# Web-Searching to Learn: The Role of Internet Self-Efficacy in Pre-School Educators' Conceptions and Approaches

Chia-Pin Kao
Southern Taiwan University of Science and Technology, TAIWAN

Hui-Min Chien
Center for Teacher Education, Cheng Shiu University, Kaohsiung, TAIWAN

### ABSTRACT

This study was conducted to explore the relationships between pre-school educators' conceptions of and approaches to learning by web-searching through Internet Self-efficacy. Based on data from 242 pre-school educators who had prior experience of participating in web-searching in Taiwan for path analyses, it was found in this study that conceptions of learning by web-searching play a major role in approaches to learning without Internet Self-efficacy (ISE). The results indicated that preschool educators' Internet self-efficacy was the significant moderator of their conceptions of and approaches to learning by web searching. Thus, this result suggests that improving preschool educators' ability to use the Internet as well as their use of relevant web-based tools may increase their approaches to learning by web-searching, which may in turn strengthen their learning performances in Internet-based environments.

**Keywords:** Internet self-efficacy, conceptions of learning, approaches to learning, web-based learning

## INTRODUCTION

The rapid improvements in web-based technology have led to increased application of such technology in a range of educational contexts. In the past, researchers have provided evidence of the possible benefits of utilizing technology in early year education (McKenney & Voogt, 2012; Penuel et al., 2012). As the Internet is broadly used in the educational area, preschool educators may have more opportunities to utilize web-based technology to enhance their learning effectiveness. In particular, preschool educators with web-based technology competences may use some Internet related tools to support young children's understanding (Yost & Fan, 2014). According to previous research, Internet based technology usage has been used to enhance teaching and learning in early childhood education (Blackwell et al., 2013; Hamre et al., 2012). Moreover, the literature has emphasized that early year educators' positive views of web-based technology are essential for influencing teaching

**Correspondence:** Hui-Min Chien, *Center for Teacher Education, Cheng Shiu University, Kaohsiung, Taiwan.*
✉ chm@csu.edu.tw

**State of the literature**

- Some studies suggest that early year educators' positive views of web-based technology are essential for influencing teaching practices, while the educators themselves can play an important role in supporting and extending children's experiences with web-based technology.
- While preschool educators may have more opportunities to use the Internet to search for information for their teaching, this study aims to explore their conceptions of learning and approaches to learning by web-searching in the web-based context.
- In this study, the mediating effect of Internet self-efficacy involved in the considerations of preschool educators' perceptions of learning by web-searching.

**Contribution of this paper to the literature**

- This paper analyzed how the relationship between Internet self-efficacy, conceptions of learning by web-searching and approaches to learning by web-searching may be accounted for by path analysis, which also gave the possibility to test mediator effects.
- This paper showed that Internet self-efficacy acted as mediator between conceptions of learning by web-searching and approaches to learning by web-searching and positively predicted Deep Motive and Deep Strategy.
- These results showed that the perceptions and the practices of technology usage of preschool educators are very important in that they could contribute significantly to the incorporation of the specific technologies used in preschool education.

practices, while the educators themselves can play an important role in supporting and extending children's experiences with web-based technology (McKenney & Voogt, 2012; Thorpeet al., 2015). These studies have however focused on exploring preschool educators' beliefs and practices of using technology, with few studies regarding their views or intentions to integrate technologies into early childhood education (Gialamas & Nikolopoulou, 2010; Fu, 2013; Nikolopoulou & Gialamas, 2015). This may suggest that preschool educators need refined understanding of proper ways of searching for web-based information for facilitating their teaching and learning. Thus, strengthening the importance of investigating preschool educators' conceptions of and approaches to learning by web-searching should be highlighted. Research has indicated that there is a relationship between learners' conceptions of learning and their educational backgrounds. Lin and Tsai (2013) and Gibbings, Lidstone and Bruce (2015)'studies both support this claim, based on their findings that students in different disciplines, including nursing, engineering and science, showed noticeably different conceptions of learning. Ho and Liang's (2015) study also found differences in the conceptions of learning of high school students from different curricular programs. However, the research focus on preschool teachers is still limited. Therefore, it is hypothesized in this study that preschool educators' conceptions of learning would show a relationship with the context of the learning, as suggested by Leung, Wong and Wong (2013) and López-Íñiguez and Pozo (2014). That is to say, conceptions of learning are considered to be contextually dependent, and therefore some variation is expected to be found between

general conceptions of learning and conceptions of web-searching learning. Hence, this study aims to analyze pre-school educators' conceptions of learning by web-searching.

Approaches to learning are the ways in which academic tasks are processed by learners and how they influence their learning outcomes. It is generally accepted that there are two main approaches to learning, that is, surface approaches such as rote learning, and deep approaches such as meaningful learning. These approaches have been found in engineering problem solving (Sinapuelas & Stacy, 2015), in solving applied problems (Martyn et al., 2014), and in learning in the context of online discussions (Ellis et al., 2008). The results indicate that surface approaches tend to be oriented toward engagement in the learning environment which promotes reproduction. On the other hand, deep approaches are more likely to be oriented toward achieving a real understanding of the material. Moreover, Trigwell, Ashwin and Millan (2013) have argued that the deep and surface approach constructs have essentially the same meaning regardless of the subject area, but the way they are applied to the tasks associated with particular subjects may show slight differences in their manifestation.

Some researchers have applied the concepts of conceptions of learning and approaches to learning to Internet-related situations (Ellis et al., 2008; Dong et al., 2015; Wang, Tsai & Wei, 2015). While preschool educators may have more opportunities to use the Internet to search for information for their teaching, this study aims to explore their conceptions of learning and approaches to learning by web-searching in the web-based context.

The focus of Internet self-efficacy has also been extended from real classrooms to virtual settings (Kim et al., 2013). Internet self-efficacy refers to the ability of an individual to evaluate his or her own Internet usage as well as the ability to successfully perform Internet tasks independently (Kuo et al., 2014). In the past, some studies have found that Internet self-efficacy could predict learners' learning outcomes while also helping to sustain their online learning activities (Wang, Shannon & Ross, 2013). In addition, more positive learning beliefs (Chang et al., 2014), more constructivist learning strategies (Chuang, Lin & Tsai, 2015) and more effective searching approaches (Aesaert & van Braak, 2014) are able to be developed and can be predicted as a result of having higher Internet self-efficacy. Furthermore, research has revealed that preschool teachers who feel confident in their own ability to use technology will also view positively perceptions of the use of web-based technology (Nikolopoulou & Gialamas, 2015). Consequently, Internet Self-efficacy (ISE) has become a concern for researchers who are now aiming to enhance understanding of how it operates as a mediator.

The current study was therefore conducted with the aim of exploring preschool educators' conceptions of and approaches to learning by web-searching through Internet self-efficacy. The mediating role of Internet self-efficacy in the relationship between conceptions of learning and approaches to learning by web -searching was also examined. **Figure 1** provides a path diagram which illustrates the model adopted in this research.
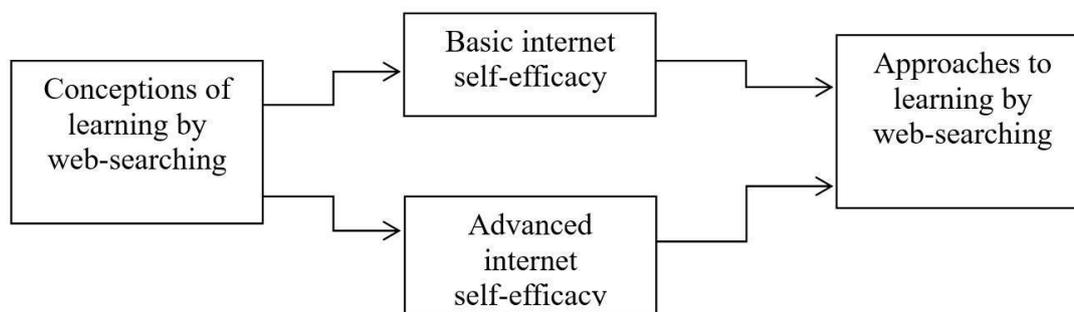
**Figure 1.** Path model depicting the relationships of ISE, conceptions of learning by web-searching and approaches to learning by web-searching

## STUDY PURPOSE

The major purpose of this study was to measure pre-school educators' perceptions of the conceptions of learning by web-searching, Internet self-efficacy and approaches to learning by web-searching. To this end, two questionnaires for assessing conceptions of learning by web-searching and approaches to learning by web-searching were developed and administered. In addition, pre-school educators' Internet self-efficacy was also examined. Then, through collecting the questionnaire responses of 242 pre-school educators in Taiwan, the research objectives outlined below were explored in this study:

1. To establish instruments for assessing pre- school educators' conceptions of learning by web-searching, Internet self-efficacy and approaches to learning by web-searching.
2. To explore the relationships of pre-school educators' conceptions of learning by web-searching and approaches to learning by web-searching.
3. To test the effect of ISE on mediating the relationship between conceptions of learning by web-searching and approaches to learning by web-searching.

## CONCEPTIONS OF LEARNING BY WEB-SEARCHING

Conceptions of learning are of interest due to the powerful influence of learners' conceptions on their learning progress, which then also affects the quality of their learning outcomes (Lin & Tsai, 2013). A study review in related literature found evidence that conceptions of learning play a potential role in students' metacognitive understanding of their own learning processes (Gonzalez, 2012). There has been much discussion of the conceptions of learning by numerous researchers in the field of education, beginning with Säljö (1979), who investigated 90 college students' learning experiences and their learning conceptualizations. His study identified five conceptions of learning categories, listed in hierarchical order as follows: (1) increase of knowledge, (2) memorizing, (3) acquisition of facts or principles, (4) abstraction of meaning, and (5) interpretive process aimed at understanding reality. Following Säljö's method, many subsequent studies continued this line of research including Tsai's (2004) study which involved 120 Taiwanese high school

students. Tsai identified two new categories in the science domain, namely "testing" and "calculating". Lin, Tsai and Liang (2012) suggested that conceptions can be viewed hierarchically, from lower level conceptions such as "Memorizing", "Testing" and "Calculating and Practicing" which reflect a reproductive view of learning, to higher level conceptions such as "Increase of knowledge," Applying," and "Understanding and "Seeing in a new way" which reflect a constructivist view of learning. This study took a constructivist view of learning in its investigation of preschool teachers' conceptions of learning via web-searching (CLWS).

## INTERNET SELF-EFFICACY

Originated from Bandura (1996), self-efficacy is a psychological concept which comprises beliefs of personal capability and expectations to accomplish a task. In the decade, the notion of Internet self-efficacy has emerged due to Internet that has been so widely used around the world. Internet self-efficacy is also often defined as a person's belief in his/her ability to use the internet to accomplish certain goals (Kuo et al., 2014). In terms of the web-based context, Internet self-efficacy has been explored in different kinds of samples such as nurses' web-based continuing learning (Chiu & Tsai, 2014), consumer online shopping intentions (Faqih, 2013), student satisfaction and performance (Kuo et al., 2014). Previous findings also indicated that the degree of the perceived self-efficacy may have an influence on whether an individual is able to locate accurate and useful information from reliable sources. For example, Chuang, Lin and Tsai (2015) reported that university students with high sources of Internet self-efficacy may have a greater chance of success in computer and Internet-related tasks. Furthermore, according to related studies, Kao, Tsai and Shih, (2014) developed self-efficacy toward web-based professional development referred to teachers' judgment of their ability to process digital information and to communicate with others by using a computer and the internet in web-based professional development. In general, in order to promote teachers' technology use in teaching and improve academic success of the students, teachers should enhance Internet self-efficacy that plays a pivotal role in their use of technology in the educational environment.

## APPROACHES TO LEARNING BY WEB SEARCHING

Oneof the earliest studies on learning approaches was conducted by Marton and Säljö (1976) followed later by Biggs (1994). Two of the most discussed learning approaches identified in these previous studies are the deep and surface approaches to learning. These approaches are associated with learners' motives and learning strategies. In the current study, approaches to learning by web- searching (ALWS) refers to the preschool teachers' behaviors of purposefully finding teaching information suitable for their requirements on the Internet. Chan and Chan (2011) found that deep approaches to learning positively correlate with the construction of online meaning and with awareness of an online community. In web-based learning contexts, this kind of web-searching has proven to be particularly beneficial for acquiring information from various websites via search engines. It has also

been found to promote active engagement and interaction by class members, and can be a platform for individualized as well as collaborative learning and the co-creation of knowledge (Sadaf, Newby & Ertmer, 2012; Greenhow, Robelia, & Hughes, 2009). Not only have these studies elaborated the learning approaches of individual learners, but they have also enabled the extension of the applicability and value of learning approaches to learning via web-searching. As such, this study focuses on the motives and strategies related to preschool teachers' deep and surface approaches to learning via web-searching.

## METHOD

The non- probability sampling technique was applied with convenience sampling to select the samples for this study. The researcher first called a number of pre-school educators to gain their permission to collect the required data. Although the convenience sampling approach was adopted, it was still possible to attain a class distribution consistent with that in the Ministry of Education database. The participants of this study can therefore be considered to reasonably represent pre-school educators in Taiwan. They were randomly selected from 30 pre-schools in the northern and southern regions of Taiwan. The final sample included 242 educators. All of them in this study had prior experience of participating in web-searching in the past five years.

### Instruments

With the aim of assessing the educators' conceptions of learning, self-efficacy and approaches to learning in the web-based environment, three instruments were implemented in this study.

### Conceptions of learning by web-searching

Conceptions of learning by web-searching (CLWS), which is based on Tsai's (2004) theoretical framework and the responses to interviews in Tsai's later work (2009), was developed specifically for this study. Upon completion of the first phase of the construction of CLWS, two experts in the field were consulted regarding the instrument's content validity. Below are presented detailed descriptions of the four categories which represent the first-order factors along with the factor labels and sample items for each factor:

1. *Increasing knowledge*: web-searching learning is considered as acquiring and accumulating knowledge, e.g., web-searching learning means acquiring knowledge that I did not know before.
2. *Applying*: web-searching learning is used to apply received knowledge, e.g., web-searching learning means learning how to apply knowledge and skills I already have to unknown problems.
3. *Understanding*: The major feature of web-searching learning is gaining a true understanding; educators focus on the ability to develop knowledge structures

which are both integrated and theoretically consistent, e.g., web-searching learning means understanding the connection between concepts.

4. *Seeing in a new wa*y: web-searching learning is considered as gaining a new perspective, while the acquisition of knowledge allows for new ways to consider natural phenomena, e.g., web-searching learning helps me view natural phenomena and topics related to nature in new ways.

These factors represent educators' CLWS as a hierarchical framework, with lower-to higher-level factors. There were four to six items for each factor, where each item was presented on a 5-point Likert-type scale, ranging from "strongly disagree" to "strongly agree." The detailed questionnaire items were posted on the website.

## Internet self-efficacy

Using Kao, Wu and Tsai's (2011) Internet self-efficacy scale as a basis, the two-dimension questionnaire was modified to have seven items (on a 5 point Likert-type scale ranging from 5, strongly confident, to 1, strongly unconfident) designed for use by adult learners. The first seven items were used to measure *Basic Internet Self-efficacy* (BISE), such as the skills needed to perform basic Internet functions (e.g., ''I am confident in handling a web browser like IE''). The second set of seven items investigated *Advanced Internet Self-efficacy* (AISE), by assessing the learners' confidence regarding utilizing the Internet as a form of communication with others (e.g., ''I am confident in the skills of posting messages in a chat room''). The detailed questionnaire items were posted on the website.

## Approaches to learning by web-searching

Based on the features of web-searching learning revealed in the teachers' interview responses in this study, the main items of Approaches to learning by web-searching (ALWS) were created by the researchers. The initial ALWS items were derived from the interview transcriptions, and the descriptions of the items on the ALWS were revised so as to focus on web-searching learning in particular. Moreover, the researchers also reviewed prior questionnaires about approaches to learning (e.g., Lee et al., 2008; Feng et al., 2011) for further suggestions of questionnaire items. Through both exploratory and confirmatory factor analysis consisting of four factors (i.e., deep motive, deep strategy, surface motive, and surface strategy). The former two factors represent deep approaches, while the latter two characterize surface approaches. The original ALWS comprised five to seven items for each factor that were presented as bipolar always/never statements using a five-point Likert-type scale. In this study, the content validity and the back-translation of the questionnaire were evaluated, approved and verified by two experts. The detailed questionnaire items were posted on the website. A description of each factor with sample items is presented below:

1. *Deep motive*: the educator has a deep motive (e.g., intrinsic interest) to web-search. A sample item is "I work hard at learning online because I find the material interesting."

2. *Deep strategy:* the educator uses deep strategies (e.g., maximizing meaning) to web-search. A sample item is "I try to relate new material to what I already know about the topic when I am learning online."

3. *Surface motive*: the educator has a surface motive (e.g., fear of failure) to web-search. A sample item is "I want to get a good score in learning online so that I can get a better job in the future."

4. *Surface strategy:* the educator adopts surface strategies (e.g., a narrow target or rote learning) for web-searching. A sample item is "I generally restrict my study to what is specially set as I think it is unnecessary to do anything extra in learning online."

## RESULTS

According to the aims of this study, exploratory factor analyses, ANOVA and path analysis were conducted. The exploratory factor analyses were carried out so as to identify the scales of the instruments for educators' CLWS, ISE and LAWS. In addition, structural equation modeling and path analysis were carried out to examine the relationships between CLWS, ISE and LAWS.

### Exploratory factor analyses

To clarify the structure of educators' conceptions of learning by web-searching (CLWS), principal component analysis was performed for the data extraction, using the rotation method of varimax with Kaiser normalization. Only items which loaded higher than 0.5 on the relevant factor and less than 0.5 on non-relevant factors were retained. The factor loadings for retained items are presented in **Table 1**. The latest version of the CLWS consisted of 20 questionnaire items with four scales, and the reliability coefficients for each scale of the CLWS respectively were 0.833, 0.805, 0.838 and 0.882. The overall alpha value of the CLWS questionnaire is 0.939, with the factors explaining 62.59% of total variance. It is therefore considered that these scales were sufficiently reliable to be used to assess the educators' conceptions of learning by web-searching.

In addition, the aforementioned method was adopted to clarify the structure of the Internet self-efficacy scale. The revised scale consisted of 16 items grouped into two factors, and the factor loadings for each of the items are listed in **Table 2**. The alpha values of the scales were 0.859 and 0.867. The overall alpha value was 0.844 and, in total, 58.272% variance was explained by these two scales. It is therefore considered that these scales could satisfy the statistical requirements and were adequately reliable for use in assessing the educators' Internet Self-efficacy.

**Table 1.** EFA results summary of the conceptions of learning by web-searching scales

| Scale | Item | M | SD | EFA (Exploratory factor analyses) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Factor loading | Eigenvalue | Variance explained | Cronbach's α |
| Increasing knowledge | K1 | 4.45 | 0.58 | 0.722 | 2.760 | 13.798 | 0.833 |
| | K2 | 4.38 | 0.58 | 0.695 | | | |
| | K3 | 4.46 | 0.56 | 0.682 | | | |
| | K4 | 4.39 | 0.56 | 0.609 | | | |
| | K5 | 4.46 | 0.56 | 0.545 | | | |
| | K6 | 4.42 | 0.58 | 0.484 | | | |
| Applying | A1 | 4.40 | 0.62 | 0.525 | 3.078 | 15.392 | 0.805 |
| | A2 | 4.41 | 0.59 | 0.470 | | | |
| | A3 | 4.23 | 0.78 | 0.630 | | | |
| | A4 | 4.34 | 0.61 | 0.628 | | | |
| | A5 | 4.37 | 0.60 | 0.589 | | | |
| Understanding | U1 | 4.36 | 0.56 | 0.805 | 3.007 | 15.036 | 0.838 |
| | U2 | 4.36 | 0.60 | 0.590 | | | |
| | U3 | 4.40 | 0.62 | 0.686 | | | |
| | U4 | 4.42 | 0.57 | 0.484 | | | |
| | U5 | 4.35 | 0.59 | 0.540 | | | |
| Seeing in a new way | N1 | 4.32 | 0.61 | 0.742 | 3.673 | 18.366 | 0.882 |
| | N2 | 4.30 | 0.60 | 0.765 | | | |
| | N3 | 4.33 | 0.61 | 0.774 | | | |
| | N4 | 4.36 | 0.62 | 0.767 | | | |

**Table 2.** A summary of the EFA results for the Internet Self-efficacy scales

| Scale | Item | M | SD | EFA (Exploratory factor analyses) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Factor loading | Eigenvalue | Variance explained | Cronbach's α |
| Basic | B1 | 4.51 | 0.59 | 0.701 | 4.126 | 29.469 | 0.859 |
| | B2 | 4.46 | 0.61 | 0.822 | | | |
| | B3 | 4.50 | 0.60 | 0.727 | | | |
| | B4 | 4.47 | 0.61 | 0.774 | | | |
| | B5 | 4.45 | 0.68 | 0.719 | | | |
| | B6 | 4.42 | 0.65 | 0.711 | | | |
| | B7 | 4.46 | 0.63 | 0.630 | | | |
| Advanced | A1 | 4.37 | 0.68 | 0.513 | 4.032 | 28.803 | 0.867 |
| | A2 | 4.14 | 0.96 | 0.736 | | | |
| | A3 | 4.00 | 1.01 | 0.812 | | | |
| | A4 | 4.01 | 1.02 | 0.789 | | | |
| | A5 | 3.85 | 1.09 | 0.695 | | | |
| | A6 | 3.41 | 1.27 | 0.783 | | | |
| | A7 | 3.55 | 1.23 | 0.822 | | | |

Similarly, based on the factor analysis, the revised version of the LAWS consisted of 22 items in five scales. The reliability coefficients for the scales respectively were 0.854 (Deep_Motive, 7 items), 0.875 (Deep_Strategy, 5 items), 0.91 (Surface_Motive, 5 items) and 0.878 (Surface_ Strategy, 5 items). The factor loadings for those items that were retained are listed in Table 3. The alpha value of the whole LAWS questionnaire is 0.841, and these scales explained 60.728% of total variance. These scales can thus be considered as being adequately reliable for the assessment of educators' approaches to learning by web-searching.

**Table 3.** EFA results summary of the approaches to learning by web-searching scales

| Scale | Item | M | SD | EFA (Exploratory factor analyses) | | | |
|-------|------|---|----|-------------------|------------|----------------------|-------------|
| | | | | Factor loading | Eigenvalue | Variance explained | Cronbach's α |
| Deep Motive | DM1 | 4.26 | 0.63 | 0.760 | 3.320 | 15.096 | 0.854 |
| | DM2 | 4.25 | 0.59 | 0.699 | | | |
| | DM3 | 4.25 | 0.64 | 0.763 | | | |
| | DM4 | 4.17 | 0.64 | 0.727 | | | |
| | DM5 | 4.18 | 0.71 | 0.609 | | | |
| | DM6 | 3.99 | 0.76 | 0.559 | | | |
| | DM7 | 4.18 | 0.66 | 0.600 | | | |
| Deep Strategy | DS1 | 4.22 | 0.63 | 0.728 | 4.154 | 18.880 | 0.875 |
| | DS2 | 4.22 | 0.65 | 0.594 | | | |
| | DS3 | 4.25 | 0.69 | 0.784 | | | |
| | DS4 | 4.20 | 0.68 | 0.794 | | | |
| | DS5 | 4.16 | 0.68 | 0.757 | | | |
| Surface Motive | SM1 | 3.06 | 1.21 | 0.564 | 2.418 | 10.989 | 0.701 |
| | SM2 | 3.92 | 0.93 | 0.786 | | | |
| | SM3 | 3.75 | 1.07 | 0.699 | | | |
| | SM4 | 4.21 | 0.69 | 0.617 | | | |
| | SM5 | 4.14 | 0.71 | 0.635 | | | |
| Surface Strategy | SS1 | 2.46 | 1.09 | 0.631 | 3.469 | 15.766 | 0.878 |
| | SS2 | 2.86 | 1.22 | 0.889 | | | |
| | SS3 | 3.08 | 1.19 | 0.851 | | | |
| | SS4 | 2.99 | 1.25 | 0.876 | | | |
| | SS5 | 3.31 | 1.12 | 0.798 | | | |

## SEM results for the relationship between CLWS and LAWS

As it is possible to use LISREL analysis for the proposed structural relationships between variables (Kelloway, 1998), SEM analysis was applied to the responses of all participants to the revised questionnaire. The testing model was developed according to analysis of the correlations between CLWS and LAWS. The measurement models of CLWS and LAWS were also examined through ISE, as reported later.

SEM analysis was performed to test the proposed model. This study proceeded to evaluate overall model fit and analyze the hypotheses. In assessing overall model fit, the goodness-of-fit indices indicated an acceptable fit of the model with the data ($\chi 2= 305.56$, d.f.

**Table 4.** CLWS and LAWS SEM results

| Parameter estimates for structural model | | |
|---|---|---|
| **Model** | **Parameter estimates** | ***t*-value** |
| Knowledge → Deep Motive | 0.108 | 1.903 |
| Knowledge → Deep Strategy | 0.143* | 2.435 |
| Knowledge → Surface Motive | -0.058 | -0.752 |
| Knowledge → Surface Strategy | -0.117*** | -1.488 |
| Applying → Deep Motive | 0.196** | 3.279 |
| Applying → Deep Strategy | 0.085 | 1.374 |
| Applying → Surface Motive | 0.118 | 1.460 |
| Applying → Surface Strategy | -0.012 | -0.149 |
| Understanding → Deep Motive | 0.111 | 1.824 |
| Understanding → Deep Strategy | 0.051 | 0.815 |
| Understanding → Surface Motive | 0.055 | 0.666 |
| Understanding → Surface Strategy | -0.014 | -0.163 |
| New way → Deep Motive | 0.284*** | 4.851 |
| New way → Deep Strategy | 0.345*** | 5.679 |
| New way → Surface Motive | 0.157* | 1.991 |
| New way → Surface Strategy | 0.079 | 0.973 |

= 95, CFI = .95, GFI = .90, NFI = .93, NNFI = .93, RMSEA = .08, SRMR =.04). According to Browne and Cudeck (1993), an RMSEA below .05 indicates good fit, but values as high as .08 may be acceptable.

**Table 4** summarizes the model parameter estimates (completed standard coefficients) and t-values. These results illustrate that CLWS mostly influenced LAWS. It should be particularly noted that 'Seeing in a new way' had significant positive effects on 'Deep Motive,' 'Deep Strategy' and 'Surface Motive' but not on 'Surface Strategy.' Moreover, it was found that 'Deep Motive' and 'Deep Strategy' were statistically positively affected by three of the CLWS factors, while 'understanding' had no effect on any of the LAWS factors.

## Path Analysis

A path analysis was performed in order to investigate whether the mediator variable significantly carried the influence of the independent variable to the dependent variable (Sobel, 1982). Some of the variables in the path analysis appeared to have both direct and indirect (mediator) effects. In order to test the significance of the mediator effects, as shown in **Figure 2**, analysis was performed for the following parameters:

- Increasing knowledge → Basic ISE→ Deep Strategy showed a significant mediator effect (β=0.1798, p < .01**) indicating partial mediation (due to the significant path between Increasing knowledge and Deep Strategy).

- Applying → Advanced ISE→ Deep Motive showed a significant mediator effect (β=0.2701, p < .001***) indicating partial mediation (due to the significant path between Applying and Deep Motive).
- Seeing in a new way → Basic ISE→ Deep Strategy showed a significant mediator effect (β=0.3739, p < .001***) indicating partial mediation (due to the significant path between Seeing in a new way and Deep Strategy).

Taken together, the path tests support the direct and indirect (mediator) effects shown in the path analysis (**Figure 2**), and the knowledge accounted for 0.143 of Deep Strategy. Applying also accounted for 0.196 of Deep Motive and New Way accounted for 0.345 of Deep Motive variances. However, the indirect meditational test results suggest that Knowledge predicted greater Deep Strategy through Basic ISE (β=0.1798, p < .01**). Applying also indirectly predicted Deep Motive through Advanced ISE (β=0.2701, p < .001***) and New Way predicted greater Deep Strategy through Basic ISE (β=0.3739, p< .001***). Nevertheless, there was no reason to test Basic ISE and Advanced ISE as mediators between CLWS and surface motive and strategy approach. These deep approaches may
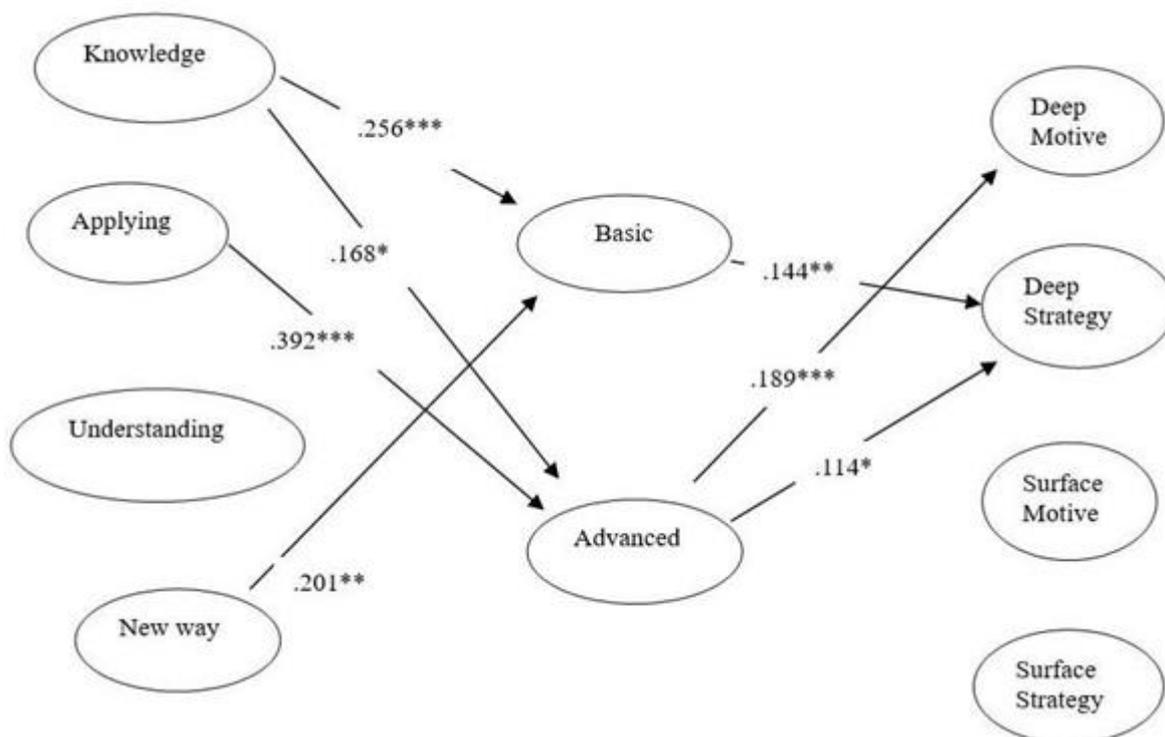


**Figure 2.** Results of mediation path analysis showing the relationships among conceptions of learning by web-searching, approaches to learning by web-searching

rather be considered as CLWS factors that are partly projected via ISE to produce higher efficiency.

## CONCLUSION

The main purpose of the present study was to investigate how the relationship between ISE, conceptions of learning by web-searching and approaches to learning by web-searching may be accounted for by path analysis, which also gave the possibility to test mediator effects. In general, the results reflect the theoretical assumptions and previous findings described in the introduction. More specifically, the initial hypotheses specified a number of expected predictors of approaches to learning by web-searching. The path analysis showed that Deep Motive and Deep Strategy were positively related to both ISE scales. The results indicated that ISE affected approaches to learning by web-searching. However, no effect of surface Motive or surface Strategy was confirmed related to ISE in the path analysis. While previous research findings typically show that Deep Motive and Deep Strategy in learning are positively related to ISE, and ISE does not necessarily improve surface approaches, some studies suggest that surface approaches are negatively related to ISE (Andreassen & Bråten, 2013; Pellas, 2014). For example, Liang and Wu (2010) described that the advantages of Internet self-efficacy could be used in order to develop more appropriate approaches to learning by web-searching. Aesaert and van Braak (2014) also found that Internet Self-efficacy significantly influences member behavioral intentions, such as conceptions and approach. When educators have a flexible and convenient learning environment, they can learn efficiently and rapidly expand their professional expertise. In other words, Taiwanese pre-school educators can use training times arranged by schools to carry out web-based learning for in-service training anytime and anywhere.

To assess pre-school educators' approaches to learning by web-searching from conceptions of learning by web-searching through ISE, we carried out exploratory factor analyses. First, the pre-school educators in this study held a more constructivist level of CLWS. Their high scores suggest that they perceived learning by web-searching as the conceptions of increasing knowledge, the application of information, and the acquisition of understanding and of new information. Previous studies concerning students' conceptions of learning in general had shown that students had more constructivist learning conceptions in more conventional learning environments (Leung, Wong & Wong, 2013; López-Íñiguez & Pozo, 2014). Although the focus of this study was pre-school educators' conceptions of learning by web-searching, the analysis results revealed similar findings to those of past studies about students' conceptions of learning in a different context. This confirms Kuo et al. (2014) finding that Internet Self-efficacy positively affects web-based learning. Second, in respect of the primary research regarding path analysis, it was indicated that most variances were firstly explained by CLWS, then by LAWS, and enhanced by Internet Self-efficacy. It showed that Basic ISE was predicted by Increasing knowledge and Seeing in a new way, while Increasing knowledge and Applying all predicted Advanced ISE. On the last paths, Basic ISE and Advanced ISE acted as mediators between CLWS and LAWS and positively

predicted Deep Motive and Deep Strategy. However, these mediators did not predict Surface Motive or Surface Strategy in the path analysis.

Furthermore, compared to path analysis without ISE, the conception of learning by web-searching more effectively applied to a deep approach to learning by web-searching, which is a more complicated process than merely clicking, surfing or browsing. Thus, ISE acts as an important mediator between conceptions of learning and approaches to learning by web-searching. In addition, the path analysis revealed that pre-school educators' increasing knowledge of CLWS is a significant positive predictor for the deep motive and deep strategy scales of the ALWS. That is, preschool educators with increasing knowledge of CLWS and with higher ISE are more likely to express deep approaches to learning by web-searching than those without ISE. This result supports the conclusion of many previous studies (Elliset et al., 2008; Elliset et al., 2006) that when learners increase their learning conceptions, their level of approach to learning by web-searching will also be fostered accordingly.

These results validate that having constructivist conceptions has noticeable effects on preschool educators' deep approaches. Nonetheless, it should be noted that the focus of this study is on the learning by web-searching context. Our results echo those of Lee et al. (2008), who indicated that learners' conceptions of "increasing knowledge," "applying" and "seeing in a new way" are the key determinants for understanding their approach to learning by web-searching. This also seems to suggest that preschool educators' constructivist learning conceptions by web searching may in fact have a part to play in their deep approaches to learning by web-searching.

In conclusion, the path analysis model of ISE, conceptions of learning by web-searching and approaches to learning by web- searching were clearly supported by this study. Preschool educators who had higher Internet self-efficacy expressed more positive conceptions of learning by web- searching, which positively affected their approaches to learning by web-searching. Consistent with a previous report (Zhao et al., 2011), our results identify Internet self-efficacy as the primary factor influencing the relationship between conceptions of learning by web-searching and approaches to learning by web-searching. What is more, the results also seem to suggest that educators need to identify effective approaches for improving preschool educators' ability to utilize the Internet and their use of appropriate Internet-based tools. A number of studies have found that preschool educators need to be trained in technology use and integration in the classroom learning environment (Fu, 2013). Therefore, the perceptions and the practices of technology usage of preschool educators are very important in that they could contribute significantly to the incorporation of the specific technologies used in preschool education.

In sum, the results of this study contribute to the understanding of how to enhance pre-school educators' conceptions of and approaches to learning by web- searching. The findings of this study offer some suggestions for future research. First, while this study

confirms that the ISE between the preschool educators' conceptions of and their approaches to learning by web-searching is a good mediator, whether other intermediate factors exist between these two constructs deserves further exploration. Second, in order to further test the instruments developed as well as the implications of this study, it would be valuable to see future studies involving preschool teachers of different ages, different subject areas, and with different Internet experiences.

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