

Construction and Standardization of Achievement Test in Educational Psychology

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ABSTRACT

Conceptual and research based literature related to achievement test construction and educational psychology topics were studied thoroughly for developing Achievement Test in Educational Psychology. The preparation and standardization of the Achievement test consisted of four major phases such as planning, construction, evaluation and validation. In present investigation one hundred MCQ items were prepared by the researcher which was reviewed by experts in the field and then first draft of the achievement test was ready for tryout. For pilot testing, the test was administered on representative sample of 80 pupil teachers of different institutions keeping in mind that they should have knowledge of test content and they must have gone through the content earlier. Achievement test having 67 items with four options each was given to participants and scoring was done with the help of scoring key. Difficulty Value and Discrimination Power of the test calculated. This test has a value 0.936 (Cronbach Alpha) for test consistency. Researcher also used Split-half method to establish the reliability of the test.

Keywords: Achievement test, educational psychology, standardization

The dexterity or proficiency of accomplishment in a given task or skill is called achievement; it implies the mastery of an individual in a particular context or domain of knowledge. In other words, the kind of utmost performance test that describes what a person has learnt to do is called an achievement test (Thorndike & Christ, 2011). An instrument that assesses the attainments of an individual must be objective, reliable and valid. Achievement test serves four general purposes, namely summative, formative, diagnosis and placement (Bloom *et al.* 1971). For developing Achievement Test in Educational Psychology, the available conceptual and research literature related to achievement test construction and educational psychology topics were studied thoroughly. Some achievement tests constructed earlier by different investigators was critically studied. Different significant dimension of achievement test of educational psychology; Objectives, Content, Method and Evaluation were identified from available conceptual as well as

research literature. The items were checked, edited properly and then subjected to experts' criticism. Based upon the comments of experts, some items were dropped and necessary modifications were made in some other items. Sixty Seven statements of achievement test of different dimensions were finally selected. The selected items were again subjected to expert's criticism to get their comment with a view to improve them on the basis of expert's opinion, some of the items were modified.

Thus, to measure the performance of the pupil teachers before and after the experiment, an Achievement test in Educational Psychology was constructed by researcher on the selected topics viz; Learning, Intelligence, Personality and Creativity. The items included in the test were of objective type consisting of only 04 options multiple choice questions. The test was designed to assess the achievement in the Knowledge, Understanding and Application domains; the same achievement

test was used for pre-test and post-test stage of the research.

THE STEPS FOLLOWED IN THE TEST DEVELOPMENT AND VALIDATION

The preparation and standardization of the Achievement test consisted of four major phases such as planning, construction, evaluation and validation.

- Phase I - Planning
- Phase II - Construction
- Phase III - Evaluation
- Phase IV - Validation

Phase I: Planning

For appropriate planning of the test, the investigator kept following aspects in mind such as: to whom, what, when and how to measure. It includes designing the test and preparation of the blue print. The major steps included in this phase are:

- (i) Defining test universe and test purpose.
- (ii) Defining the construct and content to be measured.
- (iii) Preparing the blue print of the achievement test.

(i) Defining Test Universe and Purpose

For defining the target group the researcher made a list of characteristics of the individuals identified for taking test and B.Ed. Students of first semester identified as Test Universe. In present research, the purpose of the test was to compare the pupil teacher.

(ii) Defining the Construct to be Measured

In the present research the researcher selected the remembering, understanding and application

domain as the major constructs and prepared test items as per the basic guidelines for preparing the Achievement test.

(iii) Blueprint of the Achievement Test

Blue print provides a bird’s view and serves as a ready actuary of the full test, the content covered, objectives, type of questions and distribution of scores (Baer, 1997). A blue print is the basis of test construction. After the review of topics to be covered and selecting domain of objectives, the researcher decided the number of items to be included in the test. A blueprint is prepared as per details is given in Table 1.

Phase 2: Construction: Preparation of Test Items

The researcher selected objective type format of questions (multiple choice) for the test because such questions can be objectively graded. The Multiple choice questions based examinations are efficient, capable of discrimination and can be combined with other assessment techniques to contribute for inclusive assessment package (Brady, 2005, Rodriguez, 2005, Bennett, Rock, & Wang, 1991, Rodriguez, 2005). In present investigation one hundred MCQ items were prepared by the researcher which was reviewed by experts in the field and then first draft of the achievement test was ready for tryout.

Phase: 3: Evaluation of Item: Qualitative and Quantitative Qualitative Evaluation of Items by Experts

The prepared first draft of Achievement test was given to the supervisor and experts of education and particularly educational psychology. Experts are requested for critical evaluation of test items and check whether the items are from concerned

Table 1: Blueprint of the Achievement Test (First Draft): Objective Wise Distribution

Sl. No.	Objectives Content	Remembering	Understanding	Applying	Total
1	Intelligence	50% (13)	25% (06)	25% (06)	25% (25)
2	Learning	30% (08)	30% (07)	40% (10)	25% (25)
3	Personality	40% (10)	30% (08)	30% (07)	25% (25)
4	Creativity	30% (08)	30% (07)	40% (10)	25% (25)
5	Total	40% (39)	30% (28)	30% (33)	100% 100

Table 2: Blueprint of the Achievement Test- Second Draft: Objective Wise Distribution

Sl. No.	Objectives Content	Remembering	Understanding	Applying	Total
1	Intelligence	60% [12] (03, 04, 21, 23, 33, 44, 45, 46, 47, 49, 50, 51)	25% [05] (01, 10, 20, 22, 48)	15% [03] (18, 24, 65)	30% 20
2	Learning	33% [05] (07, 11, 17, 35, 36)	27% [04] (06, 13, 14, 55)	40% [06] (15, 19, 39, 52, 56, 63)	22% 15
3	Personality	50% [07] (05, 08, 30, 31, 32, 37, 38)	28% [04] (02, 12, 16, 27)	22% [03] (34, 53, 54)	21% 14
4	Creativity	28% [05] (09, 26, 28, 41, 42)	33% [06] (25, 29, 40, 43, 57, 59)	39% [07] (58, 60, 61, 62, 64, 66, 67)	27% 18
5	Total	40% 27	32 % 21	28% 19	100% 67

Table 3: Blueprint of the Achievement Test- Final Draft: Objective Wise Distribution

Sl. No.	Objectives Content	Remembering	Understanding	Applying	Total
1	Intelligence	40% (04)	40% (04)	20% (02)	23% (10)
2	Learning	17% (02)	33% (04)	50% (06)	27% (12)
3	Personality	55% (06)	27% (03)	18% (02)	25% (11)
4	Creativity	27% (03)	27% (03)	46% (05)	25% (11)
5	Total	34% (15)	32% (14)	34% (15)	100% (44)

field and representative of the specific objectives, they were also asked to point out ambiguous items and provide fruitful suggestions in revision of test. This procedure helped the researcher to improve language and other difficulties of test. The researcher made necessary corrections and modifications in the test and prepared the final draft of the Achievement test having sixty seven multiple choice items which were arranged randomly.

Quantitative Evaluation: Pilot Testing

For pilot testing, the test was administered on representative sample of 80 pupil teachers of different institutions keeping in mind that they should have knowledge of test content and they must have gone through the content earlier. Achievement test having 67 items with four options each was given to participants. They had to put a tick mark in the response sheet at appropriate column A, B, C or D which represents the correct answer. However, there was no time limit but generally one hour thirty minute was given to the candidates. Scoring was done with the help of scoring key.

Item Analysis: Item Difficulty Index

The item difficulty is a measure of the proportion of respondent who respond to an item correctly (Nunnally, 1972; Thorndike *et al.* 1991). The difficulty index is calculated by using following formula:

$$DV = \text{Total No of correct Response} / N$$

The P value of an item difficulty supplied an accurate evidence of how easy or difficult the item was for the responded. The difficulty index can range from 0.00 to +1.00. For a multiple choice test consisting of four or more alternatives, items in the range between 0.20 and 0.80 should be selected (Nunnally, 1972). All items found too easy or too difficult were excluded.

Item Discrimination

Discriminatory power of item supplies us information to what extent the test is able to discriminate between high and low achievers on achievement test. The discrimination power was calculated using the formula:

$$DP = RU-RL/N$$

Where,

RU = Correct response in the upper group

RL = Correct response in the lower group

N = the number of students in either group

For calculating discrimination index researcher arranged 80 response sheets in the descending order of the scores. The top 27% (22 Nos.) response sheets and bottom 27% (22 Nos.) response sheets were used for statistical treatment. The numbers of respondent given correct response in the upper group (U) and in the lower group (L) on same item were identified and subtracted from upper group to lower group who answered the item correctly. The greater the difference, the better the item as it could discriminate the upper group from the lower group. The items having a DI of below 0.13 are considered as poor discriminators and eliminated from test, however difficulty value is also considered for taking final decision about any item. (Thorndike *et*

al. 1991). Ebel and Frisbie (1986) gave the following rule of thumb for determining the quality of the item, in terms of the discrimination index. Table 4 shows the values DI and their corresponding interpretation.

Table 4: Discrimination Index

Range	Grade	Recommendations
> 0.39	Excellent	Preserve
0.30-0.39	Good	Possibilities for enhancement
0.20-0.29	Average	Need to verify/review
0.00-0.19	Poor	Reject or review in depth (Items having good difficulty value but discrimination index up to 0.10 is considered for revision and finally included in the test)
< -0.01	Worst	Remove

List of Item Difficulty value and Item Discrimination Index is given in Table 5 below with item decision.

Table 5: Item Analysis: Item Difficulty Index and Item Discrimination

Sl. No.	Score	Difficulty Value (Score/80)	Correct answers of Upper group	Correct Answers of Lower Group	Difference	Discrimination index	Item Decision
1	54	0.67	20	0	20	0.90	Selected
2	13	0.16	4	5	-1	-0.04	Rejected
3	71	0.88	18	16	2	0.09	Rejected
4	45	0.56	12	10	2	0.09	Selected
5	54	0.67	20	0	20	0.90	Selected
6	49	0.61	17	13	4	0.18	Selected
7	54	0.67	20	0	20	0.90	Selected
8	48	0.6	17	1	16	0.72	Selected
9	64	0.8	16	16	0	0	Rejected
10	68	0.85	19	17	2	0.09	Rejected
11	69	0.86	17	17	0	0	Rejected
12	53	0.67	19	0	19	0.86	Selected
13	53	0.66	20	0	20	0.90	Selected
14	43	0.53	14	1	13	0.59	Selected
15	54	0.67	19	14	5	0.22	Selected
16	54	0.67	20	0	20	.90	Selected
17	55	0.68	20	0	20	.90	Selected
18	11	0.13	3	4	-1	-0.045	Rejected
19	13	0.16	3	3	0	0	Rejected
20	48	0.6	18	5	13	0.59	Selected
21	45	0.56	12	12	0	0	Rejected
22	48	0.6	18	5	13	0.59	Selected

23	47	0.58	16	11	5	0.22	Selected
24	42	0.52	14	5	9	0.40	Selected
25	49	0.61	15	15	0	0	Rejected
26	70	0.87	19	16	3	0.13	Rejected
27	48	0.6	18	5	13	0.59	Selected
28	50	0.62	17	14	3	0.13	Selected
29	53	0.66	15	12	3	0.13	Selected
30	73	0.91	19	18	1	0.045	Rejected
31	51	0.63	15	9	6	0.27	Selected
32	64	0.8	20	14	6	0.27	Selected
33	70	0.87	18	17	1	0.045	Rejected
34	12	0.15	4	3	1	0.045	Rejected
35	70	0.87	17	17	0	0	Rejected
36	78	0.97	20	19	1	0.045	Rejected
37	61	0.76	18	14	4	0.18	Selected
38	54	0.67	20	0	20	1	Selected
39	64	0.8	20	14	6	0.27	Selected
40	25	0.31	11	7	4	0.18	Selected
41	50	0.62	16	11	5	0.22	Selected
42	55	0.68	14	12	2	0.09	Selected
43	55	0.68	16	15	1	0.045	Rejected
44	12	0.15	6	4	2	0.09	Rejected
45	68	0.85	19	15	4	0.18	Rejected
46	55	0.68	14	12	2	0.09	Rejected
47	28	0.35	11	8	3	0.13	Selected
48	57	0.71	17	16	1	0.045	Rejected
49	39	0.48	13	12	1	0.045	Rejected
50	63	0.78	18	17	1	0.045	Rejected
51	54	0.67	20	0	20	0.90	Selected
52	46	0.57	15	7	8	0.36	Selected
53	54	0.67	20	0	20	0.90	Selected
54	51	0.63	17	4	13	0.59	Selected
55	47	0.58	13	10	3	0.13	Selected
56	54	0.67	20	0	20	0.90	Selected
57	55	0.68	16	6	10	0.45	Selected
58	51	0.63	17	4	13	0.59	Selected
59	45	0.56	14	7	7	0.31	Selected
60	55	0.68	20	1	19	0.86	Selected
61	13	0.16	7	3	4	0.18	Rejected
62	44	0.55	14	8	6	0.27	Selected
63	54	0.67	20	0	20	0.90	Selected
64	54	0.67	20	0	20	0.90	Selected
65	58	0.72	20	4	16	0.72	Selected
66	56	0.7	20	1	19	0.86	Selected
67	56	0.7	20	1	19	0.86	Selected

ASSEMBLING THE FINAL TEST

The items meeting the item analysis criteria were arranged in a manner that easiest question be placed first and difficult one at the end in the final form of the test. The final achievement test consisted of 44 Items with a possibility of 44 as the highest score.

Phase 4. Validation - Reliability and Validity of Achievement Test

Reliability of the Test

Reliability is one of the most important elements of test quality. The reliability of a measuring instrument is usually expressed as the degree of consistency usually expressed by a co-efficient of correlation. This test has a value 0.936 (Cronbach Alpha) for test consistency. The more reliable the test is, the more confidence the researcher can have that the scores obtained will have a consistency if re-administered in future (Barlow, & Proschan, 1975). Researcher also used Split-half method to establish the reliability of the test. Split-half is the method of splitting the test in two halves and finding the correlation. The responses of eighty students were used for the calculation. The scores of two halves were correlated and reliability of the test was found to be 0.898 (Guttman Split-Half Coefficient)

Validity of the Test

While preparing the blue print and writing items of test, face validity and content validity of the test was assured by awarding adequate weightage to content and objectives. The views of experts in this field were taken into consideration while preparing the items of the test and indispensable modifications were made according to their recommendation.

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