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CONSTRUCTION AND STANDARDIZATION OF AN ACHIEVEMENT TEST IN MATHEMATICS

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ABSTRACT:

This paper includes construction and standardization of achievement test in mathematics. It was constructed and standardized after discussion with research scholars and experts. The final draft of the achievement test was prepared on the basis of item analysis for difficulty value and discriminating power. Items with discriminating index more than 0.40 were considered to be the best.

KEYWORDS: *includes construction and standardization of achievement test , discriminating power.*

INTRODUCTION

Each child is unique and different in his/her class. Some are good in spellings while some are good in mathematics. The evaluation and grading system tends to evaluate knowledge and understanding of the students. NCERT revised our syllabus of mathematics for IX and X in 2002 as recommended by NCF (2002) so this test is constructed to measure instructional progress of the students of IX class. The study was carried out with the following objectives:

1. To prepare achievement test in mathematics covering whole syllabus of mathematics for class IX.
2. To standardize the achievement test in mathematics by finding out the difficulty value and discrimination index of each item, determining the reliability and validity of the test.

REVIEW OF TOOLS ALREADY CONSTRUCTED

Criterion referenced tests have become popular for last many years to specially determine whether an individual has learnt specific skills or specific knowledge or has attained a given instructional behaviour objective. Chaudhary (1978), undertook "Construction and standardization of an achievement test in Trignometry for XI class students of Punjab". Gakhar (1981) constructed and standardized his own achievement test in mathematics for VIIth class students. Kaur(1991) constructed and standardized achievement test in Biology for 10+1 class.

Gulati (2001) constructed and standardized achievement test in Accountancy for the students of 10+1 class.

IN SEARCH OF ITEMS

Before constructing the achievement test in the subject of mathematics, it was essential to be acquainted with the course of study. For that text-book of mathematics prescribed by the Punjab School Education Board, Mohali and NCERT were read thoroughly and the objectives upon which the evaluation had to

be based were framed content-wise.

The investigator before constructing her own achievement test had gone through all the test items prepared by NCERT and other experts for the achievement test used for various survey researches in different subjects. Investigator's own knowledge about the subject of mathematics, and thorough discussion with subject experts who were teaching this subject to IX classes helped in identifying some main concepts of mathematics. Those items which were found to be suitable for the present study were retained for preliminary draft of the test. In addition to this some additional items were prepared by the investigator, keeping in view the content and the objectives in mind.

PREPARING TEST ITEMS

In all 121 items were written from14 chapters of the text-book of IX class prescribed by Punjab School Education Board, Mohali. Detail Description of the items along with chapters has been given in table 1.

Table 1

Chapter-wise allocation of items for the preliminary draft of the achievement test.

Sr.No.	*Topic*	No. of items
1.	Irrational Numbers	6
2.	Polynomials	10
3.	Ratio and Proportion	5
4.	Linear equations in two variables	5
5	Percentage and its applications	5
6	Compound Interests,Profit and loss	9
7	Lines, Angles and Triangles	11
8	Congurency of Triangles	5
9	Triangles	12
10	Parallellogram	6
11	Areas	13
12	Trignometry	20
13	Measurement of plane figures	4
14	Statistics	10
		N=121

Six copies of these 121 items were got photostat and were given to six experts in the field of mathematics. These experts were told the purpose of research and were requested to find out if there were any defects in the language or vagueness in the format of items.

Out of 121 items, 17 items were deleted by these six experts. Chapter wise number of deleted items have been shown in table 2.

Table 2

Chapter-wise serial number of deleted items

Sr.No.	*Topic*	Serial no. of deleted items	Item left
1.	Irrational Numbers	-	6
2.	Polynomials	90,39	8
3.	Ratio and Proportion	11,12,13	2
4.	Linear equations in two variables	2	4
5	Percentage and its applications	-	5
6	Compound Interests,Profit and loss	24	8
7	Lines, Angles and Triangles	59	10
8	Congurency of Triangles	69,84	3
9	Triangles	75,76,78, 79	8
10	Parallellogram	-	6
11	Areas	-	13
12	Trignometry	103,115	18
13	Measurement of plane figures	-	4
14	Statistics	34	9
		17 (deleted)	**104 (left)**

In this way after the judgement of judges, the achievement test comprised of 104 items. The preference to multiple choice items was on account of their wide use and consensus among specialists about their superiority over all other types. Stanley and Hopkin (1972) while stressing the superiority of multiple choice items quoted Lindquist who has asserted that multiple choice of items are definitely superior to all other types for measuring the educational objectives as inferential reasoning, understanding or sound judgement and discrimination on the part of pupils.

PRELIMINARY TRY OUT OF THE TEST

After finalizing and arranging the test items on the basis of judgement of judges, the remaining 104 items were got typed and were given to 50 students of IX class to find out the level of difficulty as well as vagueness, if any, in the construction of the items.

There was no time limit and the time taken by each student was noted. The necessary instructions were given. The students were required to record their responses on a separate response sheet prepared for this purpose.

Out of 104 items, 19 items were found either difficult or confusing and these 19 items were dropped on the basis of performance of the above 50 students.

Chapter- wise dropping of items have been shown in table 3

Table 3

Chapter-wise dropping of items during the preliminary try-out of the items and the items left after the preliminary try-out of the test

Sr.No.	*Topic*	Serial no. of deleted items	Item left
1.	Irrational Numbers	-	6
2.	Polynomials	38,91	6
3.	Ratio and Proportion	-	2
4.	Linear equations in two variables	-	4
5	Percentage and its applications	-	5
6	Compound Interests,Profit and loss	23,93,96	5
7	Lines, Angles and Triangles	101,102,103	7
8	Congurency of Triangles	70	2
9	Triangles	-	8
10	Parallellogram	-	6
11	Areas	43,46,50	10
12	Trignometry	108,111,113, 117	14
13	Measurement of plane figures	52,56,57	1
14	Statistics	-	9
		19 (deleted)	**85 (left)**

The remaining 85 items were arranged keeping in view the nature of the topic. In this way achievement test in mathematics after the preliminary try out consisted of 85 items. This is ready for final try out.

FINAL TRY OUT OF THE ACHIEVEMENT TEST

85 Items selected after the preliminary try out of the test were got printed in the form of booklet for final try out of the test. The final try out of the test was tried on 200 students of IX class taken from four institutions. Table 4 shows that the names of the schools and the number of students taken for final try out.

Table 4
List of students taken for final try out of the test

Sr.No	*Name of the institution*	No. of students
1.	Government Model Senior Secondary School, Mani-Majra (Chandigarh)	70
2.	D.A.V.School, Ropar	50
3.	Chakwal National Senior Secondary School, Kurali	50
4.	Shri Guru Harkrishan Public School, Doraha (Ludhaiana)	30
		N=200

ITEM ANALYSIS OF THE ACHIEVEMENT TEST

The aim of the item analysis of the test is to locate any ambiguity, clue or ineffective distracter that might have been overlooked during the test construction. Item analysis helps in the selection or rejection of items in a test and reveals the nature of each question. For this purpose, statistics are required to consider in a meaningful way the acceptability of items and appropriateness of the test as a whole. These statistics are:

1. The Item Difficulty
2. The Item Discrimination

The Item Difficulty

The difficulty of an item is usually expressed by its degree of facility or facility index (F). If the value of F is high, the item is easy one but if it is low, then the item is difficult one. The facility index of an item is defined as the percentage of all candidates making a correct or appropriate response to the item.

Therefore Facility Index $F = \frac{Nh + N1}{2n}$

Where Nh is the number of correct responses which comprises 27 % of the higher limit.

Nl is the number of correct responses which comprises 27 % of the lower limit.

n is the number of candidates constituting 27 % of the entry i.e. the number in each group.

The Item Discrimination

The item discrimination is expressed by the discrimination index of the item, which is calculated by the formula

Discrimination Index $D = \frac{Nh - Nl}{n}$

Researches have shown that 27 % provides the best compromise between making the extreme groups as large as possible and making them as different as possible. 27% appears to be optimum value, the use of which enables it to be said with confidence that the selected upper group will be superior in ability to the selected lower group. At the same time, it provides an adequate sample upon which to carry out the calculations.

The purpose of item analysis is to enable the test constructor to distinguish between good and poor items. A good item is one, which is at roughly the correct level of difficulty and has sufficiently high discrimination. For particular purposes, this is considered to be an item for which the facility index falls between 40 percent and 60 percent and for which the discrimination index exceeds 0.40.

ARRANGEMENT OF DATA FOR ITEM ANALYSIS

When all the booklets were scored, the scores were arranged with highest scores at the top and going down with the lowest scores at the bottom. This way scores for all the pupils were arranged in order of merit. Two groups were made – an upper group consisting of 27 % of the total group who received the highest scores on the try out test and a lower group consisting of an equal number of papers from those who received lowest marks. Thus, 27 students were included in the upper group and 27 students were included in the lower group.

Number of correct responses for each item was counted separately for top group and bottom group and was denoted by Nh and Nl respectively. Then the difficulty and discriminating values were calculated by the following formulae

$$\text{Facility Index } F = \frac{Nh + Nl}{2n} \times 100\ \%$$

$$\text{Discrimination Index } D = \frac{Nh - Nl}{N}$$

SELECTION OF ITEMS ON THE BASIS OF FACILITY AND DISCRIMINATION VALUES

On the basis of their total scores for 85 test items, upper 27 % and lower 27 % pupils were selected to work out the facility index and discriminating value. Items having facility index between 40 % and 60 % were considered to be the best. Those items with facility of more than 60 % were on the easy side and those with facility index of less than 40 % were on the too difficult side. Items with discrimination index more than 0.40 were considered to be the best, those with discrimination index between 0.30 and 0.39 were reasonable while those with less than 0.30 were rejected out rightly.

Table 5

Classification of items on the basis of discrimination index and facility index

Discrimination Index	Facility Index		
	<40%	40-60%	>60%
>0.40	34	3,9,10,12, 18, 20, 32, 33, 36, 41, 43, 49, 50, 54, 56, 59, 64, 71, 74, 81, 82, 85	24, 25, 29, 30, 31, 35, 39, 42, 53, 58, 63, 68, 73, 75, 76, 78, 80, 84
0.30-.39	8	22,26,27,38,40,52,65, 77	2,4,6,15,16,21,23,47, 55, 62, 67, 69, 72

FINAL FORM OF THE TEST

The items for the final print were selected out of the list of items, which had been cleared by the try out test in such a way as to give appropriate distribution of difficulty level and discrimination value besides meeting the other requirements of valid items.

After rejecting items for either high or low difficulty value or low discrimination power, the final form was left with 30 valid items. These are shown in the table no.5.

Hence, in this way, mathematical achievement test in its final form comprised of 30 items.

METHODS TO ESTIMATE RELIABILITY OF THE TEST

There are many procedures by which the reliability of the test measures can be established. Guilford (1980) has suggested three general categories namely:

(1)Alternative forms reliability.

(2)Internal – consistency reliability.

(3)Retest reliability or test – retest reliability.

All these forms have a common approach of obtaining the two sets of measures from the same scale and

administer to the same sample for the purpose of finding coefficient of reliability.

These forms undoubtedly have their own merits and limitations but their major distinctions still hold today. They are, however, much more rigorously defined and the operations are better controlled. The recent trends in the measurement of reliability are mainly in terms of studying the effects of the nature of distribution of the test scores and items difficulty upon the reliability of the test. These trends, however, demand very sophisticated techniques and their practical application is hindered by their tediousness and complexity.

As the test being heterogeneous and items have been arranged logically, the two halves could not have been identical. Therefore, in the light of the above discussion on reliability, test–retest reliability was found to be the most suitable for this test. The reliability study of the test was conducted on a sample of 30 students. The second administration of the test was given after a month. The product moment coefficient of correlation between two scores was found to be 0.73. This coefficient of correlation is high enough, which testifies the soundness of the test.

METHODS OF VALIDATION OF THE TEST

A variety of validity procedures have been suggested by experts in the field of test construction, like Thorndike and Hegan (1962), Ebel (1966), Anastasi (1971) and many others, with variations of nomenclature in the terminology used. These procedures have been classified under three principal categories: Content, Criterion-related and Construct Validity. Fundamentally, all these procedures are concerned with the relationship between performance on the test and other independently observable facts about the behaviour characteristics under consideration.

The purpose of the present investigation and the nature of the items restricted the use of very exhaustive statistical techniques to validate the test. Factorial validity could not be ascertained as in general each concept was represented by only few items.

Mathematical achievement test was validated against criterion of “Content Validity”. The content validity is concerned with the adequacy of sampling of a specified universe of content. To determine the content validity, the test items and a list of outcomes was given to the panel consisting of four experts in the subject of mathematics and two experts in test construction. The panel was asked to identify which test items corresponded to which component. The experts agreed 98% with the investigator on the assignment of test items. This concurrence was taken as evidence of content validity.

REFERENCES

1.Aggarwal, J.C.,& Biswas, A. (1971). Encyclopaedia, Dictionary and Dictionary of Education. 1(1), 250.
2.Anastasi, A. (1976). Psychological Testing. (4th Ed.), The Macmillan Publishing Corporation. Inc., New York.
3.Chaudhary, Geeta Bali (1978). Construction and Standardization of an achievement test in Trignometry for XI class students of Punjab. M.Ed. Dissertation, Panjab University, Chandigarh.
4.Ebel, R.L. (1966). Essentials of Educational Measurement. Prentice Hall of India Pvt. Ltd., New Delhi, pp. 100-113.
5.Gakhar, S.C. (1981). Identification of Variables of Educational Environment as Related to the Acquisition of Mathematical Concepts at the junior Secondary Stage, Ph. D. (Edu.) Thesis, P.U. Chandigarh.
6.Gulati, V. (2001). Effectiveness of Inquiry Training Model, Mastery Learning Model and Conventional Method of Teaching Accountancy on Achievement and Self Concept, Ph.D (Edu), P.U. Chandigarh.
7.Kaur, B. (1991). Correlates of Achievement in Biology: A Comparative Study of Urban and Rural Senior Secondary Students of Punjab, Ph.D. (Edu.) Thesis, Panjab University, Chandigarh.
8.Stanley, J.C. and K.D. Hopkin (1972). Education and Psychological Measurement and Evaluation, Englewood Cliffs, N.J: Prentice – Hall.
9.Thorndike, R.l. and Hegan, E. (1962). Measurement and Evaluation in Psychology and Education, John, Willy and Sons, New York, p.461.

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