CONSTRUCTION AND STANDARDIZATION OF COMPUTER KNOWLEDGE TEST FOR ELEMENTARY SCHOOL TEACHERS

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Abstract

For measuring computer knowledge test of elementary school teachers, the present task was undertaken to construct and standardize computer knowledge test. 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 knowledge test was further subjected to item analysis to select valid items with moderate difficulty level. The reliability of test was established with the help of test-retest and Cronbach's Alpha method *which were found to be appreciably high. The validity of computer knowledge test was ascertained and norms were established for interpretation of obtained scores on the test. In the last, conclusions have been presented and applicability of computer knowledge test has been discussed.*

Keywords: *Construction, Standardization, Computer knowledge.*

INTRODUCTION

Technology has impacted almost every aspect of life today, and education is no exception. Earlier, technology in education was a debatable topic amongst the society. Everyone had their own views on modernizing education and making it technology aided. There were a huge number of positives and negatives to education technology. But, gradually as technology was embraced by the educational institutes, they realized the importance of technology in education. Its positives outnumbered the negatives and now, with technology, education has taken a whole new meaning. Technology and education are a great combination if used together with a right reason and vision.

Computer knowledge means the knowledge of computer hardware, input devices, output devices etc. and the skill of using various software applications like MS-word, excel, powerpoint, internet etc. Computer knowledge is being aware of how a computer looks and functions. This doesn't mean just what programmes you can load into a computer but also the parts that make up a computer on the inside. Computer knowledge for teachers can be stated as mixture of knowledge and interaction with computers. Computer awareness involves conceptual knowledge related to basic terminology and skills to perform tasks in word processing, database, spreadsheet, presentation graphics and base operating system function. New methods and techniques in information technology have become important tool in learning.

Massoud (1991) obtained from the computer knowledge items were compared to the educational testing service (ETS) sample. The comparison indicated some significant differences between the two samples. **Cagiltay et al (2001)** found that teachers were not sufficiently trained to use computers in their classroom but they agreed that technology will significantly influence education and that the ultimate goal of teacher computer literacy training should be to have computer-literate teachers who utilize computer technology

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successfully in the classroom. **Muir-Herzig (2003)** indicated that teachers' technology use, students' technology use, and overall technology use had no significant positive effect on the grades and attendance of at-risk students. In addition, the study found that technology use was low among the teachers in the sample. **Kay (2007)** found that boys used computers to play games, use educational software, and access the internet, whereas girls used computers for e-mail, instant messaging, and homework. Girls appeared to prefer to use computers for goal-oriented activities with meaningful contexts. **Gross and Latham (2009)** found that undergraduate students were computer information proficient, but their knowledge and information searching skills were insufficient. **Nihuka (2010)** showed that on an average, students had positive perceptions. In students' perspective, results showed that the first priority benefits of using computer and internet as e-learning technologies were; (i) to have more responsibility for their learning, (ii) to have easy access to courses, assignments and course outlines and (iii) enhancing students' learning. **Tharanganie, Wickremasinghe and Lakraj (2011)** found that confirmed that the two variables, computer awareness and computer literacy were associated with each other, rather than considering these two variables separately, considering them jointly was expected to yield better results. **Das, Kharbuli and Rynjah (2017)** indicated that participants of orientation programmes were more aware of ICT and more proficient in using it in their professional development. There was a significant difference in the number of participants using ICT for making power point presentation for lectures between participants of the OPs and refresher courses.

A glimpse of research literature reveals that most of the research studies on computer knowledge 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 knowledge of school teachers. Hence, it was thought worthwhile to construct and standardize computer knowledge test for elementary school teachers.

PURPOSE OF THE TEST

The present test is intended to measure the computer knowledge of elementary school teachers.

OBJECTIVES OF THE STUDY

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

METHODOLOGY

For construction and standardization of computer knowledge test 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 out item analysis of preliminary draft of computer knowledge test. At the second stage, a sample of 62 elementary school teachers was selected to compute test-retest reliability of

pISSN 2320-9305 eISSN 2347-5706
Volume 6, Issue 2, July 2018

computer knowledge test. At the time of second administration, 16 elementary teachers were not present. Therefore, test-retest reliability was computed on the basis of responses given by the 46 elementary school teachers. At the third stage, 80 upper primary school teachers were selected to estimate reliability of the computer knowledge test through Cronbach's Alpha method. At the last stage, a sample of 550 elementary school teachers was chosen for establishing norms for interpretation of scores obtained on computer knowledge test.

Planning and Preparation of Initial Draft of Computer Knowledge Test for Elementary School Teachers

First of all, the investigator thoroughly screened the related literature, different questionnaires, inventories and tests on 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 50 items written in English language. This test is comprised of true / false / don't know type items. There are 2 marks for every correct response; one mark for wrong response and zero mark for don't know response. The correct response to any item of the test indicates complete knowledge and incorrect/ wrong response to any item of the test indicates individual's incorrect / false knowledge about computers. On the other hand, a response of 'don't know' by the individual on any item will indicate his / her being indecisive / unaware about that specific aspect of computers. The total computer knowledge score of a teacher on this test was computed by adding the score on all individual items of the test.

Editing and Revision of Initial Draft of Computer Knowledge Test for Teachers:

After writing the items for computer knowledge test, they were edited and revised. For this, the initial draft of the test was given to experienced teachers, teacher educators, computer teachers and experts, 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 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 initial draft. It was decided to have 42 items in preliminary draft of computer knowledge test.

ANALYSIS AND INTERPRETATION OF THE DATA

Item Analysis of Preliminary Draft (Try-Out Form) of Computer Knowledge Test

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

The preliminary draft of computer knowledge test was administered on a sample of 100 elementary school teachers of Kinnaur and Lahaul-Spiti districts of Himachal Pradesh. The selection of these elementary school teachers was made by employing multistage sampling along with random sampling technique. The scoring was done in the manner as mentioned earlier.

The technique of item analysis was employed for selection / rejection of test items for preparing final draft of computer knowledge test. For this, 27% of the elementary school teachers (40 teachers) with highest total score and 27% of the elementary teachers with lowest total score on computer awareness test 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. Then, the validity index for each item was computed in terms of 't-value'. t-value indicates the validity index of an item (i.e. its discriminative power). On the basis of computation of t-value, only those items were retained for final draft of the test which was having t-value equal to or greater than 1.75. Also, difficulty index for each item of the test was calculated and only those items whose difficulty index lied between 0.25 to 0.75 were selected for its final draft. The values of difficulty index and validity index in respect of 42 items of preliminary draft of computer knowledge test are given in Table 1.

Table 1. Difficulty Indices and Validity Indices in respect of 42 Items of Preliminary Draft of Computer Knowledge Test

Item No.	*Difficulty Index*	*Validity Index*	*Item No.*	*Difficulty Index*	*Validity Index*
1.	0.629	2.148	*23.*	0.333	*2.679*
2.	0.686	3.045	*24.*	0.463	3.927
3.	0.5	3.748	*25.*	0.352	2.647
*4.**	0.89	0.789	*26.*	0.481	2.647
5.	0.37	2.341	*27.*	0.556	2.253
6.	0.519	4.341	*28*	0.445	2.176
7.	0.611	3.278	*29. **	0.18	0.548
8.	0.519	2.393	*30. **	0.20	0.124
*9. **	0.19	0.425	*31.*	0.426	2.500
*10. **	0.97	0.258	*32.*	0.556	1.882
11.	0.556	2.850	*33. **	0.12	0.349
*12. **	0.13	0.567	*34*	0.519	1.890
*13. **	0.21	0.457	*35*	0.482	3.182
14.	0.556	2.726	*36*	0.463	2.977
15.	0.445	3.894	*37*	0.556	2.742
16.	0.389	1.996	*38*	0.482	2.366
*17. **	0.16	0.129	*39*	0.37	2.587
18.	0.482	3.156	*40 **	0.23	0.458
*19. **	0.87	1.235	*41*	0.278	2.76
*20. **	1.23	0.498	*42*	0.611	3.621
21.	0.519	2.596			
22.	0.426	2.535			

**------ indicates rejected items.*

pISSN 2320-9305 eISSN 2347-5706
Volume 6, Issue 2, July 2018

After computing the values of difficulty index and validity index in respect of 42 items of the test, 12 items were rejected and 30 items were retained for final draft of computer knowledge test. The total computer knowledge test score of teachers can be computed by adding the score on all 30 items of the test. The score of the test can range from 0 to 60. The higher total score of the test will reflect high computer knowledge level and vice-versa.

RELIABILITY OF COMPUTER KNOWLEDGE TEST

The reliability of computer knowledge test was determined by using test-retest and Cronbach's Alpha method.

1. Test-Retest

The test-retest reliability of computer knowledge test for elementary teachers was estimated by administering the final draft of the test twice on 62 elementary school teachers after a time gap of fifteen days. It is important to mention that at the time of second administration, 16 teachers were not present. Therefore, test-retest reliability was computed on the basis of responses given by 46 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 0.698 which is significant at 0.01 level of significance. The test was found to have fairly satisfactory index of reliability.

2. Cronbach' s Alpha

Cronbach's alpha is designed as a measure of internal consistency. The value of Cronbach's alpha of computer knowledge test came out to be 0.883 respectively. This value is indicative of the fact that computer knowledge test for is internally consistent to a greater extent for measuring computer knowledge of elementary school teachers.

VALIDITY OF COMPUTER KNOWLEDGE TEST:

The validity of computer knowledge test was ascertained in terms of content validity, cross validity and item validity:

1.Content Validity: The content validity of computer knowledge test was established by carrying out critical discussions with field experts at the time of development of preliminary draft of the test. The experts were of the opinion that the items in computer knowledge test were fully adequate and relevant to measure the computer knowledge level of teachers. In addition to this, only those items were retained in the preliminary draft of the computer knowledge test for which, there has been at least 90% agreement amongst experts with regard to relevance of items. Thus, the computer knowledge test was found to possess adequate content validity.

2.Cross Validity: The cross validity of the computer knowledge test 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 knowledge test was considered valid enough in terms of item validity because only those items were retained in the final draft of the test which were having t-values equal to or greater than 1.75 (highly discriminating items). Furthermore, items with moderate difficulty were retained for final draft of computer knowledge test.

Statistical Results

For establishing norms for interpreting obtained scores on computer knowledge test, 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 2. Statistical Results in respect of Computer Knowledge Test

N	Mean	SD
550	35.76	12.49

Norms: On the basis of the statistical results presented in Table 2, z-score norms have been prepared and the same have been presented in Table 3.

NORMS FOR INTERPRETING SCORES ON COMPUTER KNOWLEDGE TEST FOR TEACHERS:

Table 3. Raw Scores and Corresponding z-scores on Computer Knowledge Test

Raw Score	z-score	Raw Score	z-score	Raw Score	z-score
0	-2.86309	21	-1.18175	41	0.419536
1	-2.78303	22	-1.10168	42	0.4996
2	-2.70296	23	-1.02162	43	0.579664
3	-2.6229	24	-0.94155	44	0.659728
4	-2.54283	25	-0.86149	45	0.739792
5	-2.46277	26	-0.78143	46	0.819856
6	-2.38271	27	-0.70136	47	0.89992
7	-2.30264	28	-0.6213	48	0.979984
8	-2.22258	29	-0.54123	49	1.060048
9	-2.14251	30	-0.46117	50	1.140112
10	-2.06245	31	-0.3811	51	1.220176
11	-1.98239	32	-0.30104	52	1.30024
12	-1.90232	33	-0.22098	53	1.380304
13	-1.82226	34	-0.14091	54	1.460368
14	-1.74219	35	-0.06085	55	1.540432
15	-1.66213	36	0.019215	56	1.620496
16	-1.58207	37	0.099279	57	1.70056
17	-1.502	38	0.179343	58	1.780624
18	-1.42194	39	0.259408	59	1.860689
19	-1.34187	40	0.339472	60	1.940753
20	-1.26181				

pISSN 2320-9305 eISSN 2347-5706
Volume 6, Issue 2, July 2018

Norms for interpretation of the level of Elementary Teachers' Computer knowledge have been given in Table 4.

Table 4. z-scores Norms for Computer Knowledge Test

Sl. No.	Range of Raw Scores	Range of z-Scores	Interpretation (in terms of Computer Knowledge Test)
1.	52 – 60	+1.26 to +2.00	High
2.	43 – 51	+0.51 to +1.25	Above Average
3.	30 – 42	-0.50 to +0.50	Average
4.	21 – 29	-1.25 to -0.51	Below Average
5.	0 – 20	-2.00 to -1.26	Low

CONCLUSIONS

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

1. The present computer knowledge test has been specifically constructed for elementary school teachers. However, it can be employed for measuring computer knowledge of high school and senior secondary school teachers by taking precaution and care.
2. The initial draft of computer knowledge test was comprised of 50 items 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, 8 items were rejected and certain items were modified / revised. The preliminary draft of the test was thus comprised of 42 items. After carrying out item analysis, on the basis of computation of t-value, only those items were retained for final draft of the test which were having t-value equal to or greater than1.75. Also, difficulty index for each item on the test was calculated and only those items whose difficulty index lied between 0.25 to 0.75 were selected and final form of the test has 42 items.
3. The reliability of the test computed through test-retest method and Cronbach's Alpha was found to be 0.698 and 0.883 respectively which were highly significant and thus, computer knowledge test can be considered to have satisfactory index of stability and high internal consistency respectively.
4. The validity of computer knowledge test 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 knowledge test have been developed on the basis of which, the level of computer knowledge of elementary school teachers can be ascertained.

APPLICABILITY AND IMPLICATIONS

The present research work was carried out to construct and standardize a test for measuring computer knowledge of elementary school teachers. This test can be used for any diverse group of respondents differentiated on the basis of level of education, gender etc. This test can also be used for measuring and comparing computer knowledge of teachers working at different levels of education. The test is fairly reliable and valid to measure the computer

knowledge level of elementary school teachers. This test can be easily administrated in individual situations and can be scored and interpreted conveniently. On the basis of scores obtained on this test, necessary steps can be taken to bring suitable changes in computer knowledge of elementary school teachers.

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pISSN 2320-9305 eISSN 2347-5706
Volume 6, Issue 2, July 2018

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