self-efficacy" and "Advanced self-efficacy." A total of 64.69% variance was explained by the two scales. The reliability coefficients for these factors were 0.86 and 0.92 respectively, and the overall alpha value was 0.90, indicating that these factors were sufficiently reliable for measuring teachers' perceived Internet self-efficacy. In addition, the teachers scored highest on the "Basic self-efficacy" factor (M = 4.69, S.D. = 0.47), followed by the other factor "Advanced self-efficacy" (M = 3.66, S.D. = 1.16).

3.2 Clustering teachers' stages of concern toward Internet-based learning

On the basis of teachers' scores for SoC questionnaire, a k-means clustering analysis

method was employed to classify teachers into distinctive groups. The three-cluster solution was selected and yielded the significant distinctions in the six stages of concern among each group (F = 26.84~112.45, $p < 0.001$). As shown in Table 1, the number of participants and mean values of stages of concern toward IBL in each cluster. By comparing the mean score of each cluster with the total mean score of teachers via t-tests, the attributes of each cluster were identified.

Table 1. The clusters of teachers' SoC toward implementing IBL

Scales	Cluster 1 (Higher SoC) (n = 131) Mean (S.D.)	Cluster 2 (Lower SoC) (n = 25) Mean (S.D.)	Cluster 3 (Lowest SoC) (n = 78) Mean (S.D.)	F (ANOVA)
Awareness	3.80 (0.88) (+)	4.15 (0.79) (+)	2.64 (0.77) (-)	57.13***
Personal	4.37 (0.54) (+)	2.43 (1.08) (-)	3.56 (0.60) (-)	112.45***
Management	2.45 (0.83)	3.61 (0.73) (+)	2.40 (0.65) (-)	26.84***
Consequence	4.38 (0.52) (+)	2.55 (0.79) (-)	3.86 (0.61) (-)	108.05***
Collaboration	4.29 (0.47) (+)	3.02 (0.85) (-)	3.33 (0.66) (-)	90.34***
Refocusing	3.86 (0.60) (+)	2.76 (0.78) (-)	3.02 (0.83) (-)	48.83***

*** $p < 0.001$

Note: The sign (+) represents the mean was significant higher than total mean while the sign (-) represents the mean was significant lower than total mean.

The teachers in the cluster 1 (higher SoC) represents that their mean scores in all stages were significantly higher than the total mean scores (t = 4.62~11.06, $p < 0.001$) except the "Management" stage, which means that cluster 1 teachers expressed stronger concerns in most of the stages, particularly those higher stages such as "Consequence," "Collaboration," and "Refocusing" concerns. Next, in the cluster 2 (lower SoC), teachers' mean scores in the "Awareness," and "Management" stages were significantly higher than the total mean scores (t = 4.43, 7.20, respectively, $p < 0.001$). In addition, the mean scores in other stages including "Personal," "Consequence," "Collaboration," and "Refocusing" were significantly lower than the total mean scores (t = -9.23~ -4.49, $p < 0.001$), indicating that these teachers showed stronger concerns in the lower stages (i.e., "Awareness" and "Management"). Finally, teachers in the cluster 3 (lowest SoC), their mean scores on the each stage were significantly lower than the total mean scores (t = -9.28~ -2.12, $p < 0.05$), suggesting that the teachers in cluster 3 showed lowest concerns in all stages.

3.3 Teachers' Internet self-efficacy among different cluster groups

In this study, the relationship between teachers' stages of concern (divided into three clusters, as shown in Table 1) toward IBL and their Internet self-efficacy was explored. A series of ANOVA test analyses were employed to reveal the relationships between teachers' Internet self-efficacy and their stages of concern toward IBL. The results of the ANOVA analyses reveal that there are significant differences among the three clusters on the factors of "Basic self-efficacy" (F = 7.07, $p < 0.01$), and "Advanced self-efficacy" (F = 9.02, $p < 0.001$). A series of *post hoc* tests (Scheffe tests) were also conducted to make comparisons among the three clusters. In the scale of "Basic self-efficacy", the results indicated that teachers in cluster one (higher SoC) had a significant higher score than those in cluster three (lowest SoC) (4.76 versus 4.54, $p < 0.01$). In addition, teachers in the "lower SoC" cluster scored significant higher than those in the "lowest SoC" cluster (4.84 versus 4.54, $p < 0.05$). In the scale of "Advanced self-efficacy", the teachers in the "higher SoC" cluster also had a significantly higher score than those in the "lowest SoC" cluster

(3.89 versus 3.22, $p < 0.001$). Accordingly, teachers expressed stronger concerns in the lower stages (i.e., higher SoC and lower SoC clusters) might perceive themselves with higher basic Internet self-efficacy. Yet, only teachers showed stronger concerns in the higher stages (i.e., higher SoC cluster) might possess higher advanced Internet self-efficacy.

4. Conclusion and implication

This study aimed to explore teachers' concerns toward implementing IBL. The results show that not only it is reliable to assess junior high school teachers' concerns toward implementing IBL but also with a satisfied validity to assess and review teachers' concerns toward implementing IBL in a more effective way.

Moreover, in the current study, three distinct teacher clusters were found based on their SoC questionnaire scores. In general, teachers with higher Internet self-efficacy showed their concerns toward implementing IBL on higher stages. Furthermore, this study found teachers who concerned more in the lower stages tended to possess higher basic Internet self-efficacy. However, only those who concerned more in the higher stages showed higher advanced Internet self-efficacy. The results imply that teachers' perceived Internet self-efficacy including basic and advanced ones might influence their concerns toward IBL implementation. It is possible that the advanced Internet self-efficacy was the crucial factor to attain higher levels of concern whereas the basic Internet self-efficacy was essential for teachers to begin to familiarize IBL implementation in their classrooms.

The study was conducted using quantitative measures to reveal teachers' stages of concern toward implementing IBL, which may not be sufficient to provide more in-depth insights for explaining teachers' concerns regarding IBL implementation. Future studies might be needed to employ qualitative or mixed methods to gain a deeper understanding of teachers' concerns toward IBL implementation into their teaching practices. Moreover, the SoCQ used in this study was merely one of the dimensions of CBAM model. To acquire a better understanding of teachers' concerns toward implementing IBL, researchers are encouraged to undertake other dimensions of CBAM model such as Levels of Use (LoU) which describes the behaviors of individuals using the innovation.

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What make seniors feel more confident in learning Internet and computers? A case study

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Abstract: The purpose of this study was to investigate each aspect of the influential factors of seniors' confidence increase when learning Internet and computers. Factors included, seniors' motivation, obstacles solved due to support, and their coping strategies for obstacles when learning Internet and computers. A course was designed to support beginning-level seniors to learn knowledge and skills regarding usage of Internet and computers with teachers' and assistants' guidance. Content analysis was used to investigate each aspect of influential factors of confidence increase from the interview data. A sample of 30 middle and aged students was volunteered in this study. It is found that providing a course with content knowledge and skills that are interesting, enjoyable, useful, and sharable to seniors is important for motivating seniors, which in turns could increase their confidence. The findings also pinpointed the crucial role of assistants around students as most of them said that their increase of confidence was due to obstacles solved with the aid. In addition, asking for help was reported as one dominant coping strategy, which was used by seniors that can make them feel more confident.

Keywords: Internet and computers learning, Confidence increase, motivation, obstacles, coping strategies.

Introduction

Because of the rapid development of the Internet and communication technologies, the European committee raised a report, *Making a European Area of Lifelong Learning a Reality*, to enhance seniors' digital learning literacy [7]. Hence, seniors' abilities of operating computers and Internet to learn, communicate, and search for information are deemed as critical for life-long learners.

Most researchers have been interested in the investigation of computer self-efficacy and Internet self-efficacy [6, 13, 15]. According to Bandura [1], self-efficacy refers to a person's ability to self-assess one's capabilities of successfully performing specific tasks. Computer self-efficacy refers to the confidence one person has regarding his/her capabilities to perform various tasks using computers [5]. With the rapid growth of Internet, Internet self-efficacy has become a focus in the research field that probe a person's belief and confidence in one's Internet usage and whether he/she can successfully accomplish specific Internet tasks [14]. Actually, confidence and self-efficacy are highly related and intertwined. For instance, individual who has high computer self-efficacy would show higher confidence in specific tasks that he/she has to accomplish [5]. Studies also have been explored on related factors to confidence or self-efficacy. For instance, it is found that "confidence in one's abilities generally enhances motivation, making it a valuable asset for individuals with imperfect willpower [2]." In addition, low confidence is found to be one of many factors that inhibit students continuing learning [9]. Besides, providing computer aids to learners will improve their ability and in turn result in higher self-efficacy [5]. Even though many

studies have been explored on confidence and self-efficacy, there is still limited research aimed to explore influential factors that make learners feel more confident with a more in-depth analysis. Therefore, the objectives of this study were to:

1. Design a training course with teachers' and assistants' guidance and support.
2. Use content analysis to investigate each aspect of the influential factors of seniors' confidence increase from the interview data. Categorized factors included, seniors' motivation, obstacles solved due to support, and coping strategies for obstacles when learning Internet and computers.
3. Investigate and compare results of pretest and posttest of seniors' self-efficacy toward Internet and computers utilizing two questionnaires.

Methodology

1. Participants

A sample of 30 middle and aged students (6 males and 24 females) with an average age being 58 was volunteered in this study. They were a group of students participated in a Buddhist organization in New Taipei city in Taiwan. According to their educational background, these students graduated with a high school degree in average.

2. Course introduction, Procedure, and Data analysis

The course design in this study was a series of instructional activities specifically designed based upon findings in the literature [4] as well as the interview data for beginning-level seniors to learn how to use Internet and computers. In addition, the ratio of assistants to students was 1:3. The course was given in three sessions during an eight week period (four hour per week). Participants met at the computer training lab of the Buddhist organization and each was assigned to a personal laptop. The course was divided into three major content areas: computer basic operations (typing and organizing files), communication applications (i.e. emails and msn), and searching skills (information, music and pictures).

Interviews were conducted on the third week, the sixth week, and the eighth week. Major interview questions included, 1) Why would you like to join this course? 2) What obstacles did you confront in learning computers and Internet? 3) Do you feel more or less confidence so far and why? Each of the interview session lasted within 30 minutes.

Content analysis was used to analyze students' responses to the interview questions. Those whose responses to the corresponding question were vague and/or uncompleted would be dropped out. The coders read all of the responses first, coded important keywords, and discussed and reached consensus in categories and criteria. Their inter-coder agreements for these analyses were assessed and reported as greater than 0.80.

3. Instrument

The measures were administered at both the beginning and end of the course. The time between pretest and posttest ranged from 8 to 9 weeks. The computers self-efficacy (CSE) questionnaire, which was developed and modified by Murphy et al. [11], was implemented with a bipolar statement in a six-point Likert mode, ranging from "strongly confident" to "strongly unconfident." Our study used 12 of the original 32-item instrument developed by Murphy et al. [11]. The loadings for the scales were ranged from 0.52 to 0.91, and the overall alpha was 0.96. A sample item of the basic ISS is "I feel confident of downloading pictures and films from the Website."

The Internet self-efficacy (ISE) questionnaire was mainly modified from Liang and Wu's [8] Internet self-efficacy scale (ISS) and added new items suitable for seniors. Therefore, in this study, the questionnaire has 22 items with a 6-point Likert scale ranging from 6 (very confident) to 1 (very unconfident). This ISS included two scales: basic Internet self-efficacy and advanced Internet self-efficacy. The alpha reliability coefficients for these two scales were 0.95 and 0.94, and the total alpha of this sample was 0.95 from Liang and Wu's [8] study. A sample item of the advanced ISS is "I feel confident of writing e-mail."

Results and Discussions

1. Influential factors of confidence increase when learning computers and Internet

Those 30 percent of seniors who considered motivation as an important factor that influences their confidence increase mentioned enjoyment, interest in learning, and sharing. For instance, student #s17 said, "*When other people ask me to help, I will be happy since I know it and I am available to help.*" As for obstacles solved due to support, 33 percent of male and 42 percent of female mentioned that there is sufficient support such as a number of assistants in the course. For instance, student #s01 said, "*You teacher and assistants spent a lot of time and energy to teach us. It's pretty nice that you have patience.*" Only 10 percent of students mentioned coping strategies, such as inner-directed exploration and asking for help as their reasons of confidence increase. For instance, student #s10 said, "*I explored on my own when the teacher is teaching a topic*."

Table 1. Frequency and percentage of influential factors of confidence increase

	Motivation	Obstacles solved due to support	Using coping strategies
male	0 (0%)	2 (33%)	0 (0%)
female	9 (38%)	10 (42%)	3 (13%)
total	9 (30%)	12 (40%)	3 (10%)

Note: n=30, (male=6; female=24)

2. Motivation toward learning computers and Internet

To investigate their motivation, the interview data were examined and compared with findings in the literature [3] and finally coded into two dimensions, which are, deficiency-oriented motivation (motives from the outside environment) and growth-oriented motivation (motives from inner-self or personal desire). There were 23 percent of students mentioning that they were motivated to catch up the trend in learning computers and Internet. For instance, student #s02 said, "*Using computers is a trend. When everybody knows it, you cannot leave yourself behind.*" There were both 17 percent of students mentioning encouragement by others and usefulness recognition as their motivation to learn. For example, student #s04 indicated, "*We were encouraged by masters in this organization to learn.*" Student #s18 mentioned, "*There are many things you have to use computers to handle with, such as searching information online, etc.*"

Table 2. Frequency and percentage of motivation toward learning computers and Internet

	Deficiency-oriented				Growth-oriented	
	Encouraged by others	Catch up the trend	Seize the opportunity	Afraid to be mocked	Recognize usefulness	Desire to learn more
male	1 (17%)	0 (0%)	0 (0%)	0 (0%)	1 (17%)	1 (17%)
female	4 (17%)	7 (29%)	2 (8%)	1 (4%)	4 (17%)	0 (0%)
total	5 (17%)	7 (23%)	2 (7%)	1 (3%)	5 (17%)	1 (3%)

Note: n=30, (male=6; female=24)

3. Obstacles of learning computers and Internet

The study categorized two main aspects of obstacles faced by seniors based on interview data, which are, personal factors and contextual factors. It is found that 20 percent of seniors in this study needed to face some personal obstacles such as physical barriers. Very much similar to the previous findings [10, 12], most of seniors in this study mentioned bad memorization, slow typing, and eyes that are easily get tired. As for contextual factors, there were 17 percent of students mentioning insufficient resource, as well as instruction and assistance as obstacles they faced. For instance, student #s05 mentioned, "*We did buy computers at home, but those computers were took over by kids*." Even with the arrangement of the ratio of assistants and students as 3:1, there were 17 percent of students mentioned too many people resulted in their waiting for asking.

Table 3. Frequency and percentage of seniors' obstacles of learning computers and Internet

	Personal factors		Contextual factors	
	Physical barriers	Insufficient skills	Insufficient resource	Insufficient instruction & assistance
male	1 (17%)	1 (17%)	1 (17%)	1 (17%)
female	5 (21%)	0 (0%)	3 (13%)	4 (17%)
total	6 (20%)	1 (3%)	4 (13%)	5 (17%)

Note: n=30, (male=6; female=24)

4. Coping strategies for obstacles encountered in learning computers and Internet

Among 63 percent of students who chose to ask for help, there were 67 percent of female and 3 percent of male asked for help. Uniquely, two females among all students mentioned that they study on their own, which shows inner-directed coping strategies. For example, student #s15 said, "*Sometimes during short breaks, I will try to explore and practice by myself frequently.*"It is almost the same situation when it is out of the class.

Table 4. Frequency and percentage of seniors' coping strategies for obstacles

	In-class		Out of the class		
	Asking for help	Inner-directed	Libraries	Family	Other experts
male	3 (50%)	0 (0%)	0 (0%)	0 (0%)	2 (33%)
female	16 (67%)	2 (8%)	1 (4%)	5 (21%)	6 (25%)
total	19 (63%)	2 (7%)	1 (3%)	5 (17%)	8 (27%)

Note: n=30, (male=6; female=24)

5. Comparison among seniors' confidence increase, CSE, and ISE

After examining influential factors of confidence increase in-depth, this study further analyzed the trend of seniors' confidence change with time passing by. It is found that there were 30 percent of students described their confidence chance as low-middle-high with time change. Only 7 percent of students regarded their confidence change as decrease. This finding can be further supported by the findings as shown in Table 5. The t-test result showed that seniors perceived higher computer self-efficacy and Internet self-efficacy both on general and advanced aspects in the posttest when comparing with the pre-test.

Table 5. Pre-post comparison in seniors' responses to CSE and ISE

	Pre-test mean (S.D.)	Posttest mean (S.D)	*t*-test
CSE	3.12 (1.00)	4.35 (0.60)	-6.87**
ISE-General	3.82 (1.05)	4.42 (0.47)	-3.39**
ISE-Advanced	2.84 (1.25)	4.02 (0.58)	-5.72**

Note: *p<.05, **p<.01

Conclusions

This paper was intended to examine the influential factors of seniors' confidence increase and further query the aspects categorized from their reasons of confidence increase. It is found that most of the students who mentioned confidence increase mainly because of obstacles solved with the aid pinpointed the crucial role of assistants around them. In addition, students could be motivated when they were able to share with or help others. As a result, designing instructional strategies that provide enough assistants and opportunities for students to help each other is suggested. For instance, arranging students' sitting places based on the level of skills and knowledge may be an option for educators who have interests in teaching seniors about computers and Internet. Besides, with the encouragement of and support from outside resource, seniors seemed more likely to have confidence in learning. However, only a small proportion mentioned using coping strategies such as studying in libraries or trying and practicing on their own. It is also found that most of online learners don't know how to fight for available resource from outside [6]. As a result, teachers and assistants may encourage students to possess abilities in using active coping strategies to solve problems.

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Information commitments and Internet attitudes of nutritional science students and in-service dietitians in Taiwan

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Abstract: This study aimed to explore nutritional science students' and in-service dietitians' information commitments and Internet attitudes toward online nutritional information. The subjects were 340 nutritional science students and in-service dietitians in Taiwan. Two instruments, Information Commitments Survey (ICS) and Internet Attitude Scale (IAS), were used in this study. Results of the study showed that, although students and dietitians with more Internet experience perceived more positively toward Internet's usefulness, they tended to utilize less advanced information commitment standards and less advanced online information searching strategy. No gender difference was found in this study. Significant relations were found between information commitments and attitudes toward Internet. Finally, the in-service dietitians demonstrated more 'Technical' standard and 'Elaboration' searching strategy than did the nutritional science students.

Keywords: Information commitments, Internet attitudes, nutritional science

1. Introduction

Internet technology has become not only an integral part in our life but also used in learning of education for decades [1]. It is common that learners use the Internet to search relevant information and resources to complete their learning tasks. They have been found to use different types of searching strategies to get information from the Internet [2]. They may also set different evaluation standards to assess the accuracy and usefulness of online information [3]. Tsai proposed a theoretical framework describing Internet users' information commitments based on three dimensions: standards for accuracy, standards for usefulness and searching strategies [4]. Wu and Tsai then utilized this framework to assess students' information commitments in Web-based learning environments [3]. Their study found that students' evaluative standards of Web information had a significant effect on their information searching strategies in online learning environment. These two variables seemed to be critical factors for learning in Web-based learning environments.

In addition, Internet attitude is another important factor for online learning. Students with different Internet using experience tended to hold different attitudes toward the Internet [5]. Specifically, students with more Internet experience tended to hole more positive attitude than those with less experience. Tsai, Lin and Tsai [5] developed an instrument, the Internet Attitude Scale (IAS), to assess learners' affection, perceived usefulness, perceived control and behavior of using the Internet. Further research indicated that holding a positive attitude toward the Internet benefits for successful Internet-based learning, as it affects learners' learning motivation, interests and outcomes [6] [7].

It is also very common for future citizens to search information about health and nutrition via the Internet. People may need advanced information commitments and positive Internet attitudes in order to make reasonable judgments and decisions after reading various online nutritional information. However, very limited studies have been conducted to this issue, especially for those who are or will be dieticians. Therefore, this study tried to investigate the information commitments and internet attitudes of those who have nutritional science backgrounds, including students who majored in nutritional science (i.e. pre-service dieticians) and in-service dieticians. To be more specific, the following questions were investigated:

- What are the information commitments and Internet attitudes of nutritional science major students and dieticians?
- What is the role of Internet experience played in their information commitments and Internet attitudes?
- What are the relationships between their information commitments and Internet attitudes?

2. Methodology

2.1 Subjects

Subjects of this study were 340 volunteers, including 289 nutritional science students and 51 in-service dietitians in Taiwan.

2.2 Instruments

To assess nutritional science students' and in-service dietitians' Information commitments and Internet attitudes in web-based environments, two instruments were employed in this study. One is the Information Commitments Survey (ICS) developed by Wu and Tsai [8] and the other is the Internet Attitude Scale (IAS) developed by Tsai et al. [5].

First, ICS had three aspects: standards for accuracy, standards for usefulness and searching strategy, each of which consist two scales. Therefore, the ICS included six scales, named respectively 'multiple sources as accuracy' , 'authority as accuracy' , 'content as usefulness' , 'technical issues as usefulness' , 'elaboration as searching strategy' , and 'match as searching strategy'. All six scales were measured by a six-point Likert scale, ranging from 'strongly agree', 'agree', 'somewhat agree', 'somewhat disagree', 'disagree' to 'strongly disagree'. Overall alpha was 0.80 and these factors accounted for 65.30% of variance. Sample items of the six scales were as follows:

- Multiple sources as accuracy scale (Multiple sources): *"I will discuss with teachers or peers, and then to judge whether the nutritional information which was received from the Internet is correct."*
- Authority as accuracy scale (Authority): *"I will believe in its correctness if the nutritional information appears in government websites."*
- Content as usefulness scale (Content): *"If its content fits my searching goal, I will think the nutritional information is useful to me."*
- Technical issues as usefulness scale (Technical): *"If it does not take much time to be*

retrieved, the nutritional information is useful to me."

- Elaboration as searching strategy scale (Elaboration): *"I can use some acquired information for advanced search to find the most-fit nutritional information."*
- Match as searching strategy scale (Match): *"If I find the first relevant nutritional website, I will not search others."*

Second, the IAS had 18 items which included four subscales: perceived usefulness, affection, perceived control and behavior. All four scales were presented in a six-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. Overall alpha was 0.81 and these factors accounted for 53.81% of variance. Sample items of the four subscales were as follows:

- Perceived usefulness: "*The Internet helps me acquire relevant information I need.*"
- Affection: *"The Internet helps me acquire relevant information I need."*
- Perceived control: *"I need an experienced person nearby when I use the Internet."*
- Behavior: *"I only use the Internet at schools when told to."*

3. Results

3.1 Factor analysis

To clarify the structure, this study used the exploratory factor analysis (EFA) by principle component method as a validation for the ICS. The results of factor analysis revealed that nutritional science students' and the dieticians' responses on the instrument could be analyzed based on the six factors: 'Multiple source', 'Authority', 'Content', 'Technical', 'Elaboration' and 'Match', i.e. all six factors exactly the same as Wu and Tsai`s study [8]. The total variance of the factors was 57.65%. All eigen-values of the six factors amount were greater than one. The reliability coefficients (alpha) of the scales respectively were 0.83, 0.64, 0.71, 0.60, 0.81 and 0.67 (overall alpha is 0.79). These supported the validity and reliability of the six factor surveys as a mean to assess the subjects' nutritional information commitments.

In addition, to validate the instrument of their attitudes toward internet, this study also examined subjects' IAS scores by an EFA. The results also demonstrated good validities and reliabilities under the following four factors: 'Perceived usefulness', 'Affection', 'Perceived control' and 'Behavior', provided in Tsai, Lin and Tsai`s study [5]. The total variance explained by the factors was 58.26%. The overall reliability alpha for IAS was 0.82 and were 0.77, 0.65, 0.61 and 0.62 for subscales respectively.

3.2 Correlation between subjects' background and ICS

In this study, an interesting finding was found regarding the correlations between subjects' Internet experience and their information commitments. it was found that the students' and the dieticians' Internet experience had significantly negatively correlated with 'Multiple sources' ($r = -0.12$, $p < .05$) and 'Elaboration'($r = -0.17$, $p < .01$). This indicated that students and the dieticians with higher Internet experiences tended not to utilize advanced evaluative standards, such as 'Multiple sources' as standards for judging online nutritional information and 'Elaboration,' the advanced searching strategy, to search online nutritional information. It also found that their 'Confidence' for learning nutritional

science was negatively correlated with 'Authority' (r= - 0.14, p < .05). This indicated that, though they had high 'Confidence' for learning nutritional science, they tended not to utilize advanced standard for usefulness, such as 'Content' information commitment. However, their 'Interest' for learning nutritional science had not any significant correlation with all the ICS scales.

3.3 Correlation between subjects' background and IAS

This study also found a positive correlation between subjects' Internet experience and their Internet attitude regarding perceived usefulness. The students and in-service dieticians with higher Internet experience for learning nutritional science had higher scores in their responses on 'Perceived usefulness' of IAS (r=0.12, p < .05). This means that students and in-service dieticians with higher Internet experience tended to perceive the online nutritional information was useful. Also, it was found that their 'Confidence' for learning nutritional science was positively correlated to 'Perceived usefulness' of IAS (r=0.12, p < .05). It indicated that students and in-service dieticians with higher confidence in learning nutritional science perceived more about the usefulness of online nutritional information. However, their 'Interest' for learning nutritional science had no significant correlation with all the IAS scales.

3.4 Correlation between ICS and IAS

Table 1 shows the results of correlations between ICS and IAS scores. First, all sub-scores in IAS were significantly positive correlated with Elaboration strategy and significantly negative correlate with Match strategy. This means that the subjects with better Internet attitudes tended to use better strategies to search online information. Second, there were significantly positive correlation between all IAS sub-scores and Content score of ICS. This indicated that subjects with better Internet attitudes tended to evaluate online nutritional information's usefulness majorly by content. Third, regarding the accuracy standards, the subjects with higher usefulness and behavior scores of IAS tended to judge online nutritional information based on both multiple sources and authority. However, the ones with higher affections of Internet tended to judge information by only authority; and the ones with higher perceived control of Internet tended to use multiple sources for evaluation standards.

Table 1: The correlation between subjects' scores on the ICS and IAS (N=340)

	Multiple sources	Authority	Content	Technical	Elaboration	Match
Perceived usefulness	0.36***	0.32***	0.42***	0.21***	0.37***	-0.22***
Affection	0.08	0.13*	0.19***	0.05	0.11*	-0.25***
Perceived control	0.32***	0.07	0.21***	0.02	0.39***	-0.36***
Behavior	0.13*	0.16*	0.24***	0.01**	0.20***	-0.39***

*$p < .05$, ** $p < .01$, *** $p < .01$

3.5 Comparisons between pre-service and in-service dieticians

Comparisons between students and the dieticians in this study showed significant

differences in terms of their scores on the 'Technical' (t = -3.83, p<0.01) and 'Elaboration' (t = -3.85, p<0.01). It indicated that in-service dieticians were more oriented to use the 'Technical' standard and 'Elaboration' strategy than pre-service dieticians when searching nutritional information on the Internet. Besides, there was no significant gender difference on the scales of the ICS and IAS with all of their responses scores. This indicated that male and female students or in-service dieticians had similar on-line nutritional information commitments and the Internet attitudes.

4. Conclusion

This study used two instruments to assess nutritional science students' and in-service dietitians' information commitments and Internet attitudes. By exploratory factor analysis, the ICS and IAS are deemed to be sufficiently reliable in assessing subjects' information commitments and Internet attitudes. Liang and Tsai found that medical students with more Internet experience tended to use 'Elaboration' searching strategy while inclining towards utilizing quite 'mixed' standards for judging online information [1]. However, this study revealed that the nutritional science students' and in-service dietitians' Internet experience were negatively related to 'Multiple sources' scale and 'Elaboration' scale of the ICS, and positively related to 'Perceived usefulness' scale of the IAS. This means that respondents with more Internet experience tended to utilize less advanced standards for correctness and searching strategy, but tended to have positive Perceived usefulness about the Internet attitudes. Their confidence for learning nutritional science was negatively related to 'Authority' of the ICS, and tended to have more "Perceived usefulness" of Internet attitudes. It also found that the nutritional science students and in-service dietitians with better Internet attitudes tended to use advanced online information search strategy, to perceive Internet's usefulness majorly according to the content provided on the Internet, and to judge online nutritional information on a mix standard (based on both multiple resources and authorities). Furthermore, there were some differences regarding ICS between in-service and pre-service dietitians. That is, the in-service dietitians tended to use 'Technical' standard for usefulness and 'Elaboration' searching strategy more than did the nutritional science students. Finally, future studies can be conducted to compare the information commitments about online nutritional information and Internet attitudes between students with and without nutritional backgrounds.

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Applying Recommendation System to Facilitate Exploratory Online Learning - An Empirical Study at Graduate Level

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Abstract: Information exploration has become an essential part of exploratory learning that encourages students to acquire new knowledge and solve problems. However, conducting web search is complex and challenging, and learners may fail to acquire valuable information they really need. Recommendation systems have been proposed as a potential means to facilitate learner's web search. Nevertheless, few recommendation systems were developed to help learners obtain more suitable keywords toward a specific field. In this paper, an empirical study was conducted to examine the effectiveness of a proposed recommendation system in facilitating learners to specify keywords more precisely for searching.

Keywords: Recommendation Systems, Exploratory learning, Information searching strategies, concept association techniques

1. Introduction

With the rapid development of information technologies, World Wide Web has become an important information repository involving varieties of resources [6]. Learners often search for and collect information what they desire on the specific sites or academic databases, such as Google, Yahoo, Wikipedia, ISI Web of knowledge. These sites do not only provide alternative opportunity for learners to explore specific domain knowledge, but also build the relationship among information to form a Web of knowledge to help learners expand the scope of knowledge.

However, a number of studies showed that learners often face difficulties, such as information evaluation [4] and disorientation [5][6]. The difficulties might increase learners' cognitive load and impede their exploratory learning on the web. More specifically, they do not know how to query appropriate keywords and are unfamiliar with the specific domain. To address the difficulties above, numerous recommendation mechanisms have been proposed, such as content-based filtering [3] and collaborative filtering [1]. The former applied the Term Frequency-Inverse Document Frequency of information retrieval technique to extract important keywords from collected documents, and then recommend the suitable information based on learner's past experience. The latter used the association rule mining of data mining technique to discover the relationship among a group of learners who have similar experience, and then recommend relevant information based on collaborative filtering to help learners.

With the advantages of the two filtering mechanisms, the recommendation system with the concept association techniques was proposed by previous study [2], which demonstrated the

technique is an efficient approach to facilitating learners to exploratory learning. However, the previous study only evaluated learners' exploratory performance. There is still a lack of strong evidences to demonstrate the effect of the concept association techniques on exploratory learning. Several factors have been identified might influence learners on seeking information on the web. For example, Tasi and Tasi's study found that learners with low self-efficacy might not use high-level searching strategies [6]. In addition, Tu et al. study indicated that learners with high metacognitive skill had better searching outcome [7]. Therefore, it is necessary to understand learners' perceptions toward using the concept association techniques in exploratory learning

The purpose of this study was to supplement the findings of previous study [2]. It is similar to the previous study which focuses on the effect of the concept association techniques on learners' searching behavior. It differs from previous study, however, in the way learners' perceptions toward the techniques is evaluated. To this end, this study conducted an empirical experiment to evaluate how the concept association techniques influence learners' behaviors and perceptions of information searching.

2. Method

2.1 Participants and activity

This study conducted an experiment to investigate the effect of the concept association techniques on exploratory learning. The participants of this study were 30 graduated students in Taiwan. All of them participated in two exploratory learning activities, and each activity lasted 90 minutes. Participants had to search for information on the ISI database to perform the assigned task in two different settings. The task is open-ended questions related to the digital technologies learning domain.

2.2 Research instruments

2.2.1 The exploratory learning of two settings

The participants were asked to use database provided by ISI web of knowledge to seek information in the first exploratory learning activity. The ISI provided basic and advanced query function and also provided the refined function to re-query based on additional criteria from the searched results. Participants used these functions to search relevant information and organized collected papers to complete their reports.In the second activity, participants only used the recommendation system with concept association techniques provided by previous study [2]. The system is providing keywords recommendation function in light of the keywords identified by participants and providing the search interface made of concept map tool to assist learners in organizing information.During exploratory learning activity, participants' searching behaviors on screen were captured by Camtasia application for further analysis. After each activity, each participant was asked to fill out a questionnaire about their perceptions toward their information seeking strategies.

2.2.2 Onscreen searching behaviors

In order to better understand how learners search for information in the two different settings, the onscreen searching process were analyzed to gain in-depth behavioral

attributes. A total of six searching behavioral attributes were identified. The attributes are described in detail as follows:

- Frequency of keyword searching: The number of times keyword searches were queried by the learners to search for information.
- Number of keywords: The number of keywords shows that the number of distinct keywords that a student used to search for information. All keywords identified by a student are similar that were considered as the same keyword.
- Frequency of logical searching: This attribute indicates the number of times that learners used logical expressions to query database in light to multiple criteria.
- Frequency of repeated search: The learners may repeat using the same keyword to search for information. The frequency of repeated search reveals the number of times that the students performed such repeated searches.
- Number of papers downloaded: This attribute reveals the quantity of information that learners considered useful during searching information process.
- Number of papers cited in reports: This attribute displays the valid impact of the information seeking activity on learning as the students may have used only a small portion of the papers they found to complete their reports.

2.2.3 Questionnaire

A questionnaire was used to examine how learners perceived their information searching strategies in the two different sittings. Therefore, this study adapted the Online Information Searching Strategies Inventory (OISSI) proposed by Tsai [5] to understand the learners' perception of information searching. The questionnaire provides a well framework, and presents good validity and reliability (.91). Thus, the questionnaire is a suitable instrument to assess the learners' perceptions toward applying information searching strategies in two settings. To meet the context of this study, the questions items of OISSI were moderately revised by this study. The Cronbach's alpha value of adapted questionnaire is .913, which serve as a reliable instrument.

2.3 Data analysis

To answer the questions concerning difference of the two different setting toward exploratory learning, the method of paired t-test was used to analyze participants' responses to the questionnaire on the five parts. Furthermore, participants' exploratory learning activities were extracted searching behavioral attributes. These behavioral attributes were also analyzed with the dependent t-test to understand the difference of the two different settings. By way of t-test analysis, we gain a better understanding of how the concept association techniques might facilitate learners' information searching behaviors and searching strategies.

3. Results and discussion

3.1 Information searching behaviors

It is shown that the learners demonstrated different searching behavior in the two settings, as shown in Table 1. The learners used higher frequency of keyword searching in the recommendation setting than they did in the ISI setting ($t = -2.65$, $p < .05$). In addition, the learners significantly cited more useful information in their reports in the recommendation

setting than they did in the ISI setting (t = -3.36, p < .01). Although the frequency of logical searching behavior has no significant difference between the two settings, the behavior p value is .56 which almost approaches significant difference. It may be indicated that the learners used fewer logical searching behavior in the recommendation setting than they did in the ISI setting. There are no significant differences between the two settings for the number of keywords, frequency of repeated search and number of papers downloaded.

The results revealed that the recommendation setting with the concept association techniques may influence learners' searching behaviors. More specifically, the recommended techniques provide more appropriate keywords for learners to expand effectively their searching directions. Moreover, the techniques alleviated their cognitive overload on orchestrating different keywords to seek the correlation between different keywords. In particular, increasing rate of cited papers in their reports demonstrated that the supporting of recommendation with the concept association techniques can greatly assist them in seeking relevant papers.

Table 1. The results of information searching behaviors in the two settings

Behavioral attributes	Settings	N	Mean	SD	t-value
Frequency of keyword searching	ISI web of knowledge	30	8.87	4.41	-2.65*
	Recommendation system	30	12.53	5.78	
Number of keywords	ISI web of knowledge	30	4.33	4.16	-.73
	Recommendation system	30	5.03	3.48	
Frequency of logical searching	ISI web of knowledge	30	6.10	6.41	1.99
	Recommendation system	30	3.87	3.44	
Frequency of repeated search	ISI web of knowledge	30	1.47	2.60	1.60
	Recommendation system	30	0.73	1.08	
Number of papers downloaded	ISI web of knowledge	30	4.53	1.61	-.64
	Recommendation system	30	4.83	1.88	
Number of papers cited in reports	ISI web of knowledge	30	2.33	1.16	-3.36**
	Recommendation system	30	3.67	1.58	

*p <.05; **p< .01

3.2 Perception of information searching strategies

The learners' responses to the question items were averaged to obtain an overall understanding as shown in Table 2. The results showed that there are significant differences between the two different settings for the dimensions of system control (t= -7.01, p < .001), disorientation (t= 3.72, p < .01), problem-solving strategies (t= -2.84, p < .01), purposeful thinking (t= -7.9, p <. 001) and evaluation (t= -8.62, p < .001). However, there was no significant difference between the settings for problem solving strategies (t= -1.987, p<.05). Overall, the results reveal positive effects of using recommendation system with concept association techniques on information searching strategies. Learners intended to consider that the searching interface of the recommendation system is easier to use than the ISI setting. Moreover, they perceived their disorientation problem decrease obviously in the recommendation system setting. That is, the recommendation system can effectively alleviate their cognitive load due to suggesting the searching direction. In addition, they felt that the recommendation system help them apply the searching strategies to solve problem. It could be supposed that the recommendation system provided appropriate keywords and clear association between concepts. The learners agreed strongly that the recommendation system can facilitate self-monitoring fit for searching purpose.

The interface with concept map tool may provide visual searching history to support their searching process since they were instantly aware of what they search status for the moment. In addition, the relationships between concepts and information were represented with linking form on the concept map in which they were easy to evaluate collected papers.

Table 2. The questionnaire results of learners perceptions toward information searching

Dimensions	Settings	N	Mean	SD	t-value
System control	ISI web of knowledge	30	3.64	0.88	-7.01***
	Recommendation system	30	4.73	0.58	
Disorientation	ISI web of knowledge	30	2.85	1.07	3.72**
	Recommendation system	30	2.14	0.65	
Problem-solving strategies	ISI web of knowledge	30	4.25	0.68	-2.84**
	Recommendation system	30	4.67	0.59	
Purposeful thinking	ISI web of knowledge	30	3.07	0.69	-7.90***
	Recommendation system	30	4.71	0.72	
Evaluation	ISI web of knowledge	30	3.17	0.81	-8.62***
	Recommendation system	30	4.72	0.54	

*p <.05; **p< .01; ***p< .001

4. Conclusion

The study administrated an empirical experiment to investigate the effects of the recommendation system with concept association techniques on learners' information searching strategies and their perceptions. The results shown in this study demonstrated that the recommendation system with concept association techniques is a useful approach to facilitate learners' searching direction and expand the scope of domain knowledge. Moreover, they perceived the recommendation system can help them to reflect upon the status of their searching and solve searching difficulties in disorientation and information evaluation. However, this study was a small-scale investigation. Further work is needed to conduct a large sample to support the findings of the study. In particular, the participants of the study are graduated students. It would be interesting to see the effects of the concept association techniques on the different ages of learners.

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