

## CONSTRUCTION AND STANDARDIZATION OF COMPUTER SELF-EFFICACY SCALE FOR PROSPECTIVE SECONDARY SCHOOL TEACHERS

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### Abstract

The present task was undertaken to construct and standardize scale for measuring computer self-efficacy of prospective secondary school teachers. For this, data were collected from prospective secondary school teachers by adopting random sampling technique. An item pool was created initially by consulting various sources and theoretical and empirical literature available in the concerned area. This item pool was put to evaluation and criticism by technical as well as language experts. The preliminary draft of computer self-efficacy scale was further subjected to item analysis to select only highly discriminating items. The reliability of scale was established with the help of test-retest and split-half methods which were found to be appreciably high. The validity of computer self-efficacy scale was ascertained and norms were established for interpretation of obtained scores on the scale. In the last, conclusions have been presented and applicability and implications of computer self-efficacy scale have been discussed.

**Keywords:** Construction, Standardization, Computer Self-Efficacy.



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### Introduction

The concept of self-efficacy has been described as an individual's own judgment of himself about his/her capacity to organize and make successfully necessary activities to show a certain performance. The belief of self-efficacy is a concept not about how an individual is competent but his/her belief on his/her own abilities. Bandura (1986) defines self-efficacy as self-evaluation of individuals who organize necessary activities in order to display specific performance and their capacity to conduct these activities successfully. Self-efficacy reflects an individual's confidence in his/her ability to perform the behaviour required to produce specific outcome and it's thought to directly impact the choice to engage in a task, as well as the effort that will be expended and the persistence that will be exhibited. Computer self-efficacy refers to "a judgment of one's capability to use a computer". It was noted that self-efficacy judgments could influence an individual's expectations because "the outcomes one

expects derive largely from judgments as to how well one can execute the requisite behaviour". Computer self-efficacy has a major impact on an individual's expectations towards using computers. The teaching and learning process has recently been altered by the convergence of a variety of technological developments. Computers are common tools in most of schools, and are used increasingly in all subject areas. In so far as computer aided learning, it is crucial for all prospective teachers to become familiar and comfortable with its use. Teachers are currently being asked to become computer literate to integrate emerging computer technology into their teaching. Because computers are a relatively new phenomenon in education, it is important for prospective teachers to understand what level of impact teachers' degrees of computer self-efficacy have on their teaching. In addition, individuals who did not see themselves as competent to use computer, these individuals were less likely to use computers. The review of research studies reveals that for enhancing use of computers and other modern technologies in teaching-learning process, it is very essential to possess self-efficacy beliefs for the same. Miura (1987) has suggested that self-efficacy may be an important factor related to the acquisition of computing skills. Computer self-efficacy is a specific type of self-efficacy. Specific self-efficacy is defined as belief in one's ability to "mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Wood & Bandura, 1989). Brosnan (1998) argued that better computer self-efficacy could increase persistence in studying computing. Computer self-efficacy was also found to be associated with attitudes toward computer technologies (Zhang & Espinoza, 1998) who also reported that past enrollment in computer programming courses was found to be positively related to self-efficacy and computer self-efficacy is positively related to plans to take more computer-related courses. Research on computer self-efficacy in general also revealed that males on an average have better computer self-efficacy than females (Torkzadeh & Koufteros, 1994). It was concluded that computer self-efficacy beliefs of male prospective teachers are higher than that of females and that computer self-efficacy beliefs of prospective teachers who have a computer are higher than that of those who have not. Wallace (1999) investigated and described four main factors that influenced the development of computer self-efficacy. These factors were computer anxiety, computer confidence, and computer liking and computer knowledge. He demonstrated a significant correlation between the computer self-efficacy model (composed of the four mentioned factors) and a 3-item measure of computer self-efficacy. He reported that computing students expressed low levels of computer anxiety, and higher levels of computer knowledge, computer liking, and computer confidence in comparison with education students. Agerwal, Sambaurthy and Stair

(2000) found that judgment of self-efficacy serves as key antecedent of perceived cognitive efforts (ease of use) associated with technology usage. Further, self-efficacy judgments in the task domain of computing are strongly influenced by the extent to which individuals believe that they are personally innovative with respect to information technology. Stern (2004) in his study reported that the relationship between computer self-efficacy, anxiety, experience and support were positively related to computer self-efficacy and computer self-efficacy was negatively related to anxiety and positively related to usage. Nanjappa and Lowther (2004) revealed that the participants had strong beliefs about the impact of technology integration on instruction and students; but belief about their own readiness was comparatively weak, even though their computer self-efficacy scores were above average. Saleh's (2007) research indicated that computer self-efficacy (CSE) may be one determinant of who uses technology and who does not and revealed varying degrees of computer self-efficacy. Valanides and Angeli (2008) suggested that to develop self-efficacy, science teachers need to be introduced to computer technologies systematically and be engaged in activities that will provide them with positive experiences with regard to computer use. Topkaya (2010) found that pre-service English teachers had moderate level of computer self-efficacy perceptions. Computer experience, frequency of use and gender were identified to create a significant difference in computer self-efficacy perceptions.

On the basis of above discussion, it appears that the most of the research studies on computer self-efficacy of prospective secondary school teachers have been carried out in foreign countries and there is a lack of such studies in India. Moreover, there is no research tool available at present which can be safely used for measuring computer self-efficacy of prospective secondary school teachers. Hence, it was thought worthwhile to construct and standardize computer self-efficacy scale for prospective secondary school teachers.

### **Purpose of the Scale**

The present scale is intended to measure the self-efficacy of prospective secondary school teachers towards using computer.

### **Objectives:**

1. To prepare the preliminary draft of computer self-efficacy scale for prospective secondary school teachers.
2. To carry out item analysis of preliminary draft of computer self-efficacy scale.
3. To estimate reliability of computer self-efficacy scale through test-retest and split-half methods.
4. To ascertain the validity of computer self-efficacy scale.

5. To establish norms for interpretation of scores obtained on computer self-efficacy scale.

### **Methodology**

For construction and standardization of computer self-efficacy scale for prospective secondary school teachers, survey technique under descriptive method of research was employed.

### **Sampling**

Multistage sampling with stratified random sampling technique was employed in this research work. Firstly, a sample of 150 prospective secondary school teachers was selected for carrying out item analysis of preliminary draft of computer self-efficacy scale. At the second stage, a sample of 55 prospective secondary school teachers was selected to compute test-retest reliability of computer self-efficacy scale. At the time of second administration, 10 prospective teachers were not present. Therefore, test-retest reliability was computed on the basis of responses given by 45 prospective secondary school teachers. At the third stage, 90 prospective secondary school teachers were selected to estimate split-half reliability index of computer self-efficacy scale. At the last stage, a sample of 928 prospective secondary school teachers was chosen for establishing norms for interpretation of scores obtained on computer self-efficacy scale.

### **Planning and Preparation of Initial Draft of Computer Self-Efficacy**

First of all, it was considered worthwhile to plan for the content of computer self-efficacy scale for prospective secondary school teachers. For this, the investigator thoroughly screened the related literature, different questionnaires, inventories and tests on self-efficacy and use of computers carried out discussions with the experts in the concerned area. On the basis of this, investigator prepared a list of 45 items/statements which were pooled from various sources and getting the statements of opinions from experts, researchers, experienced teachers and computer instructors. The items in the scale were formulated by using Likert Method of Summated Ratings on a five point continuum i.e. strongly disagree, disagree, undecided, agree and strongly agree. The scoring was done by awarding 1, 2, 3, 4 and 5 marks respectively for previously mentioned responses in case of negative statements. This procedure was reversed in case of positive statements. The total computer self-efficacy score of a prospective secondary school teacher on this scale was computed by adding the score on all individual items. A higher score on the scale indicated higher computer self-efficacy and vice-versa.

### **Editing and Revision of Initial Draft of Computer Self-Efficacy Scale:**

After writing the statements for computer self-efficacy scale, they were edited and revised. For this, the initial draft of the scale containing 45 items was given to experienced teachers, experts in the concerned area, research scholars, faculty members of the department of education, HPU, Shimla to judge the content and linguistic accuracy of each item and its relevance. Each item/statement was personally discussed with the experts and their valuable comments and suggestions were taken into consideration in order to remove any type of logical, technical and linguistic ambiguity in the statements. On the basis of expert opinion, 8 items were rejected from the preliminary draft and it was decided to have 37 items in preliminary draft of computer self-efficacy scale.

### **Data Analysis and Results**

#### ***Item Analysis of Preliminary Draft (Try-Out Form) of Computer Self-Efficacy Scale***

Data were analyzed by employing appropriate statistical techniques. The details are given as under:

The technique of item analysis was employed for selection/rejection of statements for preparing final draft of computer self-efficacy scale. To carry out item analysis, the preliminary draft of computer self-efficacy scale was administered on a sample of 150 prospective secondary school teachers of two B.Ed. colleges of Shimla district of Himachal Pradesh. Afterwards, the scoring of computer self-efficacy scale was done by following the outlined procedure. Afterwards, 27% of the prospective secondary school teachers (40 prospective teachers) with highest total scores and 27% of the prospective secondary school teachers with lowest total scores on computer self-efficacy scale were taken into consideration. These two groups were named as 'top group having high scores' and 'bottom group having low scores' respectively. The middle 46% cases were weeded out and not considered for further analysis. After this, mean and standard deviation for each statement were calculated and t-values were computed for each item to find out the significance of mean difference among two groups in respect of each statement of preliminary draft of computer self-efficacy scale. The value of 't' is a measure of the extent to which a given statement differentiates between the high and low scoring groups. The t-values for all 37 items were computed and the items having t-value equal to or greater than 2.00 (highly discriminating) were selected for final draft of the computer self-efficacy scale and the statements having t-values less than 2.00 were rejected. The computed t-values in respect of each item of computer self-efficacy scale are given in Table 1.

**Table 1 t-values in respect of 37 Items of Preliminary Draft of Computer Self- Efficacy Scale**

Item No	t-value	Item No	t-value	Item No	t-value
1.	6.07	16.	3.56	31.	6.43
2.	5.96	17.	5.61	32.	6.69
3.	5.84	18.	10.43	33.	6.55
<b>4.</b>	<b>1.98</b>	19.	7.15	34.	7.76
5.	4.67	20.	6.89	35.	4.97
6.	5.52	21.	7.23	36.	5.83
7.	8.07	22.	7.91	37.	8.11
8.	6.81	23.	8.14		
9.	8.34	24.	6.75		
10.	6.37	25.	6.04		
11.	5.26	26.	7.82		
12.	5.09	27.	7.01		
13.	3.69	28.	6.06		
14.	4.54	29.	7.83		
15.	4.12	30.	7.25		

**Note:** ‘t-value shown in bold letters indicate rejected item.

On the basis of this, 1 item with serial no. 4 in preliminary draft was rejected and remaining 36 items were selected for the final draft of the computer self-efficacy scale for prospective secondary school teachers. A copy of final draft of computer self-efficacy scale is given as Annexure-1.

### **Reliability of Computer Self-Efficacy Scale**

The reliability of computer self-efficacy scale was determined by using two methods i.e. test-retest method and split-half method.

#### **1. Test-Retest Reliability**

The test-retest reliability of computer self-efficacy scale was estimated by administering the final draft of the scale twice on prospective secondary school teachers after a time gap of fifteen days. It is important to mention that at the time of second administration, 10 prospective teachers were not present. Therefore, test-retest reliability was computed on the basis of responses given by the 45 prospective secondary school teachers. Then, the correlation coefficient was calculated between the two sets of scores by using “Karl Pearson’s Product Moment Correlation Method”. The correlation coefficient ‘r’ i.e. reliability index came out to be 0.49, which was significant at 0.05 level of significance and thus, was considered as satisfactory in terms of reliability.

#### **2. Split-Half Reliability**

For estimating the reliability of computer self-efficacy scale by split-half method, the items of the final draft of the scale were divided into two halves by following odd-even procedure. The two halves of the scale were administered on 90 prospective secondary school



teachers selected from three B.Ed. colleges situated in Shimla district. Further, scoring was done separately for two halves of the scale and the value of correlation coefficient was computed between the scores of two halves by using Karl Pearson's Product Moment Correlation Method. The correlation coefficient for half of computer self-efficacy scale was found to be 0.79. The reliability of the whole computer self-efficacy scale was obtained by applying Spearman-Brown Prophecy Formula. Thus, the split-half reliability of computer self-efficacy scale came out to be 0.88 which indicates high internal consistency of the scale.

#### **Validity of Computer Self-Efficacy Scale:**

The validity of computer self-efficacy scale was ascertained in terms of item validity, content validity and cross validity. Computer self-efficacy scale was considered to be valid enough in terms of item validity because only those items were retained in the final draft of the scale which were having t-values equal to or greater than 2.00 (highly discriminating items). The content validity of the computer self-efficacy scale was established by carrying out critical discussions with field experts at the time of development of preliminary draft of the scale. The experts were of the opinion that the statements in computer self-efficacy scale were fully adequate and relevant to measure the computer self-efficacy of prospective secondary school teachers. In addition to this, only those items were retained in the preliminary draft of the computer self-efficacy scale for which there had been at least 90% agreement amongst experts with regard to relevance of items. Thus, the computer self-efficacy scale was found to possess adequate content validity. Furthermore, the computer self-efficacy scale can be considered to have adequate intrinsic validity because split-half reliability of the scale was found to be 0.88 which is a high correlation index. The cross validity of the computer self-efficacy scale was ensured by taking entirely different samples of prospective secondary school teachers in order to carry out item analysis, establishing reliability and developing norms.

#### **Norms for Interpreting Scores on Computer Self-Efficacy Scale:**

The scale was administered on a sample of 928 prospective secondary school teachers from 38 B.Ed. colleges selected from 7 districts of Himachal Pradesh. On the basis of collected data, the mean and standard deviation in respect of overall computer self-efficacy score of all sampled prospective secondary school teachers was calculated which came out to be 128.05 and 24.591 respectively. Then, the raw scores were converted into z-scores by taking into consideration the values of mean and standard deviation for the purpose of establishing norms for interpretation of obtained computer self-efficacy scores. The following

range of z-scores on a continuum can be used as suggestive norms for interpreting scores obtained on computer self-efficacy scale for prospective secondary school teachers.

**Table 2 Norms for Interpretation of Scores on Computer Self-Efficacy Scale for Prospective Secondary School Teachers**

<b>Sr. No.</b>	<b>Range of Raw Scores</b>	<b>Range of z-Scores</b>	<b>Interpretation</b>
1.	178-180	+2.01 and above	Extremely High
2.	160-177	+1.26 to +2.00	High
3.	141-159	+0.51 to +1.25	Above Average
4.	116-140	-0.50 to +0.50	Moderately Average
5.	98-115	-0.51 to -1.25	Below Average
6.	79-97	-1.26 to -2.00	Low
7.	36-78	-2.01 and below	Extremely Low

**Conclusions:**

Following conclusions were drawn with respect to construction and standardization of scale for measuring computer self-efficacy of prospective secondary school teachers:

1. The present computer self-efficacy scale has been specifically constructed for prospective secondary school teachers. However, it can be employed for measuring computer self-efficacy of in-service and pre-service teachers at other levels of education by taking necessary care.
2. The initial draft of computer self-efficacy scale was comprised of 45 statements which was put to strict and rigorous examination in terms of expert opinions. After such critical examination and taking into consideration the suggestions of field experts, eight statements were rejected and certain items were modified/revised. The preliminary draft of the scale was thus comprised of 37 items. After carrying out item analysis, one statement with t-value less than 2.00 (least discriminating item) was rejected and final form of the scale has 36 items.
3. The reliability coefficients computed through test-retest and split-half method were found to be 0.49 and 0.88 which were significant and thus, computer self-efficacy scale possessed satisfactory index of stability and high internal consistency respectively.
4. The validity of computer self-efficacy scale has also been ascertained in terms of item validity, content validity and cross validity which have been found to be satisfactory.
5. The suggestive norms for interpretation of obtained score on the computer self-efficacy scale have been developed on the basis of which, the level of computer self-efficacy of prospective secondary school teachers can be ascertained.



### **Applicability and Implications:**

The present research work was carried out to construct and standardize a scale for measuring computer self-efficacy of prospective secondary school teachers. This scale can be used for any diverse group of respondents differentiated on the basis of level of education, gender etc. This scale can also be used for measuring and comparing computer self-efficacy of in-service and pre-service teachers at different levels of education. The scale is fairly reliable and valid to measure the computer self-efficacy level of prospective secondary school teachers. This scale can be easily administered in individual situations and can be scored and interpreted conveniently. On the basis of scores obtained on this scale, necessary steps can be taken to bring suitable changes in computer self-efficacy beliefs of prospective secondary school teachers. Necessary changes can be brought in curriculum of pre-service teacher education programmes with special reference to computer education.

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