DEVELOPING VALID AND RELIABLE ICT ATTITUDE & COMPETENCE INSTRUMENT FOR HIGH SCHOOL STUDENTS-A PILOT STUDY

Asha Elizabeth Chhetri
Ph.D. Scholar, Department of Education,
Manipur University, Imphal, Manipur.
Thokchom Asha Sinha
Associate Professor, Department of Education,
G.P, Women's College, Imphal, India.

Abstract:

ICT (Information and Communication Technology) has been considered as a powerful tool in bringing efficient teaching-learning in educational settings. Efficiency in a task can only be brought if there is positive attitude and competence towards that task. This paper aims to measure validity and reliability of ICT attitude and competence instruments for students studying during the session 2017-18. A pilot study was conducted on 50 class-X students of four high schools in Imphal West, Manipur for measuring validity of self-made ICT Competence instrument. For checking the reliability of ICT-Attitude Scale developed by Kofi Ayebi Arthur (2010), test-retest method was adopted. Self-made ICT Competence instrument obtained an acceptable valid result. The test-retest result for ICT-Attitude Scale also gave an acceptable reliability value of 0.96.

Keywords: *Valid and reliable, ICT-Attitude, ICT Competence, instrument.*

The world today has been transformed from industrial age to information age. At this 21st Century in which we are living, all aspects of life, be it of medicine, tourism, banking, business, job opportunities have been touched by information and communication technology and we are compelled to adopt it. ICT acts as a powerful tool in changing educational practices to make it efficient. Studies has proved that computers can make learning experience much more exciting, satisfying and rewarding for the learner and teacher. Kulick, Bangert and William (1985) have explored that computer programs can raise students' scores in final examination. Using ICT as a tool for students' learning and teachers' instruction to bring quality education in both formal and non-formal settings is necessary (Mudasiru O.Yusuf and Modupe R. Balogun, 2011). Moreover, gaining competence in ICT is one of the most important challenges of 21st century where it opens route for job opportunities and place oneself capable for these era of modernization and globalization. Effective adoption and integration in ICT is not gained only by maintaining the quality and quantity of ICT equipment, but by having positive attitude and competence towards them. More positive attitudes towards computer were associated with a higher level of computer experience was affirmed by Dyck and Smither, 1995; Teo 2008).

According to Merriam Webster, attitudes are positive or negative feelings, or a way of thinking that affects a person's behavior. Lee (1997) explored that, positive responses towards ICT use as one of the causes for success. So, there is a dire need to develop positive attitude and competence towards ICT among students so that they would be able to make a place for themselves in IT revolutionized era.

Rationale

ICT is considered as a potentially powerful tool in bringing efficiency in education of different settings such as urban, rural, high and low socioeconomic population, young and old age persons, girls and women, person with disabilities and all those who cannot avail themselves for formal education. Using ICTs in classroom prepares the current generation of students for a workshop since ICT components such as computers and internet are becoming pervasive. Possessing effective and efficient ICT skills are considered as a representing and outfoxing criteria in an increasing globalizing job market. EnGauge of North Central Regional Educational Laboratory (U.S) has identified some skills for global economy which is called the 21st Century skills; The skills also called the digital literacy skills comprise of cultural literacy, functional literacy, visual literacy, scientific and technological literacy and information literacy; high order thinking and reasoning skills, inventive thinking skills and high productivity and effective communication skills. ICT promotes these skills and brings about quality education by creating learner-centered environment.

Although ICT integration in education has undeniably regarded as an effective means to bring efficiency, ICT access, ability and affordability has confronted a high challenge in Indian scenario. Sheikh, Majid Mustafa (2016) mentioned that the main barrier in Indian rural society is the fact that people underestimate the significance of ICT and have behaved passively towards the ICTs. The present study attempts to study the differences in attitude and competence of high school students in Imphal West, Manipur. Attitude and competence can serve as important dimension when analyzing the adoption and diffusion of technologies. Analysis of this study would give starting point for encouraging more people to use technologies. The findings would be of immense help for educators, policy makers and various stakeholders.

In order to explore the competence of the class-X students, in the present study, a self-made questionnaire was designed according to the syllabus of computer and communication technology framed by Board of Secondary Education Manipur for class-X students. To explore the attitude of the students, ICT Attitude Scale developed by Kofi Ayeibi Arthur (2010) was used.

In order to check the reliability of the ICT Attitude Scale, in the context of the study area, test-retest method was applied. To obtain content validity, the self-made questionnaires for ICT competence was made to go through checking by five experts who are teaching professionals of computer education for class-X students studying in schools affiliated to Board of Secondary Education Manipur. The face validity of ICT competence instrument was checked by the subject-matter professionals before the administration of the test.

The research instrument both on ICT Attitude and ICT competence which underwent reliability and validity test respectively would be of immense help in making headway for the main research work. Moreover, the validated instruments would be helpful for early-stage research scholars aspiring to work on ICT based studies in schools.

Objectives of main study: To study the attitude of students towards information and communication technology in schools of Imphal West; To study the ICT competence of students in schools of Imphal West.

Objectives of the pilot study: To test the face validity of self-made ICT Competency instrument; To test the context validity of self-made ICT Competency instrument; To test the reliability of the ICT-Attitude Scale developed by Kofi Ayebi Arthur (2010).

Literature review on importance of reliability and validity of research instrument:

In the present study, two types of questionnaires had been used: namely the ICT attitude Scale developed by Arthur Ayebi Kofi and self-made ICT Competency Scale.

Barr et al (1953) defined questionnaire as a systemic compilations of questions that are submitted to a sample of population from which information is desired.

In order to obtain accurate findings of the study, a research instrument has to be reliable and valid. A reliable research instrument is the one which measures accurately and consistently. And a valid research instrument measures accurately what is supposed to measure (Wan, 2002).

A reliable test produces approximately the same scores when applied in repeated conditions (Marczyk et al, 2005).

By knowing the validity and reliability of a research instrument helps the researcher in designing and judging one's own work. Additionally the researcher would be able to evaluate research literature and choose alternative research designs (Gliner & Morgan, 2000).

Test-retest reliability is the measure of consistency of a sample of two occasions with some interval in between (Drost, 2011).

An acceptable test-retest signifies that the internal validity of a test and ensures that the test is both representative and stable overtime (Mathew Itobbs, 2016).

In the present study, face validity and content validity was taken up for test. Face validity is the extent to which a test appears to measure and what is intended to measure. A test is said to have strong face validity if most of the people agree that the test items appear to measure what the test is intended to measure (Johnson E, 2013).

Tests, in which the purpose is clear, even to naïve respondents, are said to have high face validity. And the tests, in which the purpose is unclear is said to have low face validity (Nevo, 1985).

Content validity measures the content domain of which it was designed to measure knowledge.

Content validity is mostly measured by keeping on view, the knowledge of people who are familiar with the construct being measured. Here, the subject-matter experts are consulted and asked for feedback on how well each questions measures the construct in question.

There are three key aspects of content validity which are domain definition, domain representation and domain relevance (Sireci, 1998)

In some instances, where it is difficult to measure the traits of a test, two independent judges rate the test separately. The test items which are strongly stated relevant by both judges will be included in the final test. Measuring of content validity uses logical reasoning and hence, easy to apply (Venkitachalam R, 2015).

Research Design:
A pilot study was conducted in four high schools of Imphal West District Manipur which are affiliated to Board of Secondary Education, Manipur. The study was limited to 50 class-X students selected by using simple random technique. Out of four high schools selected two were Government schools and two were Private schools.

The Government schools were Keishamthong High School, Keishamthong and Ibotonsana Girls Higher Secondary School, Uripok. The Private schools were St. Peter High School, Kwakeithel and Catholic High School, Canchipur. Number of student selected was 10 from Keishamthong High School, 10 from Ibotonsana Girls Higher Secondary School, 10 from St. Peter High School and 20 from Catholic High School.

Table 1 - Shows the demographics information of the student participants from four selected schools for pilot study.

Name of the institutes	Type of institution (private/ government)	Number of respondents	Gender	
			Male	Female
Keishamthong High School	Government	10	6	4
Ibotonsana Girls Higher Secondary School	Government	10	-	10
St. Peter High school, Kwakeithel	Private	10	8	2
Catholic School, Canchipur	Private	20	15	5
Total	4	50	29	21

Normative-Survey Method was used to collect the data.

The questionnaires comprised of first section which inquired about the demographic information such as name, gender, status of institution (whether Government or Private Schools), class and session which they are admitted. The second section comprised of self-made ICT- Competence Scale and third section comprised of ICT-Attitude Scale designed by Kofi Ayebi Arthur, 2010 of Cape Coast.

The ICT-Attitude Scale by Kofi Ayebi Arthur (2010) comprised of 21-ICT Attitude based statements which had four point scale Likert response Mode of strongly agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). (SA coded: 4; A coded: 3; D coded: 2; SD coded: 1 for positive students). (SA coded: 1; A coded: 2; D coded: 3; SD coded: 4 for negative students).

The self-made ICT –Competence Scale comprised of 30 statements which had five point scale Likert response mode of fully competent (FC), Competent (C), Neither competent nor incompetent (NCI), Incompetent (IC) and Fully incompetent (FIC). (FC coded: 5; C coded: 4; NCI coded: 3; IC coded: 2 and FIC coded: 1).

Justification of the Instrument used:
ICT –Attitude Scale by Kofi Ayebi Arthur (2010) had been used for its easily understandable statement. The sample of the study were the students studying in class-X, they might understand the statements with greater ease. Moreover, the scale touches all three domains of cognitive, Affective and Behavioral aspects.

The self-made ICT-competency scale comprised of 30 statements. Various aspects of competency areas are taken into consideration. Such as Basic Computer Operation, Basic Concepts for a Database, Internet and its services and Basic concepts of Web browser. The statements are constructed according to syllabus of Information Technology for class-X under Board of Secondary Education Manipur. Thus, the choice of both ICT-Attitude Scale by Kofi Ayebi Arthur (2010) and self-made ICT questionnaire are quite justifiable.

Analysis and Interpretation:

Step 1: Considering the objective 1 of the pilot study which is to check the face validity of the items, panel of 5 subject-matter professionals were asked to give judgment. Likert scale was used to assess the face validity. The rating scale extended as: The test is extremely suitable for the given purpose; The test is very suitable for the purpose; The test is adequate; The test is inadequate; The test is irrelevant and therefore unsuitable Table 2 gives the judgmental statement from the subject-matter professionals.

Table 2 - Assessment of Face Validity By Five (5) Subject-Matter Professionals.

Sl. No.	Subject-Matter Professional (SMP)	Face Validity Indication in Statement
1	NO.1	The test is very suitable for the purpose.
2	NO.2	The test is adequate.
3	NO.3	The test is extremely suitable for the given purpose.
4	NO.4	The test is very suitable for the purpose.
5	NO.5	The test is adequate.

Indication:

The face validity as indicated by five subject-matter professionals ranged from extremely suitable to adequate. Therefore, the test items are considered to have acceptable face validity and can be used for the study.

Step 2:

The self-made ICT-Competence Questionnaire containing 30 items were made to check by five subject-matter teaching professionals of schools under Board of Secondary Education Manipur. The items of the questionnaires are students' self-efficiency ICT Competence statements which had five point scales with Likert response mode of Fully competent (FC), Competent (C); Neither competent not incompetent (NCI), Incompetent (IC) and Fully incompetent (FIC): (FC-Coded:5, C-Coded:4, NCI-Coded:3, IC-Coded:2 and FIC-Coded:1).

Considering the objective (ii) of the pilot study which was to check the content validity of the questionnaire items, the panel of five subject-matte professional were requested to check the relevancy of each item and mark with a three degree range of "not necessary"; "useful but not essential" and "essential".

Table 3 gives the items of self-made ICT competency questionnaire and the degree range given by the five subjects-matter professionals (SMPs).

Table 3 - Assessment of 5-Point Scale Self-Made ICT Competency Questionnaire for Content Validity by Five (5) Subject Matter Professionals (SMP)

Sl. No.	Items with Competency Area	Indicatins by Suject Matter Professionals (SMPs)				
		SMP1	SMP2	SMP3	SMP4	SMP5
	Column A: Basic Computer Operations					
1.	Start and connect computer and its peripherals. FC C NCI IC	Essential	Essential	Essential	Essential	Essential
2.	Understand the various functions of the components of a computer such as Monitor, Keyboard, Mouse and CPU. FC C NCI IC	Essential	Essential	Essential	Essential	Essential
3.	Play audio and video files using appropriate media players. FC C NCI IC	Essential	Essential	Essential	Essential	Essential
4.	Well aware of health and safety issues related to use of computers	Essential	Essential	Essential	Essential	Essential

	FC [ ] C [ ] NCI [ ] IC [ ]	FIC [ ]				
5.	Easily handle CD and DV in a Computer System	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
6.	Easily print in various printing devices	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
7.	Send data by Modem.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
Column B: Concepts for a database using MS.						
8.	Create a database.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
9.	Enter data into a database.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
10.	Open a document in MS-Word.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
11.	Transfer files from one drive to another.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
12.	Insert files into a new folder.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
13.	Easily search files from a device.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
14.	Set up validation rule.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
15.	Use simple editing like centering, folder size, bold, italics, etc.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
16.	Change colors of text on a slide.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
17.	Initialize text, change margins and layout in a dialogue box.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
Column C: Internet and its services and web browsers						
18.	Search content through internet.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
19.	Communicate with others through video conferencing and online chatting.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
20.	Download textual information by using internet service.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
21.	Create email ID.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
22.	Send and receive messages via e-mail.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
23.	Locate sites using search engines.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
24.	Find people by using net.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
25.	Browse using internet explorer.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					
26.	Save text and images from web pages.	Essential	Essential	Essential	Essential	Essential
	FC [ ] C [ ] NCI [ ] IC [ ]					

27.	Attach files to outing e-mails.					Essential	Essential	Essential	Essential	Essential
	FC		C		NCI		IC			
28.	Use web authoring tools to create web content.					Essential	Essential	Essential	Essential	Essential
	FC		C		NCI		IC			
29.	Create and save HTML.					Essential	Essential	Essential	Essential	Essential
	FC		C		NCI		IC			
30.	Write a program for simple mathematical operations such as addition and subtraction.					Essential	Essential	Essential	Essential	Essential
	FC		C		NCI		IC			

Indication:

All the test items were marked "essential by all the five subject-matter professionals".

Now, the content validity ratio was calculated by using the formula,

$$\text{CVR (Content Validity Ratio)} = \frac{(Ne - \frac{N}{2})}{\frac{N}{2}}$$

where, N_e is the number of subject matter-professionals indicating "Essential";

N is the total number of subject matter professionals.

From Table no. 3, it is observed that all the five subject-matter professionals have marked "Essential" for all test items.

Therefore, N_e for all items is 5.

Using the formula,

$$\text{CVR (Content Validity Ratio)} = \frac{(Ne - \frac{N}{2})}{\frac{N}{2}},$$

We have,

$$\text{CVR} = \frac{5 - \frac{5}{2}}{\frac{5}{2}}$$
$$= \frac{5 - 2.5}{2.5}$$
$$= \frac{2.5}{2.5}$$
$$= 1.$$

The numeric value of CVR is determined by Lawshe table value.

The Lawshe table gives a minimum value of 0.99 for five numbers of panelists for the content to be valid.

Since, the obtained value of the self-made items is 1. It may be concluded that the test items are indicated to have content-validity and may be used for the study.

Step 3: Considering the objective 3 of the pilot study which was to check the reliability of the ICT Attitude Scale developed by Kofi Ayebi Arthur, 2010, the test-retest Method was adopted. The scores of 50 selected participants score were recorded and after an interval of three weeks, retest was administered on the same participants. The value of the test and retest are against each item are given below in table 4.

Table 4 - Test Retest Score of Students on Ict-Attitude Scale Developed by Kofi Ayebi Arthur, 2010

Participants (student)	Test score (x)	Retest score (y)	x^2	y^2	xy
1	80	80	6400	6400	6400
2	70	71	4900	5041	4970
3	70	70	4900	4900	4900
4	85	86	7225	7396	7310
5	80	80	6400	6400	6400
6	84	84	7056	7056	7056
7	88	88	7744	7744	7744
8	90	90	8100	8100	8100
9	90	90	8100	8100	8100
10	100	100	10000	10000	10000
11	98	96	9604	9216	9408
12	96	96	9216	9216	9216
13	90	90	8100	8100	8100
14	84	84	7056	7056	7056
15	76	76	5776	5776	5776
16	89	89	7921	7921	7921
17	83	83	6889	6889	6889
18	88	88	7744	7744	7744
19	72	72	5184	5184	5184
20	84	84	7056	7056	7056
21	90	90	8100	8100	8100
22	90	90	8100	8100	8100
23	86	87	7396	7569	7482
24	88	86	7744	7396	7568
25	90	90	8100	8100	8100
26	86	86	7396	7396	7396
27	90	90	8100	8100	8100
28	89	90	7921	8100	8010
29	77	78	5929	6084	6006
30	87	87	7569	7569	7569
31	86	86	7396	7396	7396
32	72	72	5184	5184	5184
33	70	71	4900	5041	4970
34	80	80	6400	6400	6400
35	82	82	6724	6724	6724
36	87	87	7569	7569	7569
37	89	89	7921	7921	7921
38	77	76	5929	5776	5852
39	80	80	6400	6400	6400
40	82	82	6724	6724	6724
41	80	80	6400	6400	6400
42	85	80	7225	6400	6800
43	82	82	6724	6724	6724
44	72	72	5184	5184	5184
45	71	71	5041	5041	5041
46	80	70	6400	4900	5600
47	72	71	5184	5041	5112
48	80	82	6400	6724	6560
49	86	80	7396	6400	6880
50	88	80	7744	6400	7040
Total (n): 50	4174	4144	350571	346158	348242

The reliability of the test is checked by applying Pearson's product-moment correlation coefficient,

$$r = \frac{(n \sum xy - \sum x \sum y)}{\sqrt{((n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2))}}$$

where, r is the correlation (reliability) coefficient,

         n is the number

         x is the test scores of students

         y is the retest scores of students.

By applying the formula, we have,

$$r = \frac{(50*348242 - 4171*4144)}{\sqrt{((50*350571 - 4171^2)(50*346158 - 4144^2))}}$$

$$= \frac{(17412100 - 17284624)}{\sqrt{((17528550 - 17397241)(17307900 - 17172736))}}$$

$$= \frac{127476}{\sqrt{131309*135164}}$$

$$= \frac{127476}{\sqrt{17748249676}}$$

$$= \frac{127476}{133222.56}$$

$$= 0.96$$

Interpretation: The product movement correlation coefficient is 0.96. Thus, the reliability of the test is found to be established at 0.96 which indicates high reliability and acceptable value for the research instrument and can be applied for the study.

Findings: The self-made ICT-Competence questionnaire has acceptable face validity; The self-made ICT-Competence questionnaire has acceptable content validity; The ICT-Attitude questionnaire developed by Kofi Ayebi Arthur (2010) has a high reliability value.

Conclusions

The ICT-Attitude Scale developed by Kofi Ayebi Arthur (2010) has a high reliability value in the context of present study and can be safely used for measuring Attitude of High School Students towards Information and Communication Technology. The self-made ICT questionnaire possessed acceptable face and content validity and can be used to measure competencies of class-X students studying in Board of Secondary Education Manipur.

References

Best, W.John, Kahn V. James & Jha K. Arbind (2017): *Research in Education*, Pearson India Education services Pvt. Ltd.

Bolarinwa Akeen Oladimeji (2015). *Principles and Methods of validity and reliability testing of questionnaires used in social and health science researches*. Nigerian Postgraduate Medical Journal. Vol. 22, issue 4. Page 195-201 retrieved from www.npmj.org.

Dyck, J.L & Smither, J.A (1995). *Older adults' acquisition of word processing. The contribution of cognitive abilities and computer anxiety*. Computer in Human Behavior, 12(1), 107-199.

Garrett, E. Henry (2006): *'Statistics in Psychology and Education'*. Cosmos Publications, New Delhi.

Ghahramanian Akram, Nikanfar Ali-Reza and Zamanzadeh Vahid (2014). *Design and Implementation content Validity Study: Development of an instrument for measuring patient-centred Communication*. Journal of Caring Sciences, Tabriz University of Medical Sciences. Retrieved from www.ncbi.nim.nih.gov.

Gliner, J.A & Morgan, G.A (2000). *Research Methods in Applied Settings: An integrated Approach to Design and Analysis*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Hobbs Mathew (2016). *What is test-retest reliability and why is it important?* Retrieved from www.cambridge.cognition.com.

Johnson, E. (2013*). Face Validity*. In: Volkmar F.R. (eds) Encyclopedia of Autism Spectrum Disorder. Springer, New York, NY. https://doi.org/10.1007/978-1-4419-1698-3_308

Koul Lokesh (2006), *'Methodology of Educational Research'*: 4th edition. Vikash Publishing house Pvt. Ltd. New Delhi.

Lee, D (1997). *Factors influencing the success of computer skills learning among in-service teachers*. British Journal of Educational Technology, 28, 139-141.

Marczyk, G. Dematteo, D & Festinger, D (2005*). Essentials of Research Design and Methodology*. Hoboken, NJ: John Wiley & sons, Inc.

Merriam Webster. *More Deifinition for Attitude*. Retrieved from www.merriam-webster.com.

MES-106 Educational Research (2014). *BLOCK 3, Research Design*: Indira Gandhi National Open University, New Delhi. Page 44-58.

Nevo, B. (1985*). Face validity revisited*. Journal of Educational Measurement, 22(4); 287-293.

Sharma, R.A.(2011), *'Advance Statistics in Education and Psychology'*. Vinay Rakheja Publication R. Lall Book Depot, Meerut.

Sireci, S.G (1998). *Gathering and analyzing content validity data*. Educational assessment, Vol. 5 (4), 299-321

Teo, T. (2008). *Pre-service teacher's attitude towards computer use: A Singapore Survey*. Australian Journal of Educational Technology, 23(4), 413-424.

Venkitachalam R. (2015). *Validity and reliability of questionnaires*. Healthcare. Retrieved from www.slideshare.net>venkitachalam.

Wan, T.T.H (2002). *Evidenced-Based Health Care Management. Multivariate Modeling Approaches*. Norwell, MA: Kluwer Academic Publishers