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"DEVELOPMENT AND VALIDATION OF ICT COMPETENCY SCALE FOR SENIOR SECONDARY SCHOOL TEACHERS."

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Abstract: The purpose of the present study is to assess the ICT-based competencies essential for teachers for using Information and Communication Technology (ICT) for instructional purposes. Related literature is reviewed to prepare a preliminary draft of 42 items. The survey research method is employed in this study. The questionnaire items are framed with inputs from experts in the field of educational technology. The Item pool is based on a four-point rating scale related to 3 main domains of teachers' ICT competencies namely, Technological ICT operations, Pedagogical ICT competencies, and Social and Ethical ICT practices. Later on, 12 items are deleted as per the open of experts. This tool is randomly administered to 100 Senior Secondary School Teachers of the U.P. board in the Saharanpur district. The data is collected and analyzed by contacting the represented samples of teachers from senior secondary schools. Item- analysis is done and 30 items are retained in the final draft. The reliability and validity of the tool are demonstrated by adequate psychometric analysis to measure teachers' ICT competency.

Keywords: Development and Validation, ICT and Competency, Factor Analysis, Senior Secondary School Teachers.

Introduction:

Information and Communication Technologies (ICTs) have substantially impacted the practices of education and related fields. Now it is more vital to use and disseminate information than that of accessing information. These trends have resulted in a change in teachers' roles from merely information sources to having adequate ICT competency to integrate ICT into the ways of students learning. ICT-based instructional methods are more progressive and conducive to fulfilling the gaps in traditional form teaching and learning. In this context, schools are restructuring their curricula to enhance learners' scientific and analytical abilities. Today ICT integration is assumed as a process that stimulates students learning positively. Teachers' competencies are related to accomplishing educational goals. And teachers' ICT competencies are synchronized with the actualization of instructional objectives. Therefore teachers' positive attitudes and perceptions related to ICT competencies are prerequisites for the utilization of ICT-based services in school settings. With the increasing use of ICT and computers, teachers' attitudes are being changed positively to adopt new technology to learning circumstances. In other words, teachers are supposed to have a sufficient understanding of ICT skills conditional for integrating ICT into learning settings therefore teachers have to nurture ICT-related competencies that transform teaching and learning paradigms

Meaning of ICT: ICT stands for Information and Communication Technology it is the combination of two terms that is information and Technology and Communication Technology information technology is a scientific and engineering discipline and management technique used in handing the information its application and Association with social economical and cultural matters UNESCO (2002).

Communication Technology is the electronic system that facilitates communication between individuals and the groups who are not physically present at the same location "According to Blurton,C (2002) ICTs stands for information and communication technology and defined as a diverse set of technological tools and resources used to communicate and to create, disseminate, store and manage information."

ICT transforms society into information based society, for this professional development and change in the attitude of teachers as well as of the society towards learning process is essential.

OBJECTIVES:

The main objective of this study is to validate and standardize research tool which is used to measure ICT competency of senior secondary school teachers.

OPERATIONAL DEFINITION AND LIMITATION OF STUDY

Researcher has defined the operational terms of the present study and determined the limitations of the study, keeping in mind the availability of time, money and resources.

ICT: ICT means technological tools and resources used to create, communicate, store, retrieve, disseminate and manage information.

TEACHERS' ICT COMPETENCY: It is related to teachers' ICT skills, knowledge and behavior to perform instructional activities effectively.

SENIOR SECONDARY SCHOOL: UP board Senior Secondary School

Present study is administered on 100 male and female teachers teaching at Senior Secondary Schools to assess their ICT competency in Saharanpur district.

RESEARCH METHODOLOGY

METHOD:

The survey research method is employed by researcher to collect and analyze data.

Data collection tool:

Self developed and validated scale to measure teacher's ICT competency is used to collect data from 100 senior secondary school teachers teaching in UP board in Saharanpur district. Data is collected through a questionnaire by contacting teachers personally. Instructions and precautions are clearly conveyed to respondent.

Sample and sampling technique:

Sample:

100 Teachers teaching at Senior Secondary School are selected through simple random sampling.

Content Analysis :

In order to develop a research tool, first of all it is examined and rectified by research supervisor and the experts. Relevancy of item statement, difficulty level, language accuracy and clarity of tool is analyzed and decided by experts of related fields. After careful observation of item statements and with 95 percent consensus among experts, 42 ICT competency statements pertaining to 3 dimensions of the scale namely part 1.Technological ICT operations. Part 2, Pedagogical ICT competencies. Part3, Social and Ethical ICT practices are prepared. Four point rating scale is used to measure the level of ICT competency in this scale. For statements ranging from not

competent, somewhat competent, competent and highly competent, Point 1, 2, 3 and 4 are assigned respectively for the purpose of scoring and interpretation.

Dimensions	Name of Dimensions / Factor
Dimension-1	Technological ICT operations
Dimension 2.	Pedagogical ICT competencies
Dimension 3.	Social and Ethical ICT practices.

Scoring:

Scores of all the 100 units of sample are personally collected and for statements point 1,2,3 and 4 are assigned to not competent to highly competent responses of respondent respectively. Thus each statement has maximum 4 and minimum one score for scoring purpose. The minimum score of the scale is 30, while the maximum score is 120. The scores of the scale are categorized into four level of competencies i.e.,: highly competent, competent, somewhat competent and not competent by assigning 4, 3, 2 and 1 point respectively to each statement in the scale.

Tryout stage:

First Tryout:

Preliminary draft of the scale is administered on exceedingly small representative group of sample to improve and remove any language ambiguity of test item.

Proper Tryout:

Then it is randomly given to 100 senior secondary level teachers of UP board in Saharanpur to take decision about items on the basis of applicable statistical calculations.

Item analysis:

Item analysis is an important step for construction and standardization of any research tool. Selection of test items for retaining/ deleting items is done on the basis of item analysis. Questionnaires are arranged in descending order of obtained scores. Top 27 percent respondents and bottom 27 percent respondents are placed in higher and lower groups respectively. Both groups are used for statistical calculation to do item- analysis for

selection of items. Paired sample t- test is applied for analysis of each item to determine its discriminatory power. t-value is calculated for all 42 items and items with t-value 2.58 and more at (.01 level of significance) are retained and items with less than 2.58 t- value are rejected. Finally 30 items are retained out of 42 items in the final draft of the scale to measure the senior secondary school teachers ICT competency.

Table:

Mean, SD. t value for each item (n =100)						
Item No.	**Upper Group**		**Lower Group**		**Statistical Values**	
SR.NO.	**Mean**	**S.D.**	**Mean**	**S.D**	**t value**	**Item Status.**
1.	3.96	.20	2.48	1.08	6.82	Retained
2.	4.0	0	2.24	.83	10.59	Retained
3.	3.1	.80	3.0	.90	1.79	Deleted
4.	3.96	.19	2.16	.89	10.39	Retained
5.	4.0	0	2.04	.73	13.36	Retained
6.	2.7	1.3	2.5	1.2	1.51	Deleted
7.	4.0	0	2.0	.91	10.95	Retained
8.	3.1	.73	1.8	.88	6.26	Retained
9.	3.9	.19	1.56	.58	18.59	Retained
10.	4.0	0	1.96	.73	13.88	Retained
11.	4.0	0	2.04	.73	13.33	Retained
12.	2.7	1.3	2.4	1.4	1.19	Deleted
13.	3.64	.48	2.04	.73	12.39	Retained
14.	3.1	.90	3.0	1.0	.86	Deleted
15.	4.0	0	1.76	.59	18.75	Retained
16.	4.0	0	2.0	.86	11.54	Retained
17.	3.8	.40	1.80	.76	12.24	Retained
18.	4.0	0	1.88	.78	13.57	Retained
19.	4.0	0	2.36	.86	9.53	Retained
20.	3.96	.19	2.12	.88	10.81	Retained
21.	2.6	1.2	2.4	1.0	1.07	Deleted
22.	4.0	0	1.92	.75	13.69	Retained
23.	4.0	0	2.48	.71	10.64	Retained

24.	3.1	.80	3.3	.89	1.13	Deleted
25.	3.0	.90	3.2	.73	1.62	Deleted
26	4.0	0	2.84	.74	7.77	Retained
27	3.0	1.0	3.2	.90	1.24	Deleted
28	4.0	0	2.44	.76	10.15	Retained
29	3.96	.19	2.12	.72	12.33	Retained
30	3.3	.70	3.2	.80	.84	Deleted
31	4.0	0	1.88	.83	12.73	Retained
32	4.0	0	2.48	.77	9.86	Retained
33	3.96	.19	2.12	.65	12.33	Retained
34	4.0	0	2.28	.67	12.68	Retained
35	2.6	1.3	2.4	1.5	1.57	Deleted
36	3.92	.27	2.16	.85	10.59	Retained
37	3.96	.19	2.40	.76	10.15	Retained
38	4.0	0	2.12	.78	12.03	Retained
39	4.0	0	2.36	.95	8.61	Retained
40	3.96	.19	2.76	.72	7.85	Retained
41	2.7	1.3	2.5	1.5	1.23	Deleted
42	3.10	.90	2.7	1.0	1.74	Deleted

Final draft of ICT Competency Scale:

In the final draft 12 items out of 42 items are rejected and 30 items are retained and selected for the scale of teacher's ICT competency. The scale comprises 30 statements which are placed in order into the scale to procure an honest response.

Table:

Distribution of items on scale of Teachers' ICT Competency in specified dimensions.

No.	Dimension / Factor	Item No
1	Technological ICT operations	1-18
2	Pedagogical ICT competencies	19-25
3	Social and Ethical ICT practices	26-30

Factor Analysis of the Scale: Each dimension of Scale was taken as a factor for using Factor Analysis technique. All five used dimensions are named here as F1, F2, F3, F4 & F5.

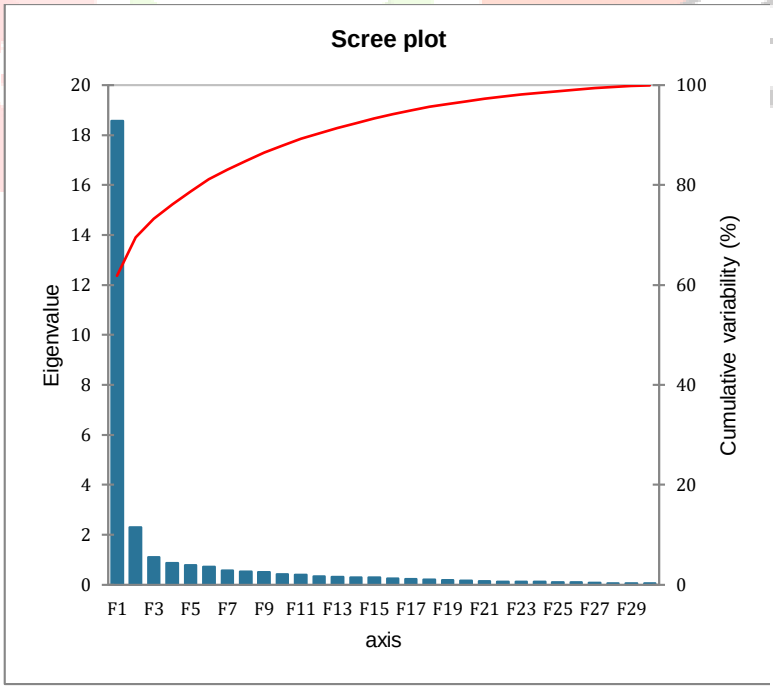
Table:

(Eigen values, variance and total variance of five factors.)

Principal Component Analysis

Eigen values:

	F1	F2	F3
Eigen value	18.568	2.293	1.110
Variability (%)	61.895	7.644	3.700
Cumulative %	61.895	69.538	73.238



Factor loadings:

	F1	F2	F3
I can identify computer hardware parts like monitor, CPU, keyboard, mouse and printer etc.	0.66	-0.05	0.59
I can properly connect the computer and its components.	0.78	-0.12	0.37
I can use different operating systems like Windows, iOS, Android and Linux etc.	0.80	-0.18	0.24
I can create and organize various types of computer documents, files and folders	0.86	-0.20	0.23
I can share and transfer files between a hard drive and a pen drive.	0.84	-0.02	0.11
I can troubleshoot and repair my computer.	0.59	-0.42	-0.12
I can protect my computer from malware and virus.	0.83	-0.20	-0.11
I can install and download software easily on my computer and devices.	0.84	-0.11	-0.19
I can operate a word processor, MS Word, to write and edit text documents.	0.82	-0.37	0.06
I can operate a spreadsheet MS Excel to sort and compute data	0.77	-0.38	0.07
I can operate MS PowerPoint for the presentation of slides and text materials.	0.85	-0.31	0.00
I can present slides with simple animation and audio-visual effects.	0.79	-0.31	-0.11
I can work with open-source software [OSS] like OBS for recording and streaming.	0.79	-0.28	-0.22
I can operate different media files by using different media players and LCD projectors.	0.83	-0.30	-0.05
I can capture, crop and edit digital images/ Photos.	0.73	0.11	-0.30
I can connect internet using LAN and wireless networks.	0.76	-0.13	-0.34
I can use various search engines and web browsers like Google, Yahoo, Bing, Chrome and Firefox etc.	0.88	-0.00	0.09
I can create Email id to send email messages with attachments.	0.75	0.53	0.02
I motivate students to use ICT tools critically and positively.	0.60	0.49	0.12
I apply ICT based strategies to enhance student learning.	0.75	0.35	0.15
I can design and prepare ICT integrated educational programmes.	0.78	0.12	-0.09
I can integrate ICT to manage curriculum and instructional activities.	0.85	0.06	-0.10
I can do surfing on internet to locate sources of information for teaching.	0.81	0.29	0.04
I use ICT for online professional development.	0.83	0.17	-0.00
I can apply ICT techniques to evaluate student learning electronically.	0.81	0.22	-0.07
I can chat online using instant messaging tools like Gmail, Yahoo, MSN and Skype Etc.*	0.80	0.23	-0.00
I can use social networking sites and ICT to communicate with peers and students.	0.76	0.19	0.01
I use technology tools for collaborative learning.	0.82	0.05	-0.13
I can use ICT tools to facilitate community learning.	0.76	0.28	-0.16
I educate students to use ICT safely and ethically.	0.659	0.515	-0.084

Reliability:

Reliability of test means, consistency of scores obtained in different time and occasion or stability of scores in different set of equivalent items. Therefore Test- retest, Split-half techniques (Even-Odd items) along with

Cronbach Alpha value are used to calculate reliability of tool and to determine the degree of internal consistency. 0.84 and 0.92 correlation Coefficient are found with both techniques which is an index of very high reliability of developed scale.

Table:

[Factors name, Cronbach value, number of the items and coefficient of correlation between factors and total score of scale]

Sr. No.	Dimension / Factors Name	No of Items	Correlation Coefficient	Cronbach Alpha Value.
1	Technological ICT operations.	18	.98	.98
2.	Pedagogical ICT competencies.	07	.92	.95
3.	Social and Ethical ICT practices.	05	.87	.93

VALIDITY:

Validity of any measuring tool means, validity is the extent to which a test measures what it purports to measure. Validity of test is determined on certain criterion, like the verdict of experts. Content and face validity is determined through rating with experts from different disciplines, from the first draft to the final draft of the scale. Hence, it is found that this tool is reliable and valid.

Norms and Interpretation Table:

Mean and S.D are calculated and norms of the tool are determined and reported in the table for interpretation.

Mean score of ICT Competency	Quantitative interpretation of scores	Qualitative interpretation (ICT Competency)
3.1 – 4.0	91 - 120	Highly Competent
2.1 -3.0	61 - 90	Competent
1.1 – 2.0	31 - 60	Somewhat Competent
0.0 -1.0	0 - 30	Not Competent

CONCLUSION:

This study describes the development and standardization of teachers ICT competency at Senior Secondary Level. Reliability and validity of the tool is determined in context-specific conditions and collected data is based on teachers self measured responses. However, the psychometric analysis of the scale indicates that the tool is reliable and valid. Therefore this research tool is useful to measure the level of Information and Communication Technology (ICT) competency of teachers teaching at senior secondary schools.

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