An exploration of the relationship between Internet self-efficacy and sources of Internet self-efficacy among Taiwanese university students

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ABSTRACT

The present study may be regarded as a pioneering study in an attempt to probe the relationship between learners' Internet self-efficacy and their sources of Internet self-efficacy. Two questionnaires, namely Internet *Self-efficacy Survey* (ISS) and *Sources of Internet Self-efficacy Survey* (SISS) were developed. The surveys were responded by 252 voluntary undergraduate and graduate students. Through exploratory factor analysis, seven factors including *usage, sharing, communication, verification, metacognition, application,* and *learning* emerged in ISS; three factors consisting of *pre-experience, influence of others,* and *psychological and affective states* were revealed by SISS. Gender differences were further explored, indicating that while females expressed more Internet anxiety, males were more likely to be influenced by others in the Internet-based environment. Finally, through correlation and regression analysis, it was found that the factor of pre-experience could predict all the factors in ISS, while the factor of influence of others could only predict the factor of usage in ISS. It was hence inferred that users' pre-experience played a significant role, whereas the influence of others seemed to play a minor part in the development of learners' Internet self-efficacy.

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1. Introduction

Internet self-efficacy, defined as individuals' perception of their ability to use the Internet (Tsai & Tsai, 2003), has been widely investigated. As Tsai, Chuang, Liang, and Tsai (2011) suggest, most studies have used questionnaires as the means to assess users' Internet self-efficacy. For example, Tsai (2004b) developed a survey to measure students' self-efficacy about online exploration and online communication. Similar surveys have been applied to many studies (e.g., Chu & Tsai, 2009; Hong, 2006; Liang & Wu, 2010; Whitty & McLaughlin, 2007) and can hence be viewed as an effective research method when measuring participants' Internet self-efficacy. However, Internet self-efficacy may not be limited to Internet behaviors, such as searching or exploring; it is noted that users' cognitive process and metacognition should be considered (Akyol & Garrison, 2011). Most of the learners today tend to be frequent users of both computers and the Internet; therefore,

Internet self-efficacy may not simply involve using browsers or possessing searching skills. Due to the oversimplified characteristic of the surveys utilized in previous research, the current study suggests that the scales and items of Internet self-efficacy instruments be reconsidered.

Hence, the main goal of the present research is to develop two surveys investigating leaners' Internet self-efficacy and their sources of Internet self-efficacy. Then, this study aims to probe gender differences using both surveys in order to realize the possible difference between males and females. Finally, with regression analysis, the relationship between students' Internet self-efficacy and their sources of Internet self-efficacy will be further examined.

2. Theoretical framework and literature review

Most of prior studies seemed to have taken a broader view toward the evaluation of individuals' Internet self-efficacy, which may not have yielded an appropriate measure for studying learners' overall self-efficacy in the Internet-based setting. For example, Torkzadeh and van Dyke (2001) examined users' Internet self-efficacy through three factors, namely, *surfing/browsing, encryption/decryption,* and *system manipulation.* Similarly, Peng,

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Tsai, and Wu (2006) and Wu and Tsai (2006) divided Internet self-efficacy into only two types: *general Internet self-efficacy* and *communicative Internet self-efficacy*. Consequently, the present study intends to focus on not only students' behaviors, such as usage, searching, sharing, communicating and application, but also their cognitive process, such as verification and metacognition. In addition, based on the suggestion proposed by a review conducted by Tsai et al. (2011), the sources of Internet self-efficacy are also investigated in the present study.

2.1. Internet self-efficacy

Internet self-efficacy is generally considered to be the examination of learners' confidence in their general skills or knowledge of operating Internet functions or applications in the Internet-based learning environment (Tsai et al., 2011). For example, online exploration is a factor of Internet self-efficacy used to assess users' ability to navigate in the Internet-based environment (Tsai, 2004b). Without adequate basic skills, it may become difficult for students to explore higher-level Internet applications, such as those for online banking, social networking, or online games. Thus, this study at first intends to probe learners' self-efficacy in learners' fundamental usage of using the Internet.

Without doubts, many people use search engines to explore information online (Jansen & Spink, 2006). However, the results of the search may depend on searching strategies and searching skills. Resulting from the advanced technology of search engines, some may argue that searching skills do not play such an important part nowadays. However, a natural language search has not yet replaced the keyword search. Moreover, in a review conducted by Tsai et al. (2011), it is proposed that much research has adopted search tasks to predict students' learning outcomes in the Internet-based context, implying that searching may still be referred to as the most commonly implemented Internet-based activities. It is, hence, important to examine the influence of searching on students' Internet self-efficacy.

Knowledge-sharing self-efficacy has been probed in previous research (e.g., Hsu, Ju, Yen, & Chang, 2007; Van Acker, Vermeulen, Kreijns, Lutgerink, & van Buuren, 2014). However, as Boisot and Canals (2004) assert, knowledge is different from information. In contrast to knowledge-sharing, information-sharing is more likely to produce a wider variety of outcomes. In addition, most sharing behaviors on the Internet tend to provide information instead of share knowledge. Therefore, individuals' self-efficacy in sharing the information should be considered when relevant tools are developed for the evaluation of students' self-efficacy.

Without doubts, the prosperous growth of the Internet plays an important role in communication. Tsai (2004b) states that online communication constitutes one of the most important factors of the Internet self-efficacy. In fact, the purpose of communication is not only to chat or exchange information, but also to maintain a relationship. It may be observed that recent enhancement of social network sites, such as Facebook or Twitter, has been extremely helpful for this purpose (Ellison, 2007). Therefore, learners' communication behaviors, such as seeking help, collaboration, and relationship management, are regarded as one of the important factors.

Moreover, individuals are free to publish information on the Internet, so the possibility of making errors may be increased consequently (Flanagin & Metzger, 2000). Thus, users may have to manage a way to elicit information they need from a vast number of sources (Morales, García-Peñalvo, Díaz, & Seoane, 2011; Noh, 2010; Rieh, 2002). As a result, Tsai (2004a) proposes a concept of information commitment, suggesting how learners can judge the correctness, usefulness, and credibility of information based on their strategies, experience, and prior knowledge. As Bandura (1997) asserts, students may verify information through previous experience, which becomes one of the sources of self-efficacy.

Furthermore, research has shown benefits from using metacognitive tools integrated into Internet-based learning (Wadsworth, Husman, Duggan, & Pennington, 2007). Jonassen (2000) also proposes that the Internet can be viewed as a metacognitive tool to improve students' learning. In general, metacognition can be described as the knowledge and regulation of cognition (Stadtler & Bromme, 2007), which involves planning, monitoring, evaluating, and elaborating (Schraw & Moshman, 1995). White, Frederiksen, and Collins (2009) argue that to become an effective learner, one must develop various types of metacognitive knowledge and capabilities which can be gained through education. Therefore, it may become critical to explore learners' Internet self-efficacy in regard to their metacognition.

Recently, some studies have been conducted to investigate users' particular kinds of Internet self-efficacy, such as blog self-efficacy (Shang, Chen, & Hung, 2008), online shopping self-efficacy (Hill & Beatty, 2011), and self-efficacy of game usage (Davis & Lang, 2012). It may be inferred that students may acquire different levels of self-efficacy when they are confronted with assorted applications or learning activities on the Internet.

According to the aforementioned discussion, students' Internet self-efficacy may be explored from a wide variety of perspectives. However, despite the sophisticated features which may be involved in learners' self-efficacy, prior research has appeared to probe it from an overgeneralized view. Therefore, based on the literature, the current study intends to develop an instrument investigating individuals' Internet self-efficacy from multiple aspects, such as verification, metacognition, and application.

2.2. The sources of Internet self-efficacy

As suggested by Tsai et al. (2011), relatively little research was found to examine learners' self-efficacy from the initially proposed concept proposed by Bandura (1982) and Bandura (1994). Based on the theory, the sources of self-efficacy include enactive mastery experience (e.g., prior experience of success or failure), vicarious experience (e.g., modeling choice or performance similarity), verbal persuasion (e.g., feedback or credibility), and psychological and affective states (e.g., psychological arousal and moods). This study endeavors to develop a survey to measure the participants' sources of Internet self-efficacy.

2.2.1. Enactive mastery experience

According to Bandura (1994), the most effective way of instilling a strong sense of efficacy is through mastery experience, which is the authentic success in dealing with a particular situation. In other words, enactive mastery experience may be seen as the most influential source of self-efficacy because they provide the most authentic experience. Compeau, Gravill, Haggerty, and Kelley (2006) suggest that the measure of computer experience can be used to access a person's enactive mastery experience. Similarly, it may be considered that learners' enactive mastery experience can be evaluated through their prior experience in the Internet-based setting.

2.2.2. Vicarious experience

Enactive mastery experience can be seen as direct experience, whereas vicarious experience is related to indirect experience from others. Vicarious experience is defined as experience acquired by observing another competent person successfully perform a task (Bandura, 1997; Zeldin, Britner, & Pajares, 2008); consequently, it may be inferred that models can play an important role in learners' vicarious experience in the online environment.

2.2.3. Verbal persuasion

Verbal persuasion is defined as communication used to convince an individual that he/she has the capacity to perform a task (Bandura, 1986). However, it should be noted that persuasion in the Internet-based environment may not only be in the form of verbal communication, but also be text-based, graphic-based, or video-based. Therefore, when probing learners' sources of self-efficacy in the Internet-based context, researchers should be aware of the variation of the persuasion process.

2.2.4. Psychological and affective states

Psychological and affective states can effectively change individuals' self-efficacy of their capability (Zeldin et al., 2008). In the words of Bandura (2004), "people read their tension, anxiety, and depression as signs of personal deficiency" (p. 623). As a result, it is significant to put students' physiological and affective states into consideration when students' sources of self-efficacy are explored.

2.3. Research purposes

The main purpose of this study is to develop two surveys, namely Internet *Self-efficacy Survey* (ISS) and *Sources of Internet Self-efficacy Survey* (SISS) investigating leaners' Internet self-efficacy and their sources of Internet self-efficacy respectively. In addition, this study aims to investigate gender differences using both surveys in order to comprehend the possible variation existing between males and females. Finally, through regression analysis, the relationship between students' Internet self-efficacy and their sources of Internet self-efficacy will be examined.

3. Methodology

3.1. Development of the surveys

At first, the present study attempted to integrate important factors and items for exploring people's Internet self-efficacy. Based on the literature review, *Internet Self-efficacy Survey* (ISS), containing factors of usage, searching, sharing, communication, verification, metacognition, and application was implemented to probe learners' Internet self-efficacy. Please refer to Appendix A for the complete survey, and a detailed description along with a sample item regarding each factor of ISS is given below:

- *Usage*: measuring participants' confidence about general online usage, such as the basic usage of browsers and adjustment of Internet connectivity. One sample item is "I know how to use the Internet to browse the information."
- *Searching*: measuring participants' confidence about their abilities of performing searching skills online, such as the manipulation of combining keywords. One sample item is "I know how to combine several keywords to search for the information I need."
- *Sharing*: assessing participants' confidence about providing relevant information on the Internet, such as posting information. One sample item is "I know how to share my opinions on the Internet."
- *Communication*: measuring participants' confidence about interacting with other people online, such as the interaction among peers. One sample item is "I know how to contact my friends on the Internet."
- *Verification*: assessing participants' confidence about the assessment of online information, such as filtering information, and judging its correctness and credibility. One sample item is "I know how to judge whether the information is correct on the Internet."

- *Metacognition*: measuring participants' confidence in processing online information, such as the application, reflection, and regulation of their prior-knowledge when viewing/interpreting online information. One example is "I know how to elicit the unnecessary information on the Internet."
- *Application*: assessing participants' confidence about using online applications such as shopping sites, or using the Internet to solve problems engaged in learning activities. One example is "I know how to use the Internet to learn any subject that I am interested in."

In a similar way, a questionnaire named *Sources of Internet Self-efficacy Survey* (SISS), including factors of enactive mastery experience, vicarious experience, verbal persuasion, and psychological and affective states, was developed to investigate the sources of students' Internet self-efficacy. Please refer to Appendix B for the complete survey, and a detailed description and a sample item in regard to each factor of SISS are presented below:

- *Enactive mastery experience*: evaluating participants' previous experience in the Internet-based environment. One sample item is "My previous experience of using the Internet makes me feel a sense of accomplishment."
- *Vicarious experience*: probing participants' experience on whether or not they endeavor to imitate their role models. One sample item is "I have asked someone to teach me how to use the Internet."
- *Verbal persuasion*: evaluating participants' perceptions on how they are influenced through the encouragement of others. One sample item is "I learn my current Internet skills from those who are equipped with better Internet abilities."
- *Psychological and affective states*: probing participants' psychological states of using the Internet, such as nervousness and anxiety. One sample item is "It makes me nervous when I use the Internet." It should be noted that the scores for this factor were reversed. Hence, higher scores indicated more comfort and enjoyment when using the Internet.

In line with the Delphi-like method (Pill, 1971), two experts in the related field were inquired to validate the surveys. As a result, ISS consisted of seven factors with 66 items. Except for the factor of application, which had 12 items, each factor had 9 items. The factor of application included more items because it might involve more activities, such as blogging, shopping, learning, and problem-solving. On the other hand, SISS consisted of four factors with four items in each factor. Both surveys were measured on a 6-point Likert scale.

3.2. Data collection and participants

Derived from a convenience sample, 252 individuals, including 166 males and 86 females, took part in this study. All of the subjects were volunteer college students, who were aged between 18 and 53. Among all the participants, 80 students majored in engineering, 71 students majored in management, 55 students majored in liberal arts, 36 students majored in science, and 10 students were from other departments. It should be noted that the surveys were delivered on a renowned online bulletin board system for two weeks so that all the participants were confirmed to have relevant experience of using the Internet.

Gosling, Vazire, Srivastava, and John (2004) suggested that Internet samples should be more heterogeneous than traditional ones because online users could disguise themselves due to the anonymity of the Internet. However, the request of personal information, such as ID numbers or real names, may have not only violated participants' privacy but also reduced their willingness to

take part in the study. Thus, those who participated in this study were only required to provide their dates of birth, educational levels, fields of study, and personal e-mail addresses, by which basic authenticity might be verified.

3.3. Data analysis

With the statistical software of SPSS, the exploratory factor analysis was at first utilized to identify the structure of each survey. Moreover, gender differences were examined by *t*-tests. Furthermore, a correlation was applied to investigate the relationship between each factor of both surveys. Finally, a stepwise regression, in which factors of SISS were considered predicting variables while factors of ISS were seen as dependent variables, was implemented to determine the influence of each source of Internet self-efficacy on the participants' Internet self-efficacy.

4. Results

4.1. Exploratory factor analysis results of Internet Self-efficacy Survey (ISS)

An exploratory factor analysis was utilized with a principal component analysis and rotation of varimax. An item was retained only when its factor loading was greater than 0.5 on the relevant factor and less than 0.5 on the irrelevant factor. Table 1 illustrates the results of the exploratory factor analysis of the Internet Self-efficacy Survey.

The outcome of the exploratory factor analysis reduced the initial 66 items to 40 items. The Cronbach's alpha coefficients for the survey were respectively 0.80 (usage, 8 items), 0.83 (sharing, 6 items), 0.74 (communication, 4 items), 0.84 (verification, 8 items), 0.77 (metacognition, 6 items), 0.75 (application, 4 items), and 0.80 (learning, 4 items). The Cronbach's alpha of ISS was 0.92, and these factors explained 53.04% of the total variance. As a result, the survey could be considered capable of sufficiently assessing users' Internet self-efficacy.

Compared with the original survey, it was found that the factor of searching vanished while a new factor named *learning* was diverged from the factor of *application*. To be more specific, the items like "I know how to use the Internet to purchase daily necessities, such as books and clothes," "I know how to use the Internet to play online games," "I know how to use the Internet to plan a recreational itinerary," and "I know how to use the Internet to manage cyber spaces, such as blogs and social media websites" were retained in the factor of *application*. In contrast, the items such as "I know how to use the sources provided on the Internet to fix the problem I am confronted with," "I know how to use the Internet to learn any subject that I am interested in," "I know how to use the Internet to make my study more efficient," and "I know how to use the Internet to promote my study effectiveness" were relabeled as the factor of *learning*.

4.2. Exploratory factor analysis results of Sources of Internet Self-efficacy Survey (SISS)

Table 2 depicts the outcome of the exploratory factor analysis of the Sources of Internet Self-efficacy Survey (SISS). Based on the statistical result, the initial 16 items were reduced to 11 items and the original four factors were condensed to three factors. To make the instrument more comprehensible, the factor of *enactive mastery experience* was renamed as the factor of *pre-experience*. Moreover, the factors of *vicarious experience* and *verbal persuasion* were

Table 1
Results of exploratory factor analysis of Internet Self-efficacy Survey (ISS).

	1	2	3	4	5	6	7
1. Usage (α = 0.80)							
Usage 1	.575						
Usage 2	.542						
Usage 3	.549						
Usage 4	.626						
Usage 5	.637						
Usage 6	.658						
Usage 7	.644						
Usage 8	.550						
2. Sharing (α = 0.83)							
Sharing 1		.677					
Sharing 2		.753					
Sharing 3		.720					
Sharing 4		.677					
Sharing 5		.715					
Sharing 6		.538					
3. Communication (α = 0.74)							
Communication 1			.585				
Communication 2			.609				
Communication 3			.748				
Communication 4			.635				
4. Verification (α = 0.84)							
Verification 1				.682			
Verification 2				.587			
Verification 3				.654			
Verification 4				.577			
Verification 5				.610			
Verification 6				.550			
Verification 7				.731			
Verification 8				.530			
5. Metacognition (α = 0.77)							
Metacognition 1					.606		
Metacognition 2					.603		
Metacognition 3					.750		
Metacognition 4					.607		
Metacognition 5					.578		
Metacognition 6					.620		
6. Application (α = 0.75)							
Application 1						.662	
Application 2						.733	
Application 3						.736	
Application 4						.632	
7. Learning (α = 0.80)							
Learning 1							.530
Learning 2							.651
Learning 3							.824
Learning 4							.836
Eigen-value	2.54	2.29	1.49	9.61	1.97	1.74	1.57
Explained variance	6.35%	5.73%	3.73%	24.00%	4.93%	4.36%	3.92%
Total variance = 53.04%							
Overall alpha: 0.92							

Note: The items shown in Table 1 are correspondent with those revealed in Appendix A.

merged into the factor of *influence of others* because the items in both factors seemed to inquire those activities triggered by other people. For instance, vicarious experience such as "I have asked someone to teach me how to use the Internet" and verbal persuasion like "I learn my current Internet skills from those who are equipped with better Internet abilities" were both those prompted by the influence of others. Finally, the factor of *psychological and affective states* remained unchanged.

In total, 50.52% variance was explained by these three factors. The Cronbach's alpha coefficients for each factor were 0.62 (pre-experience, 5 items), 0.62 (influence of others, 4 items), and 0.72 (psychological and affective states, 2 items), showing acceptable internal consistency of the SISS.

Table 2
Results of exploratory factor analysis of Sources of Internet Self-efficacy Survey.

	Pre-experience	Influence of others	Psychological and affective states
Pre-experience (α = 0.62)			
Pre-experience 1	.626		
Pre-experience 2	.589		
Pre-experience 3	.515		
Pre-experience 4	.626		
Pre-experience 5	.520		
Influence of others (α = 0.62)			
Influence 1		.615	
Influence 2		.777	
Influence 3		.609	
Influence 4		.638	
Psychological and affective states (α = 0.74)			
Affective states 1			.858
Affective states 2			.857
Eigen-value	1.32	2.23	2.00
Explained variance	12.01%	20.31%	18.18%
Total variance = 50.52%			
Overall alpha: 0.75			

Note: The items shown in Table 2 are correspondent with those revealed in Appendix B.

Table 3
Gender differences on the factors of ISS and SISS.

	Male (n = 166)		Female (n = 86)		t	Effect size
	M	SD	M	SD		
Internet Self-efficacy Survey						
Usage	4.54	0.77	4.62	0.62	−0.82	−0.11
Sharing	4.47	0.84	4.07	0.88	3.54[**]	0.46
Communication	4.59	0.78	4.56	0.86	0.31	0.03
Verification	4.55	0.66	4.47	0.69	0.84	0.11
Metacognition	4.50	0.68	4.46	0.76	0.45	0.06
Application	4.78	0.84	4.99	0.85	−1.86	−0.25
Learning	4.64	0.74	4.62	0.81	0.17	0.03
Sources of Internet Self-efficacy Survey						
Pre-experience	4.25	0.68	4.28	0.65	−0.29	−0.05
Influence of others	4.07	0.87	3.77	0.92	2.58[*]	0.34
Psychological and affective states	4.28	1.25	4.70	1.14	−2.65[**]	−0.35

[*] p < .05.
[**] p < .01.

Table 4
Relationship between ISS and SISS.

	Pre-experience	Influence of others	Psychological and affective states
Usage	0.44[***]	0.16[*]	0.25[***]
Sharing	0.30[***]	0.03	0.10
Communication	0.25[***]	0.09	0.19[**]
Verification	0.26[***]	0.09	0.19[**]
Metacognition	0.31[***]	0.05	0.12
Application	0.22[***]	0.05	0.24[***]
Learning	0.23[***]	−0.02	0.19[**]
Internet self-efficacy[a]	0.44[***]	0.10	0.26[***]

[*] p < .05.
[**] p < .01.
[***] p < .001.
[a] The sum of seven factors.

significantly lower scores (t = −2.65, p < .01) than females in the factor of psychological and affective states. It might be proposed that female participants tended to be more anxious than male users in the Internet-based environment.

4.4. Relationship between Internet self-efficacy and the sources of Internet self-efficacy

Table 4 shows the results of correlation analysis between learners' ISS scores and SISS scores. Based on the analysis, the factor of pre-experience in SISS was found to be positively and significantly correlated with the all the factors of ISS. It might be suggested that participants' pre-experience could be a strong predictor of their Internet self-efficacy. Moreover, except for the factors of sharing and metacognition, the factor of psychological and affective states in SISS was also positively and significantly correlated with all the remaining factors of ISS. The result may have suggested that when individuals use the Internet to solve problems, communicate with others, verify information, apply software, and learn new things in the Internet-based environment, users' psychological and affective states might play a role. Finally, it was found that the factor of influence of others in SISS was only to be correlated with the factor of usage in ISS. The result suggested that students' self-efficacy in dealing with basic usage of the Internet might be related to the influence of peers or others. By and large, Internet self-efficacy was found to be mainly correlated with learners' pre-experience and their psychological and affective states.

In addition, a stepwise regression was further applied to determine the sources of Internet self-efficacy that may have significantly predicted participants' Internet self-efficacy. The outcome variables were the scores of usage, sharing, communication, verification, metacognition, application, learning, and the sum score of the Internet self-efficacy, whereas the scores derived from SISS factors were adopted as predictors. Table 5 illustrates the results of the regression analysis.

As shown in Table 5, the score of pre-experience was the only factor in SISS that could significantly predict all the factors in ISS (β = 0.20–0.41). This result may have suggested that learners' relevant experience or prior engagement in the Internet-based context could play a crucial role in their Internet self-efficacy. Furthermore, it was found that, except for the factors of sharing and metacognition, the score revealed by the factor of psychological and affective states (β = 0.16–0.23) in SISS could significantly predict all the remaining factors of ISS. Consequently, it could be inferred that learners' emotional states might play a role in their Internet self-efficacy. Finally, it was indicated that the score disclosed by the factor of influence of others in SISS could only predict the factor

4.3. Gender differences in both surveys

Table 3 describes the results of t-tests on the gender differences among factors derived from both ISS and SISS.

The analysis of the ISS showed that no significant difference was found between genders in the factors of usage, communication, verification, metacognition, application, learning, and pre-experience, which suggested that males and females may have shared similar views in regard to these factors. However, significant difference was found between genders in the factor of sharing. Male participants had significantly (t = 3.54, p < .001) higher scores than their counterparts, which may have implied that males were more confident than females when they had to share information.

Moreover, the outcome derived from SISS showed significant differences in the factor of influence of others and the factor of psychological and affective states. According to the results, males had significantly higher scores (t = 2.58, p < .05) than their counterparts in the factor of influence of others, which may have indicated that male learners were more likely to be influenced by others when compared with female students. On the other hand, males had

Table 5
Stepwise multiple regression estimates for predicting Internet self-efficacy with sources of Internet self-efficacy ($n = 252$).

Dependent variables	Predicting variables	B	S.E.	β	t	R^2
Usage	Pre-experience	0.42	0.06	0.39	6.97***	0.24
	Psychological and affective states	0.14	0.03	0.23	4.10***	
	Influence of others	0.10	0.05	0.13	2.28*	
Sharing	Pre-experience	0.39	0.08	0.30	4.97***	0.09
Communication	Pre-experience	0.29	0.07	0.24	3.91***	0.08
	Psychological and affective states	0.11	0.04	0.16	2.70**	
Verification	Pre-experience	0.24	0.06	0.24	3.94***	0.09
	Psychological and affective states	0.09	0.03	0.17	2.77**	
Metacognition	Pre-experience	0.33	0.06	0.31	5.17***	0.09
Application	Psychological and affective states	0.15	0.04	0.22	3.56***	0.09
	Pre-experience	0.26	0.08	0.20	3.33***	
Learning	Pre-experience	0.25	0.07	0.22	3.53***	0.07
	Psychological and affective states	0.10	0.04	0.17	2.70**	
Internet self-efficacy[a]	Pre-experience	0.32	0.04	0.41	7.46***	0.24
	Psychological and affective states	0.09	0.02	0.22	3.99***	

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.
[a] The sum of seven factors.

of usage in ISS. This outcome may have denoted that others' influence was likely to play a minor part in learners' Internet self-efficacy.

5. Discussion and conclusion

In summary, in an attempt to examine students' Internet self-efficacy and their sources of Internet self-efficacy, two surveys were developed by current research. Based on the exploratory factor analysis results, both surveys have displayed adequate reliability and validity. Some gender differences were shown by the results of both surveys. Most important of all, participants' pre-experience was found to play a significant role in their Internet self-efficacy.

5.1. Changes in the structure of Internet Self-efficacy Survey (ISS)

It should be noted that the exploratory factor analysis result of ISS has revealed two issues: the disappearance of the *searching* factor and the emergence of the *learning* factor. Despite the fact that Tsai et al. (2011) suggest search tasks may be regarded as the most commonly implemented Internet-based learning activities, the factor of searching is found to be removed from ISS in the current study. As a matter of fact, the advanced development of search engines may account for the decreasing importance of searching behaviors. Indeed, it has become effortless for learners to search information in the Internet-based environment nowadays. Semantic search engines enable users to use natural language to seek information, which may consequently enhance information retrieval (Fernández et al., 2011). In fact, some search engines provide assistance in refining search statements (Yee, 2001). For example, Google helps users with keyword queries by instantly presenting frequent subsequent terms (Murata, 2008). Thus, it may be understandable why the factor of searching vanished in ISS.

Furthermore, a number of items from the factor of *application* are excluded and sorted into a new factor, named *learning*, in ISS. It may be suggested that students' Internet self-efficacy of applying what they know should be seen differently from what they learn in the Internet-based setting. In other words, applications may be referred to as those leisure activities conducted on the Internet like online shopping, whereas learning, such as using the Internet to

increase study effectiveness, may be regarded as a more sophisticated progress of knowledge intakes in the Internet-based environment.

5.2. Changes in the structure of Sources of Internet Self-efficacy Survey (SISS)

According to the original theory proposed by Bandura (1982, 1994), the sources of self-efficacy include enactive mastery experience, vicarious experience, verbal persuasion, and psychological and affective state. However, based on the exploratory factor analysis result, only factors of *pre-experience* and *psychological and affective states* are retained in SISS, while the factors of *vicarious experience* and *verbal persuasion* are merged into a new factor named *influence of others*. In fact, vicarious experience may take place when people actively seek a proficient model, while verbal persuasion may be the consequence of collaboration and performance-related corrective feedback (Tsai et al., 2011). Since both vicarious experience and verbal persuasion derive from the influence of other people, it is reasonable to merge these two factors into a new factor labeled *influence of others*.

5.3. Gender differences in Internet self-efficacy and the sources of Internet self-efficacy

It is generally believed that computer-related tasks are more advantageous for males than females (Li & Kirkup, 2007). Vekiri and Chronaki (2008) also propose that males' involvement in the Internet or computers results from parents' support. Indeed, some studies (e.g., Wu & Tsai, 2006) have found that males reveal better Internet self-efficacy than females. Nonetheless, in a study reported by Chu (2010), it is pointed out that gender issues may not specifically related to sex itself, but related to the complexity of the social context. Similarly, Terlecki et al. (2011) also denote that almost as many similarities as differences are found between males and females in their gaming preferences.

In the present study, although males seem to express stronger self-efficacy than females when there is a need to share information, it is also indicated that both males and females have shared similar views regarding other perspectives of the Internet self-efficacy, such as usage, communication, verification, metacognition,

application, and learning. Most of the participants recruited by the current study are undergraduate and graduate students sharing a similar background, which may lead to a high level of homogeneity of their views on Internet self-efficacy.

Moreover, like the findings presented in previous studies (e.g., Chou, 2003; Zhang, 2005), the gender difference revealed by SISS shows that females expressed more Internet anxiety than males. Likewise, prior research has shown a variety of attitudes between males and females toward the Internet (McMillan & Morrison, 2006; Zhang, 2002). It is also indicated that males are more likely to be influenced by others in the Internet-based learning environment in the present study.

5.4. Relationship between ISS and SISS

It is worthy of noticing that the current research reveals that participants' pre-experience has a strong relationship with their Internet self-efficacy. This means that individuals' enactive mastery experience, providing authentic evidence, may be the most influential source of their Internet self-efficacy. This outcome is corresponding to the most research findings regarding the sources of self-efficacy (e.g., Bigley & Steers, 2003; Britner & Pajares, 2006) showing that the accumulation of successful experience provides the strongest source for the development of students' self-efficacy.

Furthermore, the result shows that students' psychological and affective states have a moderate relationship with their Internet self-efficacy. In general, it is believed that people make a positive evaluation when they are in a good mood and a negative evaluation when they are in a bad one (Bandura, 1997). The result is similar to the outcomes revealed in a number of studies (e.g., Lackaye, Margalit, Ziv, & Ziman, 2006; Luszczynska, Gutiérrez-Doña, & Schwarzer, 2005; Thelwell, Lane, & Weston, 2007), which have demonstrated that individuals' self-efficacy is associated with their psychological and affective states.

Finally, the study has proposed that the influence of others is relatively less related to participants' Internet self-efficacy. Only users' basic usage of the Internet can be significantly predicted by the influence of others. Some research indicates that people have increasingly become isolated because of technological changes, such as the rise of home computing and the Internet (Hampton, Goulet, & Albanesius, 2014). Turkle (2011) further states that the Internet may undermine people's interaction with others. Therefore, it may be reasonable to find that influence of others makes little contribution to students' Internet self-efficacy.

To sum up, it is suggested that students should increase their Internet experience to enhance their Internet self-efficacy, and teachers should also be aware of learners' psychological and affective states when they try to foster students' Internet self-efficacy.

5.5. Conclusions

On the basis of the review conducted by Tsai et al. (2011), most of the Internet-related research concerning self-efficacy is based on questionnaires for measuring self-efficacy. With adequate validity and reliability, the surveys developed for the present study can be helpful tools for making in-depth measurements of users' Internet self-efficacy and their sources of Internet self-efficacy. Basically, the results of the current research may be viewed as an innovative attempt to probe the relationship between learners' self-efficacy and its sources. Because of the well-established Internet-based learning environment in Taiwan (e.g., Peng, Su, Chou, & Tsai, 2009; Yang & Chen, 2007; Zhang & Hung, 2006) and its prosperous development of the Internet-related educational studies, the sample selected may represent those advanced users in the Internet-based learning environment. Hence, the surveys developed in the current study are likely to be applied in other nations or in the future cross-nation research. Moreover, it is generally conceived that males seem to be more dominant in the Internet-related tasks. Nonetheless, gender difference in Internet self-efficacy is only shown in the factor of sharing in the present study, which suggests that with appropriate arrangement of the Internet-based environment, gender differences may be gradually eliminated. Furthermore, it is revealed that pre-experience and psychological and affective states may be predictors of students' Internet self-efficacy, illustrating that instructors should be aware of the variety of experience gained by each individual and his or her emotional states. Finally, as reviewed by Tsai et al. (2011), except for some research (e.g., Francescato, Mebane, Porcelli, Attanasio, & Pulino, 2007; Francescato et al., 2006; Moneta & Kekkonen-Moneta, 2007) deliberately relating to the investigation of the sources of Internet self-efficacy, relatively few empirical studies have been conducted from the initially proposed concept of self-efficacy. Thus, the present study may be regarded as a pioneering study in an attempt to probe the relationship between learners' Internet self-efficacy and their sources of Internet self-efficacy. It is recommended that future research may be conducted utilizing the current surveys to explore the relationship among Internet self-efficacy, sources of Internet self-efficacy, and other constructs, such as conceptions of learning. Moreover, in addition to the examination of learners' self-efficacy, it may be meaningful to probe teachers' perceptions toward the use of the Internet. Similar studies (e.g., Conde, García, Rodríguez-Conde, Alier, & García-Holgado, 2014; Hernández-Ramos, Martínez-Abad, García Peñalvo, Esperanza Herrera García, & Rodríguez-Conde, 2014) may potentially abridge the gap between students' learning and teachers' instruction. Finally, the target students involved in present study are mainly selected from higher education institutions; thus, it is proposed to investigate Internet self-efficacy from different educational levels and study backgrounds.

Appendix A. Internet Self-efficacy Survey (ISS)

A.1. Usage

1. I know how to use the Internet to browse the information.
2. Although it may seem difficult to operate the functions provided on the website, I learn how to use it in a short time.
3. When confronted with any problem on the Internet, I can fix it on my own.
4. I know how to use all kinds of websites to help myself connected to the Internet.
5. Despite a different computer, I know how to connect it to the Internet.
6. I know how to browse the information on a smart phone.
7. Although the website on the smart phone version may look different from that on the computer, I know how to obtain the information via a smart phone.
8. I know how to distinguish the things that I can solve on the Internet from those cannot.

A.2. Sharing

1. I know how to share my opinions on the Internet.
2. I know how to evaluate the opinions others provide on the Internet.

3. I know how to provide the information that I know on the Internet.
4. I know how to initiate an issue for others to discuss on the Internet.
5. I know how to carry out a discussion on a certain issue with others on the Internet.
6. I know how to provide my point of view on an issue which has different perspectives from mine on the Internet.

A.3. Communication

1. I know how to contact my friends on the Internet.
2. I know how to seek assistance from others on the Internet.
3. I know how to strengthen my relationship with others on the Internet.
4. I know how to manage my friendship on the Internet.

A.4. Verification

1. I know how to judge whether the information is correct on the Internet.
2. I know how to judge whether the information is trustworthy on the Internet.
3. I know how to judge whether the information is needed on the Internet.
4. Although I am not familiar with the information provided, I know how to judge its correctness through other means on the Internet.
5. When people provide identical information on the Internet, I know how to judge its correctness on my own.
6. Based on a variety of sources, I know how to judge the correctness of the information on the Internet.
7. I know how to judge whether the information others provide is correct on the Internet.
8. I know how to judge whether the information is suitable for me on the Internet.

A.5. Metacognition

1. I am aware of the consequences of my conducts on the Internet.
2. I am not anxious when I am faced with miscellaneous information on the Internet.
3. I know how to distinguish the information that I have already known on the Internet.
4. I know how to elicit the unnecessary information on the Internet.
5. After I acquire the information, I know whether it is satisfactory for my need.
6. When I am certain of what I am looking for on the Internet, I can think of different ways to achieve my goal.

A.6. Application

1. I know how to use the Internet to purchase daily necessities, such as books and clothes.
2. I know how to use the Internet to play online games.
3. I know how to use the Internet to plan a recreational itinerary.
4. I know how to use the Internet to manage cyber spaces, such as blogs and social media websites.

A.7. Learning

1. I know how to use the sources provided on the Internet to fix the problem I am confronted with.
2. I know how to use the Internet to learn any subject that I am interested in.

3. I know how to use the Internet to make my study more efficient.
4. I know how to use the Internet to promote my study effectiveness.

Appendix B. Sources of Internet Self-efficacy Survey (SISS)

B.1. Pre-experience

1. In my previous experience of using the Internet, I did not encounter any difficulty.
2. I know how to fix the problem I encounter on the Internet.
3. I know how to accomplish a task on the Internet because I have abilities in using the Internet.
4. My previous experience of using the Internet makes me feel a sense of accomplishment.
5. Getting feedbacks from others makes me enjoy using the Internet more.

B.2. Influence of others

1. I have asked someone to teach me how to use the Internet.
2. I know someone who is good at using the Internet, and I wish to be like him someday.
3. I enjoy using the Internet with friends.
4. I learn my current Internet skills from those who are equipped with better Internet abilities.

B.3. Psychological and affective states

1. It makes me nervous when I use the Internet.
2. It makes me anxious when I am confronted with difficulty on the Internet.

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