ISSN 2286-4822
www.euacademic.org

EUROPEAN ACADEMIC RESEARCH
Vol. III, Issue 11/ February 2016

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

Development of a psychometrically sound Scale of Attitude towards E-Learning: A Preliminary Step

Dr. UZMA SIDDIQUI
Assistant Professor
Department of Education
Aligarh Muslim University (A.M.U)
Aligarh (U.P.), India

Abstract:

The aim of the present study was to develop a psychometrically sound scale of attitude towards E-Learning (SAEL). A total of 210 teacher trainees participated in this study. Factor analysis of the data from these participants identified a three-factor structure of the SAEL with 30 items. The three factors, namely, 'Cognitive Component', 'Affective Component' and 'Conative Component' together explained 44.82 % of the total variance. SAEL and its factors showed good internal consistency (Cronbach's Alpha = 0.92 for SAEL, and more than 0.80 for the factors), good content and face validity. Thus, SAEL appeared to be a valid and reliable tool and therefore, may be used in further research on E-Learning.

Key words: Attitude, E-Learning, Factor analysis, Psychometric procedures, Reliability, Validity

INTRODUCTION

As we advance further into the 21st century, technology is becoming more and more integrated into our society. Smart phones are now necessities, tablets are replacing or substituting for computers and laptops, and social networking keeps the world well-connected. The rapid and widespread adoption of these technological innovations has completely changed the way we conduct our daily lives, including how knowledge is digested and taught in our classrooms. Technology in the classroom can be defined as any tool that can be used to help promote human learning, including – but not limited to – calculators, tablets (such as an iPad), Smart Boards, video cameras, digital cameras, MP3 players, CDs, DVDs and, of course, the computer and internet. These are all innovations that have helped countless people during regular daily activities, but they can also have a profound impact on classroom learning. There are many benefits of using technology in the classroom, especially as students become increasingly digitally literate. The shift in worldwide computer usage and the need for computer skills in today's workforce makes it obvious to ensure that students are prepared to meet the demands of the 21st century. It can keep students focused for longer periods of time. The use of computers and internet to look up and gather information/data is a tremendous saver, especially when used to access a comprehensive resource like the Internet to conduct research. This time-saving aspect can keep students focused on a project much longer than they would with books and paper resources, and it helps them develop better learning through exploration and research. It makes students more excited to learn. When technology is integrated into school lessons, learners are more likely to be interested in, focused on, and excited about the subjects they are studying. Subjects that might be monotonous for some – like Mathematics and Science – can be much more engaging with virtual lessons, tutoring, and the streaming of educational videos. It enables students to learn at their own pace. With the integration of technology, students are able to get direct, individualized instruction from the computer. This form of supplemental teaching allows them to engage with the information at times that are most convenient for them and helps them become more self-directed in the learning process. It prepares students for the future. By learning to use technology in the classroom, both teachers and students will develop skills essential for the 21st century. But more than that, students will learn the critical thinking and workplace skills they will need to be successful in their futures.

Electronic Learning or E-Learning is one of the most significant recent developments in the field of Information and Communication Technology (ICT) (Wang, 2003). E-learning encompasses related terms such as online learning, virtual learning, web-based learning, and distance learning (Panda & Mishra, 2007). E-Learning is simply defined as a delivery of course content via electronic media such as Internet, Intranet, satellite broadcast, audio/video tapes, interactive TV and CD-ROMs. Liaw, Huang, and Chen (2007) have defined E-Learning as the convergence of technology and learning, and as the use of network technologies to facilitate learning anytime, anywhere. E-Learning may prove quite beneficial to the learners in various ways like: (i) getting access to learning by breaking all barriers of time, pace and distance; (ii) providing individualized instruction suiting to the abilities, interests, learning styles and needs of the learners; (iii) promoting collaboration among learners from different localities and cultures across the world; and (iv) helping the students more interested and motivated (Mangal, 2009).

The trend of using E-Learning as a learning and/or teaching tool is now rapidly expanding into education at all levels across the world. And Aligarh Muslim University (A.M.U.) is no exception. The teachers at A.M.U. have integrated the web and Internet into classroom teaching. They build a course Webpage, with links through the Internet to relevant resources on other Websites. They upload their PowerPoint slide presentations, pdf files (electronic documents) of their research papers/articles and research materials, photographs, etc., on a website which students can download and print. Teachers may also use other web sites for illustration within their classroom lectures and provide students with links to other relevant sources of study materials. These are the usual practices followed by teachers working in different departments and centers of A.M.U., including Department of Education. The Department of Education offers a professional course, Bachelor of Education (B.Ed.), that prepares teachers for upper primary or middle (classes VI-VIII), secondary (classes IX-X) and senior secondary (classes XI-XII) levels of school education. B.Ed. essentially aims at providing teacher trainees with an insight into the educational scenario in the world with a specific reference to India and equips them with the latest knowledge and skills in the field of education. One of the foundation papers of B.Ed. is 'Basics of Pedagogy' that provides teacher trainees with the theoretical and practical aspects of teaching methods, skills, aids and ICT tools, including E-Learning. All this had made the researcher felt the need of developing a Scale of Attitude towards E-Learning (SAEL) that would enable to examine the attitudes and perceptions of teacher trainees and other students (who are in some way or the other familiar with and/or well-versed in E-Learning) towards E-Learning and its modes and components.

PURPOSE OF THE STUDY

The main purpose of this study was to develop a psychometrically sound Scale of Attitude towards E-Learning (SAEL).

OPERATIONAL DEFINITIONS OF KEY TERMS

E-Learning

Welsh, Wan Berg, Brown, and Simmering (2003) have defined E-Learning as the use of computer network technology through the Internet to deliver information and instruction to learners.

However, the most well-known definition that educators agree on is that E-Learning is a set of synchronous and asynchronous instruction delivered to learners over technology (Colvin & Mayer, 2008).

In this study, *E-Learning may be taken as an electronically carried out learning facilitated and supported by the use of advanced technology particularly calling for the services of computers, multimedia and networking. It includes the usage of smart phones, tablets, iPads, iPods, MP3 players, tape recorder, recorded audio and video tapes, CDs, DVDs, teleconferencing, audio-video conferencing, E-Mail, live chat, web browsing and websites*.

Scale of Attitude towards E-Learning (SAEL)

SAEL is developed on the basis of the theoretical framework put forward by Rosenberg and Hovland (1960). According to this framework, students' attitude towards E-Learning cannot be regarded as a unitary concept, but rather as a complex of the following three components:

- **Cognitive Component:** It has to do with beliefs, opinions and thoughts regarding the attitude object (in this study, E-Learning).
- **Affective Component:** It relates to feelings (like or dislike) toward the attitude object. It is the emotional component of an attitude.
- **Conative Component:** It is defined as an intention or plan of action (related to attitude object) in a particular context and under specific circumstances. This component is related to an individual's readiness for action and likeliness to participate in an action.

According to this framework, the three components of SAEL can be taken in the following sense:

- *Cognitive Component represents the students' perceptions that would reflect their beliefs, opinions and thoughts* *regarding E-Learning and its importance in teaching-learning process.*

- *Affective Component represents the students' sentiments or feelings (positive or negative) that are considered as the affective side of the students' attitude towards E-Learning.*
- *Conative Component represents the students' readiness for action, likeliness and willingness to participate in an action as well as their most likely actions and behaviors to participate in E-Learning if they find it advantageous.*

Attitude towards E-Learning

Aiken (2000) defined attitude as 'a learned disposition to respond positively or negatively to certain objects, situations, institutions, concepts or persons'. Thus, attitude towards E-Learning can be considered as a preference along a dimension of favourableness or unfavourableness to various aspects of E-Learning.

In this study, *Attitude towards E-Learning refers to students' self-reported responses on three dimensions / components: Cognitive, Affective and Conative.*

Participants

The participants for the present study were purposively selected. A total of 210 teacher trainees, who were enrolled in B.Ed. course during the session 2014-15, at Department of Education, A.M.U., participated in this study. These trainees belonged to the main campus and three centres of A.M.U. Centre-wise distribution of the sample is given in Table 1.

Table 1: ***Centre-wise Distribution of the Sample***

Name of Centre	Number of Teacher Trainees
Main Campus, Aligarh	98
A.M.U. Centre, Kishanganj	52
A.M.U. Centre, Malappuram	25
A.M.U. Centre, Murshidabad	35

Development and Try Out of the Preliminary Draft of SAEL

SAEL was developed using Likert method, a technique for the measurement of attitudes (Likert, 1932). For constructing this Likert-type scale, the researcher collected and wrote a large number of statements that provided an adequate description about various components of SAEL. For this purpose, the researcher reviewed the relevant information available in the electronic and print media, textbooks, existing psychometric scales and research articles. Initial investigation of the related literature generated a long list of items pertaining to the determination of attitude towards E-Learning.

After a careful study of related literature and discussion with several experienced Computer Science teachers, teacher educators and software experts, the investigator formulated a variety of items which were to address various components of SAEL. A preliminary draft of 39 items was prepared to explore all the possible components of attitude towards E-Learning; 13 items for each component. Table 2 presents a few sample items of SAEL on each component. All the items were positively worded. Furthermore, the form of the item was also determined. The items of this draft were of multiple choice type having five alternatives: 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree'.

Table 2: ***Sample Items of SAEL***

Component of SAEL	**Sample Items**
Cognitive	• With web browsing, the completion of assignments on time is no more a burden for me. • ICT tools add a lot of variety to my learning experiences.
Affective	• On-line learning seems to be enjoyable. • Live chatting with my peers refreshes my mind like anything.
Conative	• I am too eager to enroll myself in an E-Learning course. • I would like to be a professional in the field of designing APPs.

The preliminary draft of SAEL was administered over the sample of 210 teacher trainees. They responded to each of the items according to their extent of agreement or disagreement on a five-point scale. The scheme of scoring response categories involved differential weighting such that the response category, 'strongly agree' was given a weight of 5, 'agree' a weight of 4, 'undecided' a weight of 3, 'disagree' a weight of 2 and 'strongly disagree' a weight of 1, in respect of responses pertaining to positively worded items. Weights according to the positive polarity of items were given on all the 50 statements. The sum of these weights gave the SAEL score for a particular respondent.

PSYCHOMETRIC PROCEDURES

Validity

Validity refers to the extent to which an instrument measures what it is designed to measure (Singh, 1998). Validity is also considered as the strength of conclusions, inferences or propositions. The three types of validity were determined for SAEL: Face validity, content validity and construct validity.

Face Validity

Face validity indicates whether the attitude scale appears to be appropriate to the purpose of the study and content area. It evaluates the appearance of the attitude scale in terms of feasibility, readability, consistency of style and formatting, and the clarity of the language used (DeVon et al., 2007; Trochim, 2001). Thus, face validity is a form of usability.

To determine the face validity of SAEL, an evaluation form was developed by the researcher to help respondents assess each item in terms of the following parameters: clarity of wording, likelihood the target audience would be able to answer the items, layout and style. Eight experts in the areas of technology, Computer Science, questionnaire design, and education were purposively selected and completed the face validity form on a Likert scale of 1-4, strongly disagree = 1, disagree = 2, agree = 3, and strongly agree = 4. All the experts rated each parameter at three or four on a Likert scale of 1-4. Out of eight experts, 92 % indicated they understood the items and found them easy to answer, and 90 % indicated the appearance and layout would be acceptable to the intended target audience.

Content Validity

Content validity was undertaken to ascertain whether the content of the attitude scale was appropriate and relevant to the purpose of the study. Content validity indicates whether the content reflects a complete range of the attributes under study and is usually undertaken by seven or more experts (DeVon et al., 2007; Pilot & Hunger, 1999).

To estimate the content validity of SAEL, the researcher clearly defined the conceptual framework of E-Learning by undertaking a thorough literature review and seeking experts' opinions. Once the conceptual framework was established, eight purposely chosen experts were asked to review the 36-items draft of SAEL to ensure it was consistent with the conceptual framework. Each reviewer independently rated the relevance of each item on SAEL to the conceptual framework using a 4-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = relevant, 4 = very relevant). The Content Validity Index (CVI) was used to estimate the validity of the items. According to the CVI index, a rating of three or four indicates that the content is valid and consistent with the conceptual framework (Lynn, 1996). For example, if five out of eight content experts rate an item as relevant (3 or 4), the CVI would be 5/8 = 0.62, which does not meet the 0.87 (7/8) to 1.00 (8/8) level required, and indicates that the item should be dropped (Devon et al., 2007). Therefore, three items on SAEL were deemed to be invalid because they yielded CVIs of 5/8=0.62 to 6/8=0.75 and were removed from SAEL. All the remaining items were valid with CVIs ranging from 0.87 (7/8) to 1.00 (8/8) and thus, were retained.

Construct Validity

Construct validity refers to the degree to which the items on an instrument relate to the relevant theoretical construct (DeVon et al., 2007; Kane, 2001). Construct validity is a quantitative value rather than a qualitative distinction between ‘valid’ and ‘invalid’. It refers to the degree to which the intended independent variable (construct) relates to the proxy independent variable (indicator) (Hunter & Schmidt, 1990). For example, in SAEL, cognitive, affective and conative components were used as proxy indicators of attitude towards E-Learning. When an indicator consists of multiple items, factor analysis is used to determine construct validity.

Factor Analysis is a statistical method commonly used during instrument development to cluster items into common factors, interpret each factor according to the items having a high loading on it, and summarise the items into a small number of factors. Loading refers to the measure of association between an item and a factor (Bryman & Cramer, 2005). A factor is a list of items that belong together. Related items define the part of the construct that can be grouped together. Unrelated items, those that do not belong together, do not define the construct and should be deleted (Munro, 2005). Exploratory Factor Analysis (EFA) is a particular factor analysis method used to examine the relationships among variables without determining a particular hypothetical model (Bryman & Cramer, 2005). EFA helps researchers define the construct based on the theoretical framework, which indicates the direction of the measure (DeVon et al., 2007) and identifies the greatest variance in scores with the smallest number of factors (Delaney, 2005; Munro, 2005).

Several types of extraction methods are used to undertake factor analysis. The two most common forms are Principal Component Analysis (PCA) and Principal Axis Factoring (PAF). In PCA, all the variance of a variable (total variance) is analysed, while PAF only analyses common variance. Total variance consists of both specific and common variance. Common variance refers to the variance shared by the scores of subjects with the other variables, and specific variance describes the specific variance of a variable (Bryman & Cramer, 2005). Therefore, PCA is assumed to be perfectly reliable and without error and used on the 33 items of SAEL. Varimax, the most commonly used orthogonal rotation, was undertaken to rotate the factors to maximise the loading on each variable or factor and minimise the loading on other factors (Field, 2009).

DETERMINATION OF CONSTRUCT VALIDITY OF SAEL

It was carried out in the following step-wise manner:

Step 1: Item Analysis

Item analysis of each item was done using Pearson Product Moment Correlation technique. The aim was to make the SAEL homogeneous by checking the consistency of each item with the total scale and discarding the items showing inconsistency. To achieve this, scores on each item of the subjects were correlated with their total attitude scores. Response distributions on the SAEL items indicated that none of these variables/items were excessively skewed or kurtotic (Field, 2009). The correlation matrix contained no negative values. The corrected item-total correlations were significant and ranged from 0.33 to 0.68. So, no item was excluded on the basis of the item response distributions or correlation matrix.

Step 2: Factor Analysis

Inspection of the correlation matrix revealed a substantial number of coefficients .33 and above. The determinant of the R-matrix was .001 (>.00001, Field, 2009), indicating that there was no multicolinearity (very highly correlated variables) or singularity (perfectly correlated variables) problem. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = 0.88 (KMO = between 0.8 and 0.9 is 'great' according to Field, 2009). Bartlett's test of sphericity supported the factorability of the correlation matrix and indicated that correlations between items were sufficiently large for EFA. Data for the SAEL items were, therefore, subjected to EFA.

A principal component analysis (PCA) was conducted on 33 items of the SAEL with orthogonal rotation (varimax). PCA is one of the extraction methods of EFA. The initial analysis with eigenvalue > 1.00 (the Kaiser-Guttman criterion) extracted three factors, accounting for 47.71 % of the total variance. This confirmed the three-factor structure of the preliminary draft of SAEL. The data was further analyzed in another EFA, limiting the number of factors to 3 with all factor loadings < .40 suppressed. The three factors together accounted for 42.46 % of the total variance. Results further revealed that three items (items 31, 32 and 33) loaded at < .40. After discarding these three items, data were subjected to a final EFA with all factor loadings < .40 suppressed. Though the EFA was run this time without specifying the number of factors a three-factor structure of SAEL with 30 items was identified. Table 3 shows the results of principal component analysis with varimax rotation on SAEL. These three factors, which were rotated to position of maximum orthogonality in eight iterations, explained together 44.82 % of the total variance. 'Factor 1' accounts for 20.36 % of the variance, 'Factor 2' accounts for 13.50 % of the variance and 'Factor 3' accounts for 10.96% of the variance. The items that cluster on the same factor confirm that 'Factor 1', 'Factor 2' and 'Factor 3' represent 'Cognitive Component', Affective Component' and 'Conative Component' respectively of SAEL.

Table 3: ***Summary of Results of Principal Component Analysis with Varimax Rotation on SAEL***

	Rotated Factor Loadings on		
Item Number	**Factor 1 (Cognitive Component)**	**Factor 2 (Affective Component)**	**Factor 3 (Conative Component)**
1	0.84		
2	0.83		
3	0.80		
4	0.78		
5	0.77		
6	0.75		
7	0.70		
8	0.66		
9	0.63		
10	0.61		
11	0.57		
12	0.54		
13		0.76	
14		0.75	
15		0.73	
16		0.69	
17		0.64	
18		0.60	
19		0.58	
20		0.54	
21		0.51	
22		0.49	
23			0.74
24			0.71
25			0.68
26			0.67
27			0.62
28			0.60
29			0.55
30			0.53
Eigen Values	6.11	4.05	3.29
% of Variance explained	20.36	13.50	10.96
Cronbach's Alpha, *a*	0.89	0.85	0.82

Note. Eigen Values = Sum of squared loadings on each factor

% Variance explained = Eigen value divided by 30 (total number of items in the final form of SAEL)

Reliability

Reliability is the degree to which an instrument consistently measures whatever it is measuring and reliability coefficient indicates the consistency of the score produced (Gay & Airasian, 2006). Internal consistency reliability examines the inter-item correlations within an instrument and indicates how well the items fit together conceptually (Haladyna, 1999; DeVon et al., 2007; Nunnally & Bernstein, 1994). The two methods were used to examine the internal consistency reliability by using the scores of 210 subjects on 30 items of the final form of SAEL: Split-half reliability and Cronbach's alpha.

Split-Half reliability

In Split-Half reliability, all items that measure the same construct are divided into two sets and the correlation between the two sets is computed. A split-half reliability coefficient was found by correlating the scores of the subjects on odd items of SAEL with their scores on even items. The correlation coefficient thus obtained was 0.83 which when corrected by Spearman Brown Prophecy formula increased to 0.90.

Cronbach's Alpha

Cronbach's alpha is equivalent to the average of the all possible split-half estimates and is the most frequently used reliability statistic to establish internal consistency reliability. If an instrument contains two or more subscales, Cronbach's alpha should be computed for each subscale as well as the entire scale (DeVon et al., 2007; Nunnally & Bernstein, 1994; Trochim, 2001). Cronbach's Alpha estimates internal consistency reliability by finding out how items of an instrument relate to each other and to the total instrument (Gay & Airasian, 2006). In other words, it is an indication of the context to which respondents' responses agree to one another. The higher the value of alpha, the more reliable the test is, with regard to internal consistency. George & Mallery (2001) provide the following rule of thumb for the values of alpha: > 0.9 excellent, > 0.8 good, > 0.7 acceptable, > 0.6 questionable, > 0.5 poor, < 0.5 unacceptable.

The alpha coefficient for the SAEL was found to be 0.92, which is excellent to be acceptable. The alpha coefficients for 'Cognitive Component', Affective Component' and 'Conative Component' were 0.89, 0.85 and 0.82 respectively, as shown in Table 3. All these values are good to be acceptable.

DISCUSSION

The integrity of any research depends on the accuracy of the measures used, especially when exploring complex theoretical construct such as attitudes. The results of the validity testing on SAEL indicated it is an accurate measure of attitude towards E-Learning. The processes used to validate SAEL were rigorous and appropriate. While face validity is the lowest form of validity, it was useful in providing important information about the operationalisation of SAEL by students. Content validity helped assess whether the content was relevant to the concept of attitude towards E-Learning as defined in this study. Factor analysis assessed the theoretical construct of SAEL. The internal consistency reliability (alpha) reached the recommended level. Therefore, SAEL could be used appropriately with students.

This paper reported the psychometric validation of SAEL to measure attitude towards E-Learning according to a specific definition and context. However, to strengthen the rigor of the scale for further research, the researchers recommend undertaking convergent and discriminant validity to examine the similarities and differences of SAEL with other ICT-based attitude scales. It is also recommended that structured equation modelling (SEM) and confirmatory factor analysis be undertaken with a larger sample of students enrolled in different undergraduate and post-graduate as well as teachers to support the generalisability of SAEL. As with many other studies, this study suffers from a number of limitations, suggesting avenues for future studies. The first limitation is the reliance on a sample of small size. Though the minimum sample required for factor analysis was satisfied here, future studies on larger samples can increase the reliability coefficients, confirm the factor structure and other psychometric properties of SAEL. A second shortcoming is the use of B.Ed. trainees of A.M.U. Such a sample of convenience facilitates the early phase of a scale construction, but generalizing results to other students enrolled in different undergraduate and post-graduate may not be warranted. So, future studies should address the question of validating the SAEL on other students. A third limitation of this study is that it did not examine the temporal stability of SAEL. Future studies can consider examining its temporal stability. Despite these limitations, the present study can serve as a base for opening the door of further research on SAEL in India.

CONCLUSION AND IMPLICATIONS

The SAEL is a valid and reliable research tool which can be applied to a wider population of teacher trainees enrolled in teaching training institutions across the country. This study equips us with a psychometrically sound tool that will be useful to investigate the respondents' attitude towards E-Learning. This tool can help teachers as well as teacher educators to design and integrate E-learning based activities in teaching-learning process in the light of their students' attitudes. It can aid the policy makers and administrators in organizing seminars and worshops on the need of E-Learning at different levels of education and thus, would take appropriate measures to train the teachers (both pre-service and in-service) as well as teacher educators, set up training centers and provide basic devices and facilities for training.

SAEL can aid teachers and researchers in evaluating whether the students' attitude towards E-Learning is favourable, neutral or unfavourable. This can help them further in identifying those aspects of E-Learning that are feasible to be adopted inside as well as outside the regular classrooms in order to make teaching and learning of different academic subjects more interesting and engaging for their students. This information would guide teachers as well as researchers in planning and designing the kind of E-Learning based classroom environment and activities that might raise students' interest and motivation in studying and mastering academic subjects.

REFERENCES

Aiken, R. L. (2000). *Psychological testing and assessment* (10th ed.). Boston: Allyn & Bacon.

Bryman, A., Cramer, D. (2005). *Quantitative Data Analysis with SPSS 12 and 13. A Guide for Social Scientists*. East Sussex: Routledge.

Colvin, R., & Mayer, R. (2008). *E-learning and the science of instruction*. California: John Wiley.

Delaney, C. (2005). The Spirituality Scale, Development and Psychometric Testing of a Holistic Instrument o Assess the Human Spiritual Dimension. *Journal of Holistic Nursing*, *23*(2), 145-167.

DeVon, H. A., Block, M. E., Moyle-Wright, P., Ernst, D. M., Hayden, S. J., & Lazzara, D. J. (2007). A psychometric toolbox for testing validity and reliability. *Journal of Nursing scholarship*, *39*(2), 155-164.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Los Angeles: Sage Publications.

Gay, L. R., & Airasian, P. (2006). *Educational Research: Competencies for analysis and applications* (6th ed.). Upper Saddle River, NJ: Prentice Hall, Inc.

George, D., & Mallery, P. (2001). *SPSS for windows step by step: a simple guide and reference 10.0 update* (3rd ed.). Toronto: Allyn and Bacon.

Haladyna, T. (1999). *Developing and Validating multiple-choice test items*. New Jersey: Lawrence Erlbaum.

Hunter, J.E., Schmidt, F. L. (1990). *Methods of meta-analysis: Correcting errors and bias in research findings*. Newsbury Park: Sage Publications.

Kane, M. (2001). Current concerns in validity theory. *Journal of Educational Measurement*, *38*, 319-342.

Liaw, S., Huang, H., & Chen, G. (2007). Surveying instructor and learner attitudes toward E-Learning. *Computers & Education*, *49*(4), 1066-1080.

Likert, R. (1932). A technique for measurement of attitudes. *Archives of Psychology*, *140*, 5-55.

Lynn, M.R. (1996). Determination and quantification of content validity. *Nursing Research*, *35*, 382-385.

Mangal, S. K. (2009). *Essentials of educational technology*. New Delhi: PHI Learning.

Munro, B.H. (2005). *Statistical methods for health care research*. Philadelphia: Lippincott, Williams & Wilkins.

Nunnally, J.C., & Bernstein, I. H. (1994). *Psychometric theory*. New York: McGraw-Hill.

Panda, S., & Mishra, S. (2007). E-Learning in a mega open university: Faculty attitudes, barriers, and motivation. *Educational Media International*, *44*(4), 323-338.

Pilot, D., & Hunger, B. (1999). *Nursing research: principals and methods*. Philadelphia: Lippincott Williams & Wilkins.

Rosenberg, M.J., & Hovland, C. I. (1960). Cognitive, affective and behavioral components of attitudes. In M.J. Rosenberg, C.I. Hovland, W. McGuire, R.P. Abelson, & J.W. Brehm Eds.), *Attitude, organization and change: An analysis of consistency among attitude components*, (pp. 15-30). New Haven, CT: Yale University Press.

Singh, A.K. (1998). *Tests, measurements and research methods in behavioural sciences*. Patna, Bihar: Bharati Bhawan.

Trochim, W.M.K. (2001). *The Research Methods Knowledge Base*. Cincinnati: Atomic Dog.

Wang, Y. (2003). Assessment of learner satisfaction with asynchronous electronic learning systems. *Information & Management*, *41*(1), 75-86.

Welsh, E., Wanberg, C., Brown, K., & Simmering, M. (2003), E-learning: emerging uses, empirical results and future directions. *International Journal of Training and Development*, *7*(4), 245-258.