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CONSTRUCTION AND STANDARIZATION OF ACHIEVEMENT TEST IN SCIENCE FOR IX GRADERS

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Abstract: The primary purpose of this study is to develop and standardize an achievement test in science for ninth graders. The first draft of the test had 150 items, and it was given to 51 students in the X grade at a government school in the Faridkot district to filter out those items that were too simple or too challenging. Blueprinting, drafting, scoring, piloting, item analysis, and validating and reliable testing are all steps of achievement test construction. Sixty items were chosen for the final test after their difficulty value and discrimination power were evaluated. The test's reliability was determined using a test-retest analysis. The content's validity was established.

Keywords: Achievement test, Science, IX graders

1. Introduction

In the educational system, the student's level of knowledge about the subject is shown in terms of achievement. By acquiring various skills and knowledge, students become more confident and satisfied. In other words, achievement is the complete understanding of the subject matter after achieving the learning objectives. Achievement is based on the number obtained in test related to a subject (Good, 1973, cited in Zargar & Ganai, 2014). Achievement is defined as a person's ability to communicate knowledge acquired from various learning sources (Crow & Crow, 1969, as cited in Zargar & Ganai, 2014). Achievement is defined as individuals learning outcomes in any course of study. Student's levels of achievement and knowledge can greatly assist teachers in determining appropriate teaching methods, support materials, and assessment methods (Zargar & Ganai, 2014, p. 32).

Achievement is defined as:

- The acquisition of various skills and an in-depth understanding of content.
- Various tasks are carried out with great attention and effort.
- Provides evaluation criteria to determine the level of accomplishment of educational objectives.
- Motivate students to learn independently.
- Establish a way to evaluate student progress.
- Way to understand the effectiveness of teaching methods.
- Acts after the delivery of teaching instructions.

1.1 Factors affecting achievement

1. Important factors related to academic performance are intelligence, energy, creative thinking, concentration, imagination, thinking ability, and the power of retention. There are other factors, such as the method of gaining knowledge, command over the language, and reading and writing skills, that affect school performance (Kaur, 2019).
2. Personal factors: Individual differences such as learning habits, interests, abilities, and strengths determine academic performance (Dev, 2016).
3. Environmental factors: Environmental conditions determine the development of a child. There are two types of environments.

   a) Home environment: the child learns different things from his parents. Socioeconomic status and the expectations of family members have a huge impact on student's academic performance.

   b) School environment: students get different learning experiences at school by interacting with teachers and peers. Thus, the teacher's teaching style, student-student interaction, and the teacher's behaviour towards the students determine their score on the achievement test (Lyngdoh, 2017).

The achievement test can be categorized into teacher-made tests and standardized tests. A standardized test has been constructed to achieve a predetermined standard of quality. The format, construction, administration method, and test norms of the test are all standardized. Regarding its construction, implementation, grading, and analysis, it is a form of assessment that is standardized. Standardization ensures that the test possesses all the requisite attributes of a strong assessment instrument, including objectivity, reliability, and validity. A manual is included with standardized test, providing users with instructions and guidance about administering, scoring, and interpreting the tests. "Teacher-made tests" refer to instruments or question papers that instructors utilize to assess the progress of the students under their instruction. Typically administered to a section, class, or school, these non-standardized examinations are designed for a limited number of pupils (Kumar et. al, 2016).

2.**Objectives under study**

To construct and determine the difficulty value, discrimination index, reliability and validity to standardize the achievement test.

3.**Steps for the construction of achievement test**

Following steps was followed to construct the achievement test in science:

3.1 Planning of test: To choose the units and types of test items, the researcher first looked over the science textbook for standard IX of the Punjab School Education Board, Mohali. The objectives of the chosen content were outlined in terms of knowledge, understanding, and application within Bloom's taxonomy's cognitive domain.

3.2 Preparation of the test: The achievement test's original draft included 30 alternative-type test items, 54 blanks, and 66 objective-type test items. The test introduction contains instructions for students to ensure they have no trouble completing the test; it was designed for both Punjabi and English-medium students. There was also a response sheet attached to the back of the question paper. The scoring key for the first draft was also prepared along with the achievement test. One mark was awarded for a correct response on the response sheet, zero for an incorrect response, and no mark was given for questions that were unattempted. The first draft was sent to subject matter experts for comments and suggestions, and the test was modified in response to their advice. On the basis of the expert's advice, the item numbers 13, 17, 22, 37, 38, 39, 54, 96, 97, and 111 were modified. The blueprint for the initial draft is given in the following table:

Table 3.2 Blueprint of the achievement test in science

Objectives	Knowledge			Understanding			Application			Total
Topics	**B**	**O**	**A**	**B**	**O**	**A**	**B**	**O**	**A**	
Force and laws of motion	3(3)	3(3)	-	5(5)	2(2)	3(3)	-	12(12)	-	28(28)
Matter in our surroundings	6(6)	8(8)	3(3)	2(2)	10(10)	5(5)	-	3(3)	2(2)	39(39)
Is matter around us pure	4(4)	4(4)	3(3)	7(7)	4(4)	1(1)	10(10)	2(2)	-	35(35)
Structure of atom	7(7)	6(6)	7(7)	2(2)	7(7)	2(2)	1(1)	3(3)	-	35(35)
The fundamental unit of life	2(2)	1(1)	2(2)	1(1)	1(1)	1(1)	4(4)	-	1(1)	13(13)
Total	22	22	15	17	24	12	15	20	3	150
	59			53			38			

B- Blanks, O-Objectives, A- Alternative (True/False)

Number of questions is shown inside the bracket and marks are shown outside the bracket

3.3 Pre try-out of the test: To remove the too easy and too difficult items, 51 X grade students from a government school situated in Faridkot district took the test. From its initial draft 21 easy items and 5 repeated items were eliminated based on this trial of test. As a result, the test draft contained 124 items.

3.4 Final try-out of the test: The draft of the test with 124 items was administered to the 89 respondents in class X of two government schools situated in Faridkot district. The main objective of the final tryout was to gather data for item analysis.

3.5 Item Analysis

Following steps were used to analysis of items:

1) Based on the achievement scores, the response sheets was set up in decreasing order.

2) According to Kelley (1939) criteria, the top 27% and bottom 27% of all the answer sheets were categorized as belonging to the higher and lower groups, respectively.

3) For each test item, the total number of respondents in the higher and lower groups who provided the correct response was counted.

4) The following formula was used to determine the discrimination power (DP) and difficulty value (DV) for each item.

DV (Difficulty Value) = $(R_H+R_L)/ N_H+N_L$

R_H= Number of correct responses in higher group

R_L=Number of correct responses in the lower group

N_H= Number of respondents in higher group

$N_{L=}$ Number of respondents in lower group

D P (Discrimination power) = $(R_H-R_L)/ (N_H+N_L)/2$

R_H= Number of correct responses in higher group

R_L=Number of correct responses in the lower group

N_H= Number of respondents in higher group

$N_{L=}$ Number of respondents in lower group

3.6 Selection of items for the final draft

The final draft of the science achievement test was chosen based on two factors: discrimination power (DP) and difficulty value (DV). When the DV value was less than 0.25, an item was regarded as difficult, and when it was greater than 0.75, it was easy. From the achievement test, easy and difficult items were removed. The DP above 0.40 and the DV between 0.50 and 0.75 are regarded as good items, according to Ebel and Frisbie's (1991) criteria. Additionally, items with DP values between 0.30 and 0.39 are regarded as reasonably good. The items with DV ranging from 0.25 to 0.49 and DP ranging from 0.20 to 0.29 are deemed marginal items requiring minimal revision. The achievement test kept items with DV between 0.25 and 0.75 and DP greater than 0.40. As a result, the final version of the science achievement test had sixty items.

3.7 Reliability of the test: There are several ways to assess the test's reliability, including test-retest and split-half methods. The reliability coefficient for the current test was determined using the test-retest method. First, 48 students in the X grade at a private school in the Faridkot district took the test. Two weeks later, the same test covering the same content was administered. As a result, 0.81 is the estimated coefficient of correlation. So, the achievement test is highly reliable.

3.8 Validity of the test: When a test is said to be valid, it means that it measures exactly what it claims to measure. Four experts who teach science were given the final draft of the achievement test to ensure that it was valid in terms of content. They made a comparison between the test items and the content, and they also evaluated the scoring key.

4. Conclusion: An achievement test is essential for determining a student's level of mastery. In order to achieve the intended educational goals, teachers can also benefit from designing their pedagogy strategies to make their instruction more effective. Additionally, achievement scores help students assess how far they have come in their education. The goal of this research paper is to create a valid and reliable science achievement test that will benefit both educators and learners.

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