Development of a Survey to Measure Self-efficacy and Attitudes toward Web-based Professional Development among Elementary School Teachers

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ABSTRACT

The major purpose of this study was to develop a survey to measure elementary school teachers' self-efficacy for web-based professional development. Based on interviews with eight elementary school teachers, three scales of web-based professional development self-efficacy (WPDSE) were formed, namely, general self-efficacy (measuring teachers’ general capabilities of using Internet tools or completing basic web-based tasks), interaction self-efficacy (assessing teachers’ perceived abilities of engaging in interactions in online professional development activities), and applying self-efficacy (evaluating teachers’ confidence level of applying what they have learned in web-based professional development to their future teaching). The results of Exploratory Factor Analysis (EFA) indicated that the three scales of WPDSE arising from the interviews and the Cronbach alpha values, ranging from 0.92 to 0.85, were acceptable. Subsequently, a large-scale survey was conducted to examine the relationships between teachers’ self-efficacy and attitudes toward web-based professional development with a sample of 214 elementary school teachers in Taiwan using a questionnaire that included WPDSE and an established scale for measuring attitudes toward web-based professional development (AWPD). The results indicated that teachers’ self-efficacy played a positive role in their attitudes towards web-based professional development. The results also indicated that teachers’ confidence in their interaction self-efficacy and in their applying self-efficacy was more important than their confidence in their general self-efficacy in predicting their attitudes toward web-based professional development. Implications of the study findings were also discussed.

Keywords

Self-efficacy, Attitude, Web-based professional development

Introduction

Since the pressure of educational reform is constantly increasing, as in-class executors, teachers need to enhance their independence and professional capabilities in order to perform their job with the greatest efficiency (Levy, 2008). The introduction of web-based information technology has begun a trend in education of gaining professional knowledge online. The Internet not only assists teachers greatly in their teaching, but also plays an important role in their learning and professional development. Therefore, they have been encouraged to take part in web-based professional development to meet the demands of their future teaching (Vekiri & Chronaki, 2008). With their feature of no time or space limitations, web-based resources can provide teachers with a more flexible way of pursuing professional development. While enhancing teachers’ willingness to participate in online courses, it can also motivate them to gradually change their teaching from traditional ways (e.g., face-to-face lectures, single location) to a more flexible and adjustable approach based on individual needs (Hartley, 2007).

Self-efficacy is a psychological concept which refers to personal beliefs and expectations regarding whether someone is capable of accomplishing something (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). Internet self-efficacy indicates web users’ self-perceived confidence and expectations of using the Internet. It has been proposed that teachers with high Internet self-efficacy may have a greater chance of success in web-based-related tasks (Kao & Tsai, 2009). Those teachers who possess higher Internet self-efficacy have been found to accept new learning ideas more easily and are usually more willing to try various teaching methods using web-based technology to provide students with different learning experiences (Chen & Tseng, 2012). Therefore, teachers’ self-efficacy in using web-based information technology would influence their willingness to utilize technology in their teaching and/or learning. In other words, teachers’ self-efficacy in applying Internet technology for educational purposes is a key to their participation or engagement in web-based professional development.
Currently, most studies on learners’ self-efficacy focus on traditional learning environments (Clayton, Blumberg, & Auld, 2010). Although there are some studies on learners’ Internet self-efficacy, they generally focus on higher education and often investigate its relationship with college students’ attitudes, beliefs and preferences for online courses (Yang & Tsai, 2008; Yudko, Hirokawa, & Chi, 2008). Thus far, few instruments have been developed to specifically measure self-efficacy for web-based professional development. Since Internet-based programs have become one of the important pathways for elementary school teachers’ professional development, teachers’ web-based professional development self-efficacy is worth further discussion and subsequent study. In order to understand this particular form of self-efficacy, this study explores and evaluates elementary school teachers’ confidence levels regarding their capabilities for web-based professional development.

Moreover, the relationship between self-efficacy and attitudes toward computers and/or the Internet has been examined in some previous studies (Celik & Yesilyurt, 2013; Smarkola, 2008). The results of these studies revealed that learners’ computer attitudes are positively correlated with their computer self-efficacy. Also, learners with greater Internet self-efficacy may have more positive attitudes toward the Internet. While teachers may have more opportunities to learn with web-based professional development, this study aims to explore whether teachers’ self-efficacy might be related to their attitudes in the web-based professional development context.

Therefore, the major purpose of this study was to develop a survey to measure elementary school teachers’ self-efficacy for web-based professional development. Based on semi-structured interviews of elementary school teachers with web-based professional development experience, a survey was first developed to assess teachers’ self-efficacy for web-based professional development. Then, through gathering questionnaire responses from 214 elementary school teachers in Taiwan, the following research objectives were explored in this study:

- Determine the validity of the survey to measure web-based professional development self-efficacy and attitudes toward web-based professional development,
- Determine the web-based professional development self-efficacy expressed by the elementary school teachers,
- Determine the relationships between the teachers’ self-efficacy and their attitudes toward web-based professional development, and
- Use teachers’ web-based professional development self-efficacy to predict their attitudes toward web-based professional development.

**Literature review**

**Internet self-efficacy**

Self-efficacy is a concept introduced by the American psychologist Alberto Bandura. According to Bandura, Barbaranelli, Caprara, and Pastorelli (1996), self-efficacy is a belief that someone has in him/herself of his/her ability to accomplish an action, but which has an influence on the individual’s ways of thinking, motivation, behavior and emotional state of mind. It includes a person’s perceptions of his/her own ability, endeavors, the difficulty level of an assignment, and others’ assistance (Bandura, 2006). While performing learning activities, self-efficacy has influences on learners’ motivation, mission concentration, effort engagement, anxiety or negative thoughts of self-denial (Kinzie, 1990; Semiatin & O’Connor, 2012). Studies on the relationships between self-efficacy and learning effectiveness have found that students with higher self-efficacy are more capable of cognition and metacognition, while being more persevering in the learning context (Burgoon, Meece, & Granger, 2012; McCombs, 1984). In other words, self-efficacy can show the confidence perceived by a learner and therefore can greatly influence his/her motivation and learning results.

Studies have found that learners’ self-efficacy could predict their academic performance in conventional learning environments (e.g., Zhu, Chen, Chen, & Chern, 2011). Subsequently, researchers have applied the self-efficacy concept to Internet-related situations, and proposed Internet self-efficacy as a self-evaluation for Internet usage and execution, such as receiving e-mails, downloading/uploading files via ftp servers, using search engines, and taking part in online discussions (Hsu & Chiu, 2004; Kim & Glassman, 2013).

Tsai, Chuang, Liang and Tsai’s (2011) work reviewed some studies relating to self-efficacy in Internet-based learning environments. Their results showed that computer self-efficacy, Internet self-efficacy and Internet-Based Learning self-efficacy were consistent with the original concept of the self-efficacy theory. On the basis of their
findings, the definitions for self-efficacy regarding computers, the Internet and web-based professional development are as follows:

- Computer Self-Efficacy (CSE) can be considered a domain specific measure of self-efficacy that reflects a person’s belief in his/her ability to perform specific computer tasks.
- Internet Self-Efficacy (ISE) examines learners’ confidence in their general skills or knowledge of operating Internet functions or applications in the Internet-based learning condition.
- Web-based professional development self-efficacy (WPDSE) explores teachers’ confidence in their participation in and their expected performance of using web-based professional development.

Obvious connections have been found between past Internet experience, outcome expectations and Internet self-efficacy (Wu & Tsai, 2006). Studies have proven that if students’ self-efficacy is enhanced, not only will the frequency of their Internet use be increased, but their performance will also be improved (Burgoon et al., 2012). These related studies have not only extended the results of Bandura’s study, but have also enhanced the applicability and value of the concept of self-efficacy to the use of technology.

**Web-based professional development self-efficacy**

In the age of Internet technology, the way in which teachers undertake professional development has changed from traditional face-to-face, single-location training to developmental activities in advanced web-based environments. Because professional development is undertaken via the Internet, teachers can choose courses according to the availability of place and time (Chen, Chen, & Tsai, 2009; Kinzie, Whitaker, Neesen, Kelley, Matera, & Pianta, 2006). Meanwhile, teachers with the same interests and expertise can make connections and form a network to share their experiences of professional development and teaching resources. Therefore, web-based professional development courses not only enrich teachers’ professional knowledge and experience, but can also help them to cross school boundaries.

Some studies have pointed out that teachers with higher technology-related self-efficacy have increased inclinations to use technology in their teaching (Paraskeva, Bouts, & Papagianni, 2008). These results suggest that when teachers have higher confidence in using information technology, their willingness to apply and integrate it in their teaching is increased as well.

Although some studies discuss self-efficacy in educational environments, most discussions of web-based learning are related to students in senior high schools or universities, and indicate that in web-based learning environments, learners’ web-related self-efficacy not only has an influence on their information usage, but is also a driving factor in the continuous pursuit of learning (Tsai, 2009). Similar to the important role of students’ Internet self-efficacy in their web-based learning, teachers’ web-based professional development self-efficacy may also play a significant role in their intention to engage in and their participation in web-based professional development. By the same token, teachers’ web-based professional development self-efficacy is an important issue for investigation. However, there is still little research in this area. Therefore, it is appropriate to develop and validate an instrument that seeks to examine teachers’ self-efficacy of web-based professional development, that is, their confidence levels in their capabilities of undertaking such professional development.

**The relationship between teachers’ self-efficacy and attitudes toward web-based professional development**

The relationship between attitudes toward and self-efficacy regarding computers, the Internet and Internet-based learning has been examined in a number of studies (e.g., Liang, Wu, & Tsai, 2011; Susskind, 2008). It has been found that learners’ computer attitudes are positively correlated with their computer self-efficacy (Pamuk & Peker, 2009). Also, learners with greater Internet self-efficacy may have more positive attitudes toward web-based professional development (Kao & Tsai, 2009). Expanding on the Theory of Planned Behavior (TPB), Ajzen (2002) proposed that behavioral intentions are influenced by attitudes and self-efficacy. It has been proven that beliefs and attitudes are the key determinants of both initial technology usage and long-term usage intentions and behaviors (Sun, 2008). In light of the above research, it can be concluded that a learner’s self-efficacy and attitudes toward technology are consistently and strongly related to their usage of the technology. Therefore, the investigation of
teachers’ self-efficacy and attitudes toward web-based professional development can provide insights into their web-based professional development intentions as well as their performance.

It has been shown that successful web-based professional development depends on teachers’ Internet self-efficacy and attitudes toward its learning environment (Kao & Tsai, 2009). In some studies, teachers’ self-efficacy and attitudes have been identified as important variables that are related to their use of technology (Pynoo et al., 2011). Consequently, our study suggests that there are some relationships between teachers’ self-efficacy and attitudes toward web-based professional development. If more knowledge about these relationships can be acquired, researchers can know more about how to effectively improve web-based professional development performance and how to help teachers adopt web-based professional development.

Method

In order to explore and evaluate elementary school teachers’ web-based professional development self-efficacy, the research design of this study consisted of two procedures which combined both qualitative and quantitative methods of data collection and analysis. First, semi-structured interviews were carried out at the beginning of the study with the purpose of gathering information for the construction of the questionnaire. Then, the researchers developed a questionnaire on the basis of the interview data, and a large-scale survey was subsequently administered.

Sample

Convenience sampling was used to gather teachers’ responses about their web-based professional development self-efficacy. Eight elementary school teachers were individually interviewed in this study. The interview data were used to explore what general perceptions, expectations, and experiences the teachers held regarding web-based professional development. In addition, the researchers also used content derived from the interview data to construct a questionnaire for exploring teachers’ web-based professional self-efficacy. The interviewed teachers came from eight elementary schools in Taiwan. Six of them were females, and two were males. All of them had prior experience of participating in web-based professional development in the past two years.

In the second part of the study, a total of 214 teachers from 20 elementary schools in Taiwan were selected as the subjects. All of the participating teachers had actual experience of web-based professional development. Though the sample came from a convenient sample, these teachers were from different geographical areas in Taiwan and across schools of varying socio-economic status.

Data collection and analysis

Two types of data were collected in this study. First, eight elementary school teachers with web-based professional development experience were invited to participate in semi-structured interviews. The interview questions aimed to provide a better understanding of the teachers’ perceptions, expectations, and experiences of web-based professional development. Example questions included:

- What do you think about web-based professional development? How confident do you feel when you participate in web-based professional development courses?
- What are the advantages and disadvantages of participating in web-based professional development programs? Are these related to your confidence in taking part in web-based professional development? In what ways?
- What kinds of problems did you encounter in web-based professional development? How did you solve the problems? How confident are you about solving these problems?
- Would you recommend that other teachers attend web-based professional development programs?

Each participating teacher was interviewed individually by one researcher for about forty minutes. All interviews were audio-recorded and fully transcribed to provide detailed information regarding the teachers’ ideas about their web-based professional development self-efficacy. The verbatim transcripts were read and discussed by the researchers. Important sentences or keywords that represented the teachers’ web-based professional development
self-efficacy were marked. Then, similarities and differences in the marked sentences or keywords across each teacher were explored and summarized as the basis for creating the questionnaire items.

Secondly, the final sample in this study included 214 elementary school teachers. They were used convenience sampling from 20 elementary schools from both northern and southern Taiwan. Then, an exploratory factor analysis (EFA) with principal components analysis and Varimax rotation with Kaiser normalization were employed to validate the structure of the questionnaire using the SPSS 12 software. Based on factors resulting from the EFA analyses, and the responses to the questionnaire items, the teachers’ levels of web-based professional development self-efficacy were determined using means and standard deviations. Correlation analysis was also carried out to examine the relationship between teachers’ self-efficacy and their attitudes toward web-based professional development. Then, through a stepwise multiple regression analysis, teachers’ web-based professional development self-efficacy was tested as a predictor to explain their web-based professional development attitudes.

**Questionnaire**

The questionnaire in this study comprised of two main parts. The first part consisted of the Web-based Professional Development Self-Efficacy (WPDSE) questionnaire developed based on the interviews with the eight elementary school teachers, using prior studies (e.g., Kao & Tsai, 2009) as a reference framework to measure the teachers’ self-evaluation of their confidence level and capabilities of engaging in web-based professional development. The researchers went through the interview transcripts to identify the main themes and keywords for the construction of the initial items of the WPDSE, which included items measuring elementary school teachers’ general abilities (e.g., uploading or downloading files from the web) to engage in web-based professional development. Furthermore, items about the most current web-based technologies such as blogs and social networks were also added as WPDSE items to reflect teachers’ possible technology usage nowadays. Moreover, the questionnaire also included items for evaluating the confidence level of applying what the teachers had learned in their web-based professional development to their teaching practice, including teaching performance and integrating technologies in their classes. As a result, WPDSE included three scales (general self-efficacy, interaction self-efficacy, and applying self-efficacy), each consisting of seven to eight items, giving a total of 22 items in the initial version. All items were presented with a five-point Likert scale, ranging from one “strongly disagree” to five “strongly agree.” The details of the three scales are as follows:

- **General self-efficacy:** measuring teachers’ general capabilities of using Internet tools or completing basic web-based tasks. This scale focuses on teachers’ confidence in their basic ability to use web tools.

- **Interaction self-efficacy:** assessing teachers’ perceived abilities of engaging in interactions in online professional development activities. This scale focuses on teachers’ confidence in their ability to interact with others or to fulfill web-based tasks through interactions.

- **Applying self-efficacy:** evaluating teachers’ confidence level of applying what they have learned in web-based professional development to their future teaching. This scale focuses on teachers’ confidence in applying what they have learned in web-based professional development to their teaching practice.

The second part of the questionnaire was the Attitudes toward Web-Based Professional Development (AWPD), based on Kao and Tsai’s (2009) research. The AWPD implemented in this study included five scales and a total of 27 items. The details of the five scales are as follows:

- **Perceived usefulness scale:** assessing perceptions of the extent to which teachers perceive that the impact of web-based professional development is positive and useful. That is, the higher the score, the stronger the teachers’ beliefs in the usefulness of web-based professional development.

- **Perceived ease of use scale:** assessing the extent to which teachers perceive that web-based professional development is easy to use. That is, higher scores indicate higher agreement with the ease of use of web-based professional development.

- **Affection scale:** measuring perceptions of the extent to which teachers express favorable feelings about web-based professional development. That is, higher scores suggest more positive feelings about web-based professional development.
• Anxiety scale: measuring perceptions of the extent to which teachers experience anxiety about web-based professional development. This scale is scored in reverse. Thus, higher scores indicate less anxiety about web-based professional development.

• Behavior scale: measuring perceptions of the extent to which teachers perceive actual practice and express willingness to use web-based professional development. That is, the higher the score, the more willing the teachers are to use web-based professional development.

Kao and Tsai’s (2009) study reported alpha reliability coefficients for the five scales as 0.92 (perceived usefulness), 0.92 (perceived ease of use), 0.87 (affection), 0.88 (anxiety) and 0.93 (behavior). The alpha value for the overall AWPD was 0.91, and these factors explained 80.65% of the total variance. Therefore, these scales were deemed to be sufficiently reliable for assessing teachers’ attitudes toward web-based professional development.

Results

Validation of WPDSE and AWPD

This study utilized exploratory factor analysis to clarify the structure of the perceptions of web-based professional development based on the data obtained from the large scale survey. Items with a factor loading of less than 0.5 were subject to deletion from the item pool. In addition, Cronbach’s alpha values were estimated to confirm the reliability of the overall instrument and each item. Consequently, teachers’ web-based professional development self-efficacy was grouped into three scales: general self-efficacy, interaction self-efficacy and applying self-efficacy. Thus, using exploratory factor analysis, the initial 22 items were all retained and were in the same scales as indicated by the interviews (as shown in Table 1).

Table 1. Rotated factor loadings and Cronbach alpha values for the web-based professional development self-efficacy scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
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</thead>
<tbody>
<tr>
<td>Factor 1: General self-efficacy, α = 0.94, Mean = 4.57, SD = 0.49</td>
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<tr>
<td>GSE 1</td>
<td>0.87</td>
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<td>GSE 2</td>
<td>0.86</td>
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<td>GSE 3</td>
<td>0.84</td>
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<tr>
<td>GSE 4</td>
<td>0.82</td>
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<td>GSE 5</td>
<td>0.79</td>
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<tr>
<td>GSE 6</td>
<td>0.78</td>
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<td>GSE 7</td>
<td>0.77</td>
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<tr>
<td>GSE 8</td>
<td>0.74</td>
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<tr>
<td>Factor 2: Interaction self-efficacy, α = 0.94, Mean = 3.94, SD = 0.65</td>
<td>0.81</td>
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<tr>
<td>ISE 1</td>
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<td>ISE 2</td>
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<tr>
<td>ISE 3</td>
<td>0.79</td>
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<tr>
<td>ISE 4</td>
<td>0.78</td>
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<td>ISE 5</td>
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<tr>
<td>ISE 6</td>
<td>0.75</td>
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<tr>
<td>ISE 7</td>
<td>0.74</td>
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<td>Factor 3: Applying self-efficacy, α = 0.92, Mean = 4.05, SD = 0.48</td>
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<td>0.82</td>
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<td>ASE 1</td>
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<td>ASE 2</td>
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<td>ASE 3</td>
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<td>ASE 4</td>
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<td>ASE 5</td>
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<td>ASE 6</td>
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<tr>
<td>ASE 7</td>
<td>0.74</td>
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<tr>
<td>Percentage of variance</td>
<td>45.98</td>
<td>15.22</td>
<td>9.16</td>
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<tr>
<td>Overall α = 0.95 Total variance explained was 70.35%</td>
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</table>

The alpha values for the three scales were 0.94 (general self-efficacy, 8 items), 0.94 (interaction self-efficacy, 7 items) and 0.92 (applying self-efficacy, 7 items). The overall alpha value was 0.95, and the factors explained 70.35% of total variance. By and large, the study revealed acceptably high (Thompson & Daniel, 1996) alpha reliability coefficients for all items. Thus, the scales were considered to be sufficiently reliable for assessing the teachers’ web-based professional development self-efficacy. The 22 items for final inclusion in WPDSE are listed in Appendix 1.

Using exploratory factor analysis, the initial 27 items of AWPD were reduced to 18 items in five scales (as shown in Table 2). The final scales were the same as those proposed in Kao and Tsai’s (2009) study, namely, perceived usefulness, perceived ease of use, affection, anxiety and behavior. The reliability coefficients for the five scales of the AWPD were 0.87 (perceived usefulness, 4 items), 0.87 (perceived ease of use, 4 items), 0.86 (affection, 3 items), 0.87 (anxiety, 3 items) and 0.91 (behavior, 4 items). The alpha value of the whole AWPD questionnaire is 0.87, and these factors explained 77.35% of total variance. Therefore, these scales were deemed to have sufficient internal consistency for assessing teachers’ attitudes toward web-based professional development.

Table 2. Rotated factor loadings and Cronbach alpha values for the AWPD scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>Factor 5</th>
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<tbody>
<tr>
<td>Factor 1: Perceived ease of use, α = 0.87, Mean = 4.17, SD = 1.04</td>
<td>0.87</td>
<td>0.85</td>
<td>0.86</td>
<td>0.87</td>
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<td>Ease 1</td>
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<td>Ease 3</td>
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<td>Ease 4</td>
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<tr>
<td>Factor 2: Behavior, α = 0.91, Mean = 3.97, SD = 1.28</td>
<td>0.90</td>
<td>0.87</td>
<td>0.87</td>
<td>0.83</td>
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<tr>
<td>Behavior 1</td>
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<td>Behavior 4</td>
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<tr>
<td>Factor 3 Perceived usefulness, α = 0.87, Mean = 4.34, SD = 0.87</td>
<td>0.77</td>
<td>0.81</td>
<td>0.83</td>
<td>0.76</td>
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<tr>
<td>Perceived use 1</td>
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<td>Perceived use 2</td>
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<td>Perceived use 3</td>
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<td>Perceived use 4</td>
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<td>Factor 4 Anxiety, α = 0.87, Mean = 3.57, SD = 1.48</td>
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<td>0.77</td>
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<td>0.86</td>
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<tr>
<td>Anxiety 1</td>
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<td>Anxiety 2</td>
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<td>Anxiety 3</td>
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<tr>
<td>Factor 5 Affection, α = 0.86, Mean = 4.06, SD = 0.96</td>
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<td></td>
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<td>0.86</td>
<td>0.82</td>
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<tr>
<td>Affection 1</td>
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<td>Affection 2</td>
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<td>Affection 3</td>
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</tr>
<tr>
<td>Percentage of variance</td>
<td>44.64</td>
<td>13.47</td>
<td>7.49</td>
<td>6.12</td>
<td>5.63</td>
</tr>
</tbody>
</table>

Overall α = 0.87. Total variance explained is 77.35%

Elementary school teachers’ web-based professional development self-efficacy

The results indicated that the teachers scored highly on each of the three WPDSE scales, with an average of 4.57 per item on the general self-efficacy scale, an average of 3.94 per item on the interaction self-efficacy scale, and an average of 4.05 per item on the applying self-efficacy scale on the 1-5 Likert measurement. This result indicates that the teachers tended to display greater confidence in using the Internet for general purposes, and showed high confidence in applying learning outcomes to their teaching practice after taking part in web-based professional development. However, their relatively low score on the interaction self-efficacy scale still implies that some teachers expressed comparatively less confidence in engaging interactions during web-based professional development.
Relationships between self-efficacy and attitudes toward web-based professional development

This study also examined the relationship between teachers’ web-based professional development self-efficacy (WPDSE) and their attitudes toward web-based professional development (AWPD), as shown in Table 3.

The relationships between the WPDSE and the AWPD indicated that all of the variables were significantly positively correlated with each other (all $r > 0.19$, $p < 0.01$), except that no statistical correlation was found between applying self-efficacy and anxiety. These results, in general, support the argument that teachers expressing higher web-based professional development self-efficacy display more positive perceptions of, better affection for, less anxiety about, and higher willingness to participate in web-based professional development. In particular, the teachers’ responses on the usefulness scale were relatively more highly correlated with those on the applying self-efficacy scale ($r = 0.65$, $p < 0.01$). It seems that teachers with higher self-efficacy in applying learning outcomes to their teaching practice with web-based technology might tend to perceive web-based professional development as being useful.

By and large, the teachers’ scores on the interaction self-efficacy scale and applying self-efficacy were fairly highly correlated with all of the scales of the AWPD, with the exception of the correlation between applying self-efficacy and anxiety. This indicates that teachers with higher confidence in engaging in interaction in online learning activities and using WPD for teaching purposes tend to express more positive perspectives, better affection, less anxiety and greater willingness to use WPD. This also suggests that, for enhancing teachers’ attitudes toward web-based professional development, teachers’ interaction self-efficacy and applying self-efficacy are more important than their general self-efficacy for Internet-related functions.

Table 3. Correlation of the teachers’ self-efficacy and attitudes toward web-based professional development

<table>
<thead>
<tr>
<th>Scale</th>
<th>Usefulness</th>
<th>Ease of use</th>
<th>Affection</th>
<th>Anxiety$^a$</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>General self-efficacy</td>
<td>0.19**</td>
<td>0.37**</td>
<td>0.23**</td>
<td>0.28**</td>
<td>0.27**</td>
</tr>
<tr>
<td>Interaction self-efficacy</td>
<td>0.43**</td>
<td>0.57**</td>
<td>0.56**</td>
<td>0.31**</td>
<td>0.54**</td>
</tr>
<tr>
<td>Applying self-efficacy</td>
<td>0.65**</td>
<td>0.55**</td>
<td>0.59**</td>
<td>0.10</td>
<td>0.51**</td>
</tr>
</tbody>
</table>

$^a$ $p < 0.01$.

$^a$ a higher score indicates less anxiety about web-based professional development

Predicting teachers’ attitudes toward web-based professional development by self-efficacy

While teachers may have more opportunities to learn with web-based professional development, it is plausible to hypothesize that teachers’ web-based professional development self-efficacy may be related to their attitudes toward web-based professional development. Hence, this study also examined the predictive power of teachers’ web-based professional development self-efficacy to predict their attitudes toward web-based professional development, as shown in Table 4.

Table 4. Multiple regression models of predicting teachers’ attitudes toward web-based professional development (n=214)

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Predicting variables</th>
<th>B</th>
<th>S.E.</th>
<th>$\beta$</th>
<th>T</th>
<th>$R^2$ (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usefulness</td>
<td>ASE</td>
<td>0.55</td>
<td>0.06</td>
<td>0.58</td>
<td>9.50***</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>ISE</td>
<td>0.09</td>
<td>0.04</td>
<td>0.13</td>
<td>2.17*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>1.39</td>
<td>0.21</td>
<td>0.39</td>
<td>6.71***</td>
<td></td>
</tr>
<tr>
<td>Ease of use</td>
<td>ISE</td>
<td>0.37</td>
<td>0.06</td>
<td>0.39</td>
<td>6.25***</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>ASE</td>
<td>0.46</td>
<td>0.08</td>
<td>0.35</td>
<td>5.71***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>0.66</td>
<td>0.29</td>
<td>0.22</td>
<td>2.28*</td>
<td></td>
</tr>
<tr>
<td>Affection</td>
<td>ASE</td>
<td>0.56</td>
<td>0.08</td>
<td>0.43</td>
<td>7.11***</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>ISE</td>
<td>0.41</td>
<td>0.07</td>
<td>0.42</td>
<td>6.14***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GSE</td>
<td>0.20</td>
<td>0.08</td>
<td>0.16</td>
<td>2.49*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>0.87</td>
<td>0.36</td>
<td>0.16</td>
<td>2.44*</td>
<td></td>
</tr>
<tr>
<td>Anxiety$^a$</td>
<td>ISE</td>
<td>0.24</td>
<td>0.11</td>
<td>0.22</td>
<td>2.82*</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>GSE</td>
<td>0.23</td>
<td>0.10</td>
<td>0.16</td>
<td>1.98*</td>
<td></td>
</tr>
</tbody>
</table>
Table 4 shows that teachers with strong applying self-efficacy \( (t = 7.11, p < .001) \), interaction self-efficacy \( (t = 6.14, p < .001) \) and general self-efficacy \( (t = 2.49, p < .05) \) expressed more favorable affect toward web-based professional development, explaining the relationship for the \( R \) of 45%. Teachers with higher interaction self-efficacy \( (t = 2.82, p < .01) \) and general self-efficacy \( (t = 1.98, p < .05) \) displayed less anxiety toward web-based professional development, explaining the relationship for the \( R \) of 11%. Moreover, the result of this study found that interaction self-efficacy and applying self-efficacy could significantly and positively predict perceived usefulness, perceived ease of use, and behavior, respectively explaining 43%, 41%, and 36% of teachers’ attitudes toward web-based professional development. This indicates that those teachers with higher confidence in using WPD for learning and teaching purposes tended to express more positive perceptions of, better feelings about, and greater willingness to use WPD. In particular, teachers with high interaction self-efficacy displayed a positive effect on perceived ease of use, anxiety and behavior, indicating that interaction self-efficacy may play the most important role in the AWPD, as it was positively associated with all aspects of their attitudes toward web-based professional development. Applying self-efficacy was also a significantly positive predictor of the perceived usefulness, ease of use, affection, and behavior of the AWPD.

In sum, the results shown in Table 4 revealed the importance of interaction self-efficacy and applying self-efficacy in predicting AWPD, indicating that teachers with positive interaction self-efficacy and applying self-efficacy of web-based professional development are more likely to have favorable attitudes toward web-based professional development. However, general self-efficacy can only predict affection and anxiety for AWPD.

**Discussion and conclusions**

Web-based professional development self-efficacy is a pivotal construct for understanding a wide range of online learning activities for teachers. By assessing teachers’ web-based professional development self-efficacy, researchers can acquire some indications of their expected outcomes derived from web-based.

The WPDSE and the AWPD administered in this study are deemed to be sufficiently reliable for assessing teachers’ self-efficacy and their attitudes toward web-based professional development, respectively. By means of these two instruments, the present study explored a group of Taiwanese elementary school teachers’ self-efficacy and their attitudes toward web-based professional development. The results of this study derived from the correlation analyses demonstrate that the teachers’ web-based professional development self-efficacy was positively correlated with their attitudes toward web-based professional development. Teachers with higher web-based professional development self-efficacy expressed favorable attitudes toward web-based professional development. Also, the correlational analyses indicated that teachers who had stronger interaction self-efficacy and applying self-efficacy showed more positive perceptions of, stronger liking for, and stronger willingness to participate in web-based professional development.

Furthermore, the regression analysis revealed that teachers’ interaction self-efficacy was the most significant positive predictor (i.e., the first-selected factor for the step-wise regression model) for the ease of use, anxiety and behavior of web-based professional development. Teachers’ positive expectations of participating and engaging in interactions in online learning activities are critical for their perceptions of accessibility, lower anxiety and behavior to take part in web-based professional development. In addition, the regression analysis also revealed that teachers’ applying self-efficacy was also the main significant positive predictor (i.e., the first-selected factor for the step-wise regression model) of the usefulness and affection of web-based professional development. This seems to show that teachers’ confidence in using WPD for teaching purposes is critical for their positive perceptions of usefulness and favorable feelings toward web-based professional development activities. The findings above are also similar to those in the previous studies concerning the influences of self-efficacy on attitudes regarding the computer and/or the Internet and/or the web-based learning (Kao & Tsai, 2009; Susskind, 2008; Wu & Tsai, 2006). That is, enhancing stronger self-efficacy in using WPD of engaging interaction and applying for teaching purposes may help teachers shape
better attitudes toward web-based professional development. Thus, the importance of WPDSE should be highlighted for teachers’ web-based professional development.

The finding above is worth noting as it implies that teachers’ Internet self-efficacy may not be the most significant factor to predict their attitudes toward web-based professional development. While predicting teachers’ attitudes toward web-based professional development, their confidence in actually using WPD (i.e., their interaction self-efficacy and applying self-efficacy) is more important than their confidence in using Internet-related functions (i.e., their general self-efficacy). Therefore, educators should try to find effective ways to improve teachers’ perceptions of engaging in interaction in online learning activities and their capacity to use technology-related teaching methods in the classroom. Then, teachers’ attitudes toward web-based professional development can be enhanced accordingly.

The present results indicate that the government, educational administrators and instructional designers would benefit from being more attentive to teachers' percepts of web-based professional development self-efficacy. Likewise, our results provide encouraging support for a conceptualization of web-based professional development self-efficacy at the teacher level and for a new measure of this construct. This study may add to our understanding of the nature of web-based professional development behaviors by teachers in educational practice. As Shea and Bidjerano (2010) pointed out, learners’ learning performance can be altered successfully by interventions which increase their beliefs in their competence and their confidence. Besides, Markauskaite (2007) has suggested that an Internet-related enhancement program that was implemented might have resulted in successful mastery experiences for the teachers. Thus, given that useful and specific training programs seem to be practicable for elementary school teachers, they may be helpful for enhancing teachers’ professional development and teaching practice.

One limitation of this study is that, technically, the use of questionnaires for examining self-efficacy and attitudes toward web-based professional development may suffer from a lack of strong validity. To further explore teachers’ self-efficacy of and attitudes toward web-based professional development, researchers can place teachers in a real web-based learning environment. Through gathering extensive data when they are experiencing the web-based learning activities, researchers may know more about teachers’ real perceptions of this new type of learning.

Finally, in light of some previous research (Susskind, 2008; Pynoo et al., 2011; Pamuk & Peker, 2009) which underscored the effect of Internet or computer self-efficacy on increasing attitude levels, our results showed that a similar effect was observed with our sample. Indeed, the result of this study is helpful in facilitating an understanding of teachers’ web-based professional development self-efficacy. By using the WPDSE questionnaire, researchers are encouraged to conduct follow-up studies for different school levels as well as various areas (such as urban or rural) to acquire a better understanding of the possible differences in teachers’ characteristics in terms of web-based professional development self-efficacy. In sum, this study provides some innovative thoughts about elementary school teachers’ web-based professional development self-efficacy, and the practical importance of the results is noted, as they can help the government and educational administrators understand teachers’ perceptions and behaviors, and adjust their professional development policies accordingly. With the questionnaires, follow-up investigations can be put into practice to examine the interplay among beliefs, preferences and learning or teaching behaviors in the web-based context. Such studies will help to evaluate and predict the efficiency of web-based professional development, and furthermore, can make comparisons between web-based and conventional situations.

Acknowledgments

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References


Appendix

Appendix 1: The questionnaire items on the Web-based Professional Development Self-Efficacy questionnaire (WPDSE) survey (final version)

General self-efficacy
I feel confident about using a Web browser like “Internet Explorer” or “Firefox.”
I feel confident about reading the content from the Web.
I feel confident about clicking the hyperlink to connect to another Website.
I feel confident about keying in the Website address to connect to a particular Website.
I feel confident about printing out the content of a Website.
I feel confident about copying images or text on the Web into the WORD software.
I feel confident about searching for information on the Web using keywords.
I feel confident about uploading or downloading files from the Web.

Interaction self-efficacy
I feel confident about selecting appropriate web-based professional development courses.
I feel confident about registering for web-based professional development courses.
I feel confident about reading the contents in web-based professional development courses.
I feel confident about interacting with teachers in web-based professional development courses.
I feel confident about asking or answering questions in web-based professional development courses.
I feel confident about completing assigned course work in web-based professional development courses.
I feel confident about searching for relevant information for web-based professional development courses on the Web.

Applying self-efficacy
After attending web-based professional development, I feel confident about enhancing my teaching performance.
After attending web-based professional development, I feel confident about enriching my course contents.
After attending web-based professional development, I feel confident about applying multiple teaching strategies in my classes.
After attending web-based professional development, I feel confident about extending my teaching resources.
After attending web-based professional development, I feel confident about integrating technologies in my teaching.
After attending web-based professional development, I feel confident about enhancing students’ learning motivations.
After attending web-based professional development, I feel confident about looking for appropriate web resources to guide my students’ learning.

Appendix 2: The questionnaire items on the attitudes toward web-based professional development (AWPD) survey (final version)

Perceived usefulness
1. Web-based professional development helps my instruction become more interesting.
2. Web-based professional development helps to increase my creativity for instruction.
3. Web-based professional development effectively enhances my learning.
4. Web-based professional development improves my professional knowledge.

Perceived ease of use
1. It is easy for me to use web-based professional development on the Internet.
2. It is convenient to receive training on the job by using web-based professional development.
3. The content of web-based professional development is clear, and easy to access for learning.
4. The learning of web-based professional development is flexible.

Affection
1. I think it is interesting to use web-based professional development.
2. Web-based professional development provides an interesting and attractive environment.
3. Using web-based professional development can improve my teaching ability.
Anxiety
1. Using web-based professional development makes me feel anxious.
2. Using web-based professional development makes me feel uncomfortable.
3. Using web-based professional development is boring.

Behavior
1. I hope to spend more time using web-based professional development.
2. I want to increase my use of web-based professional development in the future.
3. I would be glad to use web-based professional development in the future.
4. I will recommend the use of web-based professional development to others.