Development and validation of scale for measurement of cognitive and behavioral development of the adult learners

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ABSTRACT

Present study was conducted to develop and validate an indigenous inventory, for the measurement of cognitive and behavioral development in the adult learners, because at present no appropriate scale is available through which one can measures these learning domains in Pakistani cultural context, therefore scale was developed through standardized procedure. Such as, related literature was studied and various rationales were floated in the population of the study. Informal discussions were also held on the topic. On the basis of responses of students, the researcher generated about 90 items for the instrument. After item evaluation through experts'opinion the numbers of the items were reduced to 60and few changes and modifications were also made in proposed scale. A tool consisting of 60 items was administered on male (80), female (100) of higher secondary and degree level students for the empirical evaluation of each item. The researcher analyzed data with the help of SPSS 16.0 by using factor analysis, correlation, alpha coefficient and percentile analysis. After factor analysis 10 more items were deleted from the scale and only 50items were retained in finalized scale , furthermore, five basic dimensions emerged as the result of varimax rotation which were termed as subscales namely, Personal, social and academic factors (10 items), Cognitive maturity (14 items), Learning Distracters (11 Items), Proactive Behavior (8 Items) and Synergy (07 Items). For the establishment of norms percentile scores were calculated, the higher score on cognitive and behavioural development indicates higher level of cognitive and behavioural maturity. On the basis of its reliability and validity scale is considered reliable and valid tool for the measurement of cognitive development of the adult learners.

Introduction

Learning is a complicated task; it can better be accomplished with the suitable teaching methodologies and conducive learning environment. This learning environment can be created and maintained if the learner is considered important. Cognitive development of the learner is directly concerned with learning. Learning is change in behavior, so behavior is another important element of the learner's personality which cannot be separated from cognitive development of the learner. Two philosophical schools of thoughts are considered important in the floor setting for the learning. One is called cognitivism and second is known as behaviorism. Scholars who belong to cognitivism believe that learning is the result of mental processes of the learner like thinking, meditation, memory, problem solving and arguing. They think that mind of a learner is a blank slate whatever a teacher wants to written on it, he/ she can write and the learner will save it in the mind. According to them human mind has schemas and whenever learner come across with a new concept, he/ she try to fix it into existing schema of mind or formulate a new one. In this way learning was defined change in schema by them. Different theories are given by the cognitivism like cognitive theory of multiple learning by Mayer. According to this theory learning is based on two channels called auditory and visual. These both channels process the information but they have limited capacity. Learning is active process and it includes filtration, selection, organization and integration of the information (Mayer,2011), Main idea behind this theory is that human beings learn better if they listen and see the thing, (Mayer, P.47) Mayer divided memory into three parts like sensory memory, working memory, longterm memory. The mind has less capacity so it interprets less information at a time. If suitable words and images are used by the instructors, the learner can create better schemas in their mind and can speed up their cognitive abilities.

Another theory in cognitivism is Cognitive Load Theory of Multimedia Learning by John Sweller. He talked about the architecture of human cognition and stressed upon use of solid instructional designs which are based upon knowledge and memory. He divided memory into two parts one is working memory second is long term memory. He put all blame on the style of synthesis of the new concepts in working memory. A mind has three types of loads like extraneous cognitive load, intrinsic cognitive loads, and germane cognitive loads (Sweller, 1998).

Behaviorism believes in the measureable change in behavior is called learning. Every behavior is response of a stimulus whether it is internal or environmental. First theory of behaviorism was given by Pavlov called Classical Conditioning. It was revised by J.B.Watson. They believe that simplest form of the learning is associative learning when a learner is establishing a link or association between two things in order to recall them successfully (Pavlov, 1927). Second learning theory was given by Albert Bandura the social learning theory. He believes that

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people learn by the imitation or observation of behavior of others. Modeling is a good technique for instruction. This theory serves as a bridge between cognitivist and behaviorism (Bandura, 1997). Next theory was introduced by most of the behaviorists like Pavlov, Watson, Thorndike, Skinner and Tolman. Learning is a passive activity it is only the matter of responding to the environmental stimuli. Positive and negative reinforcement plays very important role in learning. Attribution theory given by Bernard Weiner says that mostly people try to find out causes of behaviors of others. His theory is mostly used in assessment of achievement and main components of achievement are ability of the learner, effort put by learner, difficulty level of the task and luck of the learner (Weiner, 1935).As cognitive and behavioral aspects of learning are considered to be important in the acquisition of knowledge, if cognitive abilities of the students are not polished by the instructions and training in the educational institutions behavior modification remains an unsolved question which is purpose of the education.

Classroom environment plays an important role in learning. Learning is a change in behavior of the learner and it is not an easy task to bring this change. People of education and educational planning and management always remain interested in this aspect of the education. Present study intended to development of a scale for measurement of cognitive and behavioral development in adult learners through explorations of problems faced by the learners in adult age during learning. The study will focus upon cognitive and behavioral aspects of learning.

Research Objectives
1. To develop an instrument for the measurement of cognitive and behavioural development of adult learners.
2. To determine the psychometric properties of proposed cognitive and behavioural development scale.

Method
Present study was conducted to develop a scale for measurement of cognitive and behavioral development for adult learners. In order to fulfill this purpose a following steps were taken:

Conceptualization
All related theories and researches were consulted, in order to develop an idea of components of the topic. Theories of cognitive learning and behavioral learning facilitated to generate related items. For this purpose different libraries and internet websites were visited. And a number of rationales were developed and after that these rationale were floatedto the population in order to verify their problems and issues related to cognitive and behavioural aspects of learning.

Generation of Item Pool
Related literature of theories and previous researches enable the researcher to generate related items for the instrument development. Data gathered from population also provided a direction that which type of problems is being faced by the population actually. In light of given data a pool of 90items was generated. These items were presented to 2 judges for careful analysis. All items were arranged into frequency distributions and items with high frequency were selected for item pool. After that least satisfactory and repeating items were removed from the items pool then remaining 75 items were converted into statements all these statements are related with the various aspects of cognitive and behavioural development.

Items Evaluation
In this phase 75 statements were presented to a group of three judges for the examination of the content of each statement. Experts were requested to comment on each statement for clarity and likelihood of eliciting responses relevant to the study purpose. In this process only 7 items were deleted and 3 were modified and rest of 60 items were selected for the final scale.

Empirical Evaluation
In this phase the selected55 statements of proposed cognitive and behavioural development was administered on selected sample of 180 students. The details are as under

Population
Students at higher secondary and degree level (male and female) were taken as population of the study.

Sample
A random sample of 180 students (100 female) and (80 male) was collected from four public and private colleges of Taxila and Wah, their ages ranged from 17-22 years and family income ranged from Rs. 25000 to Rs. 75000.

Procedure
The respondents were contacted through personal visits. Data was collected in class room settings. Instructions were given on the questionnaire, instructions wereelaborated to the respondents that they were assured that their responses will be kept confidential and will be used for research purposes only. The response rate was 100%.

Scoring of Items
In total item pool of 60 after revision in light of expert opinion Likert scale 5 point was selected. This scale provides a continuum of strongly disagree, disagree, undecided, agree, strongly agree. This scale was given score of 1, 2, 3, 4, and 5 respectively. All items were positive so no item scale was reversed. The highest score indicate high level of cognitive and behavioral development and low score indicate low level of the cognitive and behavioral development of the students. For determination of validity and reliability of proposed cognitive and behavioural development scale of the adult learner different statistics analyses were performed, the details are lists as under.

Results
Factor Analysis
To find out the empirical value of the scale responses on 60 items were put to factor analysis. For this factors were rotated by using principal's component analysis and loading less than .35 was considered as no significant. Result shows that items no 1,3, 9, 14,18, 19 23, 29, 45 and54 were not significantly loaded on any factor because their factor loading is less than .35, so these items were deleted from the scale and rest of 50 retained in the scale.

Development of Norms
Percentile Ranks
Percentile ranks were determined in order to determine for three levels of low cognitive and behavioral development, moderate cognitive and behavioral development and high cognitive and behavioral development.

Discussion
Learning of the students is purpose of the education. It is a complicated process to understand intellect of every child and teach accordingly. Adult learners are different than child learners. At adult age level one is influenced by different factors like personal, social and academic. All these factors are sources of decrease or increase of standard of learning. A scale was prepared for identifying the cognitive and behavioral problems

of the learners. The related literature suggested that this area of cognition is very important in learning. The scale was constructed by using a standardized procedure. The review of literature explored the link between cognitive and behavioral problems of the learners. Open ended questions were floated in the population to get some ideas of real problems faced by the learners. Respondent's responses help the researcher to deal with the topic on factual bases. Generation of item pool was done carefully keeping in mind theories of learning and responses of respondents andmost relevant items were selected for the scale.

The scale was administered on a sample of 180 adult learners of higher secondary and degree level. In order to calculate construct validity of the scale factor analysis was computed by SPSS 16.0. Factor analysis help in determining 5 subscales of the tool such as, Personal, Social and Academic Factor affecting Cognitive and Behavioural Development, Cognitive Maturity, learning Distractor, Proactive Behaviour of the Learner and Synergy. The labels were assigned by the researchers on the basis of face validity of the items within each factor and these factors, afterwards called subscales.

Subscale 1

Personal, Social and Academic Factors affecting Cognitive and Behavioural Development (10 items)

Items in factors 1 are related various learning problems of the learners pertaining to family, society and academics:

For example

1. Lack of resources is a source of frustration for me.
2. I feel my family environment create hurdles for me.
3. Economic position of my family is not well to meet my educational expenses.

Subscale 2 Cognitive Maturities (14 Items)

This factor measure the extend of cognitive maturity of the learners.

1 I feel comfortable while participating in class room discussion.

2 I can rationalize critically my learning difficulties.

Sub Scale 3 learning Distractor (8)

This factor describes the behavior which is harmful for learning, for example:

1. Conflicts among students decrease learning.
2. Tension makes me confused/absent minded in the class room.

Subscale 4 Proactive learners Behaviour (11)

This factor deals with proactive aspects of learner behavior, such as,

1 I accept change around me.

2I can comment on different situations.

Subscale 5 Synergy (7)

Factor 5 is related with developed cognitive and behavioural aspects of learners' behavior such as,

1 I am strong in creative writings.

2 I have learnt how to manage my time.

Applied Significance

This scale can be used for 17 years to 22 years old adult learners. This scale is useful for the identification of cognitive and behavioral problems of the adult learners. This scale will also be help full for administrators of educational institutions. This scale can be used for both male and female adult learners. Study will provide a guide line to the teachers in order to design their lessons in such a way that learning will take place with cognitive and behavioral development of the students. This study will also facilitate parents in order to understand the level of cognitive and behavioural development of their offspring and if they some problem or difficulty reported they can arrange e remedial training to enhance their cognitive and behavioural abilities. Results of study will be of great importance in order to increase results of schools and to provide better product to the society. In short this tool will help the researcher to use it in different dimensions to measure cognitive and behavioral problems of the learners. It will be a significant contribution in existing knowledge of the field.

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Table 1

Eigenvalues and Percentages of Variance Explained by the Extracted Factors of cognitive and Behavioural Development Scale (N=180)

Factors		Eigenvalues	PCT of Variance	Cum Percentages
FI		3.91	29.873	
	29.873			
F2		2.849	9.128	
	39.001			
F3		2.75	6.853	
	45.854			
F4		1.56	4.992	
	50.846			
F5		1.27	3.827	
	54.673			

Table 1 shows the eigenvalues and percentages of variance explained by five factors. The result shows that F1 has an eigenvalue of 3.91 and explain 29.873 percent of the total variance. This is the highest value among five factors. Rests of all factors have eigenvalues more than 1.27. Total variance explained by all factors is 54.673 percent.

Table 2
Alpha Reliability Coefficient of cognitive and Behavioural Development Scale
(N=180)

Subscales	n		Alpha coefficient
Personal and academic factors	10	.43**	
Cognitive Maturity	14	.56**	
Learning Distracters	08	.65**	
Proactive Behaviour	11		.75**
Synergy	07		.65**
Total	50	.81**	

*P <.05 **p <.01

Table 2 portrays the Alpha reliability coefficients of cognitive and behavioural development scale;it ranges from .43 to .81. On the basis of empirical evaluation of the items it categorized into five sub scales with on the basis of the content these factors were named as Personal, Social and Academic Factors (10 items), Cognitive maturity (14 items), Learning Distracters (8 Items), Proactive Behavior (11 Items) and Synergy (07 Items).

Table 3
Inter-Correlations of the Subscales of Cognitive and Behavioural Development Scale *(N=180)*

Subscales	1	2	3	4	5
Personal and Academic Factors					
Cognitive Maturity	.64**				
Learning Distracters	.65**	.73**			
Proactive Behaviour	.37*	.59**	.63**		
Synergy	.43*	.79**	.56**	.80**	
Total	.85*	.82**	.63**	.84**	.89**

**p < .o1

Table 3 portrays inter-correlation of the subscales and total scale of cognitive and behavioural development scale. Result shows that all subscales have positive correlation with each other and with total scale. The higherinter scalecorrelation exists between proactive behavior and synergy (r = .80**).

Table 4
Factor Loading Obtained from Principle ComponentAnalysis (N=180)

Statement

Factor 1

Personal, Social and Academic Factor Affecting Cognitive and Behavioural Development

01 Lack of resources is a source of frustration for me.	.305
02 I feel my family environment create hurdles for me. .442	
03 Economic position of my family isnot well to meet my educational expanses .379	
04 Uneasy environment of the society create unrest in my mind	713
05 My physical health is a source of frustration for me. .488	
06 I do not have supporting learning environment.	.451
07I can recall things easily. .486	
08I feel hesitation in asking questions from my teachers. .491	
09my thinking patterns help me lot in learning.	.307
10 I know how to accommodate myself when I am neglected by the others	.367

Factor 2 Cognitive Maturity

01 I feel comfortable while participating in class room discussion.	.325
02 I always investigate my doubts about concepts.	.541
03 I can redesign my activities.	.443
04 I can explore new aspects of life.	.416
05 I can rationalize critically my learning difficulties.	.575
06 I can make judgments often.	.446
07 I can think logically about my learning habits.	.451
08 My learning capacity is increasing day by day.	.461
09 I accept new challenges.	.340
10 Planning is required to perform new tasks.	.482
11 Learning of technical tasks need practice.	.457
12 Positive behavior of teacher affects my classroombehavior.	.545
13 Learner cooperates with others when he/she is personally satisfied.	.362
14 Often my failures lead me towards discussion with my teachers.	.545

Factor 3 Learning Detractors

01 Modeling is a strong source to modify behavior.	.478
02 Punishment always creates negative emotions in the learner.	.490
03 Conflicts among students decrease learning.	.449
04 Tension makesme confused/absent minded in the class room.	.374
05 Teaches injustice /favoritism affect learning.	.509
06 I am considered mature by my parents so Icannot share my problems with them	.342
07 I cannot find solution of my problems independently.	.540
08 I can trust on others as my friends.	.473

Factor 4 Proactive Behavior of the Learner

01 I want to know about unknown people.	.485
02 I accept change around me.	.366
03 I can comment on different situations. .340	
04 Experience of college life has reformed my thoughts.	.436
05 Analytical approaches of students provide different dimensions of learning.	.354
06 Supportive behaviors of class fellows encourage me for learning.	.347
07 Innovative teaching methods are a strong source to make learning interesting. .366	
08 I feel need of counseling when Ilose interest in classroom. .460	
09 I believe that my teachers can understand my problems.	.379
10 I think friends are better options to share my worries.	.559
11 I think friends are better options to share my worries.	.379

Factor 5 Synergy

01 I feel difficulty in understanding new terms.	.368
02 I am able to solve my learning problems by my own self.	.565
03 I like puzzles.	.474
04 I feel happy while facing challenges.	.491
05 I always express my emotions through language.	.452
06 I am strong in creative writings.	.321
07 I have learnt how to manage my time.	.333

Table 5

Percentiles	Scores	
0 5		404
10	419	
15		428
20		435
25		*441*
30		443
35		449
40		452
45		455
50		*458*
55		464
60		468
65		472
70		476
75		*479*
80		487
85		493
90		499
95		512

Table 5 is showing the percentile ranks of the adult learners. 25th percentile is 441 showing low level of cognitive and behavioral development, 50th percentile is 458 showing mild level of cognitive and behavioral developments, 75th percentile is 479 showing high level of cognitive and behavioral development of adult learners.