



CONSTRUCTION AND STANDARDIZATION OF COMPUTER PROFICIENCY SCALE FOR ELEMENTARY SCHOOL TEACHERS

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Abstract

For measuring computer proficiency of elementary school teachers, the present task was undertaken to construct and standardize computer proficiency scale. For this, data were collected from elementary school teachers by adopting multistage and stratified 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 proficiency scale was further subjected to item analysis to select only highly discriminating and valid items. The reliability of scale was established with the help of test-retest and Cronbach's Alpha method which were found to be appreciably high. The validity of computer proficiency scale was ascertained and norms were established for interpretation of obtained scores on the scale. In the last, conclusions have been presented and applicability of computer proficiency scale has been discussed.

Keywords: Construction, Standardization, Computer Proficiency.



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Introduction

The use of technology in teaching can offer a number of benefits. First, it allows teachers to organize their teaching in an efficient manner. With technology, teachers can visualize the abstract concepts and create the real world simulations. They not only help students to understand the topic better, but they can save their time for explaining the abstract content matter to students. Second, technology provides teachers with a wide range of sources that are useful for their teaching. Usually, the already available resources can offer more than what may be needed by teachers. Technology can also help teachers develop networks with other teachers from different parts of the world who share similar interests or who have the expertise in certain field. Network building can help teachers solve their teaching problems and, therefore, enhance their professionalism. Computers and computerized devices have become an integral part of society. In fact, many people use them in schools, homes, and the workplace. It has become imperative to know basic computer skills to survive in the world.

Computer proficiency is understood as one's ability to use computer-based technologies. Computer proficiency for teachers refers to the skills and knowledge which a teacher needs to have improved learning in acquisition and development of computer skills. It also encompasses the competence and skills possessed by the teacher in using computers during teaching-learning process and for providing other educational /learning experiences to the students for improving students' learning levels. The review of research studies in this area also highlights the importance of computer proficiency and problems in its use by the individuals in their work situations. **Bradlo, Hoch and Hutchinson (2002)** suggested that people were moderately calibrated with respect to their basic computer proficiency relative to that of others, but were not well-calibrated regarding their knowledge of different sub-domains of computer proficiency and various antecedents of computer knowledge (e.g. online experience, familiarity with technology) were significant predictors of objective knowledge, self-report knowledge, and calibration, while in addition, these measures were all significantly related to consequences such as number of online purchases, and concern over buying from an internet retailer. **James, Wendy and Subramaniam (2005)** indicated that there was a significant correlation between the perceived usefulness of course website features such as; lecture notes, tutorial questions and solutions and the frequency of use or access by students of such course website features. Further, it was found that the perceived usefulness of course websites was positively related to students' computer proficiency, but not with the frequency with which students missed classes. **Rondeau and Xiaolin (2009)** revealed that those students who took and passed the computer proficiency exam. (CPE) generally scored higher in their follow-on, sophomore IT course than those who passed the prerequisite, freshmen IT course. However, the CPE pass rate proved to be significantly lower than that of the course it replaced. This created an unexpected backlog of students unable to enroll in the sophomore IT course, delaying their programme of study. Furthermore, over time the CPE highlighted patterns of weakness in students' Excel skills, proving it to be a valuable diagnostic tool. **Ogwu and Ogwu (2012)** revealed that students' readiness while entering UB significantly correlated ($r = -.295$, $n = 2368$ $p = .000$) inversely with their proficiency in ICT. This indicated that as students' readiness while entering UB decreases, their proficiency in ICT tend to increase. **Zhang, Grenhart, McLaughlin and Allaire (2016)** examined that the predictors of Computer Proficiency Questionnaire (CPQ) total score as well as the three CPQ subscales (e.g., Internet and e-mail use, communication and calendaring, and computer basic). Age, education, affects, sense of control, inductive

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reasoning, perceptual speed, and psychomotor speed were associated with at least one domain of computer proficiency. Positive affect uniquely predicted communication and calendaring. As for demographic variables, age was negatively correlated with general CPQ score, internet and e-mail proficiency, and communication and calendaring proficiency; education was positively correlated with internet and e-mail proficiency, and communication and calendaring proficiency. Sense of control had significant positive correlation with general CPQ score and all the sub-scores. Positive affect positively correlated with general CPQ score and communication and calendaring proficiency, and negative affect negatively correlated with basic computer proficiency.

A glimpse of research literature reveals that most of the research studies on computer proficiency have been carried out on students and there is a lack of such studies on teachers especially in India. Moreover, there is no research tool available at present which can be safely used for measuring computer proficiency of school teachers. Hence, it was thought worthwhile to construct and standardize computer proficiency scale for elementary school teachers.

Purpose of the Scale

The present scale is intended to measure the computer proficiency of elementary school teachers.

Objectives:

1. To prepare the preliminary draft of computer proficiency scale for elementary school teachers.
2. To carry out item analysis of preliminary draft of computer proficiency scale.
3. To estimate reliability of computer proficiency scale through test-retest and Cronbach's Alpha methods.
4. To ascertain the validity of computer proficiency scale.
5. To establish norms for interpretation of scores obtained on computer proficiency scale.

Methodology

For construction and standardization of computer proficiency scale for elementary 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 100 elementary school teachers was selected for carrying

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out item analysis of preliminary draft of computer proficiency scale. At the second stage, a sample of 56 elementary school teachers was selected to compute test-retest reliability of computer proficiency scale. At the time of second administration, 8 elementary teachers were not present. Therefore, test-retest reliability was computed on the basis of responses given by the 55 elementary school teachers. At the third stage, 80 elementary school teachers were selected to estimate Cronbach's Alpha of computer proficiency scale. At the last stage, a sample of 550 upper primary school teachers was chosen for establishing norms for interpretation of scores obtained on computer proficiency scale.

Planning and Preparation of Initial Draft of Computer Proficiency Scale for Elementary School Teachers

First of all, the investigator thoroughly screened the related literature, different questionnaires, inventories and tests on computer proficiency, computer awareness, and use of computers and carried out discussions with the computer experts. On the basis of this, the investigator prepared a list of 65 items/statements on computer proficiency. These items were pooled from various sources and getting the statements of opinions from experts, researchers, experienced teachers, teacher educators and computer instructors. Items in the scale were formulated by using Likert Method of Summated Ratings on a five point continuum i.e. don't know, can't do, proficient to some extent, proficient to great extent and fully proficient. The scoring was done by awarding 1, 2, 3, 4 and 5 marks respectively for above mentioned responses. All statements were positive in nature and there was no negative statement in the scale.

Editing and Revision of Initial Draft of Proficiency Scale for Teachers:

After writing the statements/items for computer proficiency scale, they were edited and revised. For this, the initial draft of the scale was given to experienced teachers, teacher educators, 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, 10 items were rejected from the initial draft of computer proficiency scale and it was decided to have 55 items in preliminary draft of computer proficiency scale.

Data Analysis and Results

Item Analysis of Preliminary Draft (Try-Out Form) of Computer Proficiency 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 proficiency scale. To carry out item analysis, the preliminary draft of computer proficiency scale was administered on a sample of 100 elementary school teachers of Kinnaur and Lahaul-Spiti districts of Himachal Pradesh. Afterwards, 27% of the elementary school teachers (40 teachers) with highest total score and 27% of the elementary teachers with lowest total score on computer proficiency 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 proficiency 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 55 items were computed and 41 items having t-value equal to or greater than 1.75 (highly discriminating) were selected for final draft of the computer proficiency scale / 14 items/statements having t-value less than 1.75 were rejected.

The total score on the scale can range from 41 to 205. The higher total score on the scale reflects higher computer proficiency and vice-versa.

RELIABILITY OF COMPUTER PROFICIENCY SCALE

The reliability of computer proficiency scale was determined by using test-retest and Cronbach’s Alpha method.

1. Test-Retest

The test-retest reliability of computer proficiency scale for elementary teachers was estimated by administering the final draft of the scale twice on 56 school teachers after a time gap of fifteen days. It is important to mention that at the time of second administration, 8 teachers were not present. Therefore, test-retest reliability was computed on the basis of responses given by the 48 elementary school teachers. Then the coefficient of correlation 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

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0.732 which is significant at 0.01 level of significance. The scale was found to have appreciably high reliability.

2. Cronbach's Alpha

Cronbach's alpha is designed as a measure of internal consistency. The value of Cronbach's alpha of computer proficiency scale came out to be 0.784 respectively. This is indicative of the fact that computer proficiency scale for elementary teachers is internally consistent to a greater extent.

VALIDITY OF COMPUTER PROFICIENCY SCALE:

The validity of computer proficiency scale was ascertained in terms of item validity, content validity and cross validity.

- 1. Content Validity:** The content validity of computer proficiency 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 proficiency scale were fully adequate and relevant to measure the computer proficiency level of teachers. In addition to this, only those items were retained in the preliminary draft of the computer proficiency scale for which there has been at least 90% agreement amongst experts with regard to relevance of items. Thus, the computer proficiency scale was found to possess adequate content validity.
- 2. Cross Validity:** The cross validity of the computer proficiency scale was ensured by taking entirely different samples of elementary school teachers in order to carry out item analysis, establishing reliability and developing norms.
- 3. Item Validity:** Computer proficiency scale was considered valid enough in terms of item validity because only those items were retained in the final draft of the scale which was having t-values equal to or greater than 1.75 (highly discriminating items).

Statistical Results

For establishing norms for interpreting obtained scores on computer proficiency scale, a total of 550 elementary school teachers were selected from 8 districts of Himachal Pradesh by employing incidental sampling technique. Based on the scores of 550 elementary teachers, following statistical results were obtained.

Table 1 Statistical Results in respect of Computer Proficiency Scale

N	Mean	SD
550	132.5	28.2

Norms: On the basis of the statistical results presented in Table 1, z-score norms have been prepared and the same have been presented in Table 2.

NORMS FOR INTERPRETING SCORES ON COMPUTER PROFICIENCY SCALE FOR TEACHERS:

Norms for interpretation of the level of Elementary School Teachers' Computer Proficiency have been given in Table 2.

Table 2 z-scores Norms for Computer Proficiency Scale

Sr. No.	Range of Raw Scores	Range of z-Scores	Interpretation (in terms of Computer Proficiency)
1.	189-205	+2.01 and above	Extremely High
2.	168 – 188	+1.26 to +2.00	High
3.	147 – 167	+0.51 to +1.25	Above Average
4.	119 – 146	-0.50 to +0.50	Average
5.	97 – 118	-1.25 to -0.51	Below Average
6.	76 – 96	-2.00 to -1.26	Low
7.	75 – below	-2.01 and below	Extremely Low

Conclusions:

Following conclusions were drawn with respect to construction and standardization of scale for measuring computer proficiency of elementary school teachers:

1. The present computer proficiency scale has been specifically constructed for elementary school teachers. However, it can be employed for measuring computer proficiency of high schools and senior secondary school teachers by taking precaution and care.
2. The initial draft of computer proficiency scale was comprised of 65 statements which were put to strict and rigorous examination in terms of expert opinions. After such critical examination and taking into consideration the suggestions of field experts, 10 items were rejected and certain items were modified/revised. The preliminary draft of the scale was thus comprised of 55 items. After carrying out item analysis, 14 items with t-value less than 1.75 (least discriminating item) were rejected and final form of the scale has 41 items.
3. The reliability of the scale was computed through test-retest method and Cronbach Alpha method which were found to be 0.732 and 0.784 respectively and therefore, the

scale can be considered to have appreciably high index of stability and high internal consistency respectively.

4. The validity of computer proficiency scale has also been ascertained in terms of item validity, content validity and cross validity which were found to be satisfactory.
5. The suggestive norms for interpretation of obtained scores on the computer proficiency scale have been developed on the basis of which, the level of computer proficiency of elementary school teachers can be ascertained.

Applicability and Implications:

The present research work was carried out to construct and standardize a scale for measuring computer proficiency of elementary 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 proficiency of school teachers at different levels of education. The scale is fairly reliable and valid to measure the computer proficiency level of elementary 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 proficiency of elementary school teachers.

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