International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Construction of an Achievement test in science for the student of VIII class

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Abstract

An achievement test is a test of developed skill or knowledge. The most common type of achievement test is a standardized test developed to measure skills and knowledge learned in a given grade level, usually through planned instruction, such as training or classroom instruction. Achievement tests are often contrasted with tests that measure aptitude, a more general and stable cognitive trait. Achievement test scores are often used in an educational system to determine what level of instruction for which a student is prepared. High achievement scores usually indicate a mastery of grade-level material, and the readiness for advanced instruction. Low achievement scores can indicate the need for remediation or repeating a course grade. This paper discusses about Achievement test in science for the student of VIII class.

Keywords: achievement test, standardized, aptitude, cognitive, instruction

Introduction

The study of individual differences is a fascinating and worthwhile endeavor. It is one field within the behavioral science which holds interest for both casual observer and scholar part of the fascination concerning individual differences touches on vital questions in all aspects of own lives. Educationists and psychologists are particularly differences, as they are being continually being called upon to make decisions and evaluation about people.

Meaning and concept of achievement test

Achievement tests as the name signifies, are employed for measuring the amount of success or achievement of individual in a specific field or area of accomplishment. In the school situations an achievement test is used as a tool for measuring the nature & extent of students learning in a particular subject or a group. How for a particulars student has been able to learn and acquire or has been benefited from the learning

Objectives of the study

The aims of investigation were

1. To construct an achievement test in science for the 8th class.
2. To find out differences in achievement test in Physics of boys and girls.
3. To establish the reliability of the test prepared by investigator.

Sampling

(From Large Population) Sampling is the process by which a small unit of object is selected from a population in order to find out something about the entire population from which it was selected. The size of the sample varies from study to study. The investigator administered his achievement test to 370 students only. The detail of the schools selected for study have been given in table 3.1.

TABLE-3 .1 SHOWING THE DETAILS OF THE SAMPLE FOR PRELIMINARY DRAFT

S.No.	Name of the Institution	No. of Students
1.	S.D. Girls Inter College Sadar Meerut	50
2.	B.A.B. Inter College, Tehsil Meerut	40
3.	Chavli Devi Girls Inter College Meerut	40
4.	D.N. Inter College Meerut	50
5.	K.K. Inter College Meerut	50
6.	Saheed Mangal Panday Inter College Meerut	45
7.	Sardar Patel Municipal Inter College Meerut	25
8.	Seth B.K. Maheswari Girls Inter College Meerut	35
9.	Mahaveer Siksha Sadan Inter College Jain Nagar Meerut	20
10.	Neharu Smarak Inter College Ganesh Puri Meerut	40
	Total	**370**

Construction of the test-

The test is based on the syllabus of the science for 8th class. In the construction of the test, the investigator took care that the test items were selected from all the chapters of the syllabus. In the present study the achievement test items prepared by the researcher are of objective nature.The formula applied for calculating the difficulty value (DV) of each test items was

$$DU = \frac{PU + PL}{2}$$ where

DV - difficulty value of the item

PU - proportion of correct responses in the upper group

PL - proportion of correct responses in the lower group

This formula is standard formula determining difficulty of an objective examination.

TABLE 4.1 SHOWING THE LIST OF ITEMS WITH DIFFICULTY VALUE AND INDEX OF DISCRIMINATION

Item No.	Difficulty Value	Index of Discrimination
1.	.56	.71
2.	.61	.31
3.	.55	.55
4.	.32	.62
5.	.31	.63
6.	.30	.65

7.	.56	.28
8.	.50	.59
9.	.55	.30
10.	.48	.56
11.	.45	.64
12.	.48	.64
13.	.45	.59
14.	.32	.66
15.	.28	.60
16.	.39	.59
17.	.56	.33
18.	.30	.60
19.	.27	.75
20.	.55	.56
21.	.26	.58
22.	.24	.69
23.	.60	.46
24.	.52	.55
25.	.30	.69
26.	.52	.62
27.	.23	.41
28.	.51	.57
29.	.53	.52
30.	.29	.60
31.	.57	.54
32.	.32	.69
33.	.56	.57
34.	.56	.59
35.	.28	.51
36.	.57	.71
37.	.24	.56
38.	.52	.65
39.	.55	.33
40.	.28	.54
41.	.55	.67
42.	.51	.65
43.	.56	.53
44.	.29	.68
45.	.54	.51
46.	.68	.64
47.	.53	.64
48.	.28	.25

49.	.54	.51
50.	.28	.56
51.	.24	.46
52.	.66	.64
53.	.26	.56
54.	.52	.23
55.	.50	.66
56.	.56	.57
57.	.28	.54
58.	.50	.51
59.	.53	.48
60.	.49	.62
61.	.52	.59
62.	.54	.61
63.	.52	.60
64.	.23	.48
65.	.22	.47
66.	.60	.54
67.	.23	.72
68.	.32	.52
69.	.53	.31
70.	.56	.65
71.	.25	.64
72.	.29	.63
73.	.53	.61
74.	.21	.49
75.	.53	.60
76.	.21	.49
77.	.26	.68
78.	.28	.61
79.	.58	.43
80.	.51	.51
81.	.60	.62
82.	.26	.32
83.	.50	.52
84.	.82	.63
85.	.26	.57
86.	.61	.75
87.	.50	.34
88.	.54	.61
89.	.24	.40
90.	.48	.56

91.	.49	.61
92.	.56	.57
93.	.25	.53
94.	.55	.67
95.	.50	.32
96.	.59	.67
97.	.51	.52
98.	.27	.60
99.	.59	.31
100.	.60	.44

Item selection for final draft

In the present study the researcher selected only those items having difficulty value ranges from 0.33 to .75 and at the same time having internal consistency or discrimination index ranges from -.32 to .76. Since 56 items fulfil this criterion so these 56 items were retained in the final form. After the deletion of items which did not fulfil the said criteria items were retained. Since those items satisfied the investigation criteria and hence retained for the final draft. The list of the retained items is given in the table.

These items are:

1,3,8,10,11,12,13,16,17,20,23,24,26,28,29,31,33,34,36,38,39,41,42,43,
45,46,47,49,52,55,58,59,60,61,62,63,66,70,73,75,79,80,81,83,86,87,88, 90,91,92,94,96,97,99,100.

TABLE 4

S.No.	Item No.	Difficulty Value	Index of Discrimination
1.	1	.56	.71
2.	3	.55	.55
3.	8	.50	.59
4.	10	.48	.56
5.	11	.45	.64
6.	12	.48	.64
7.	13	.45	.59
8.	16	.39	.59
9.	17	.56	.33
10.	20	.55	.56
11.	23	.60	.46
12.	24	.52	.55
13.	26	.52	.62
14.	28	.51	.57
15.	29	.53	.52
16.	31	.57	.54
17.	33	.56	.57
18.	34	.56	.59
19.	36	.57	.71

20.	38	.52	.65
21.	39	.55	.33
22.	41	.55	.67
23.	42	.51	.65
24.	43	.56	.53
25.	45	.54	.51
26.	46	.68	.64
27.	47	.53	.64
28.	49	.54	.51
29.	52	.66	.54
30.	55	.50	.55
31.	56	.56	.57
32.	58	.50	.51
33.	59	.53	.48
34.	60	.49	.62
35.	61	.52	.59
36.	62	.54	.61
37.	63	.52	.60
38.	66	.60	.54
39.	70	.56	.65
40.	73	.53	.61
41.	75	.53	.60
42.	79	.58	.43
43.	80	.51	.51
44.	81	.60	.62
45.	83	.50	.52
46.	86	.61	.75
47.	87	.50	.34
48.	88	.54	.61
49.	90	.48	.56
50.	91	.49	.61
51.	92	.56	.57
52.	94	.55	.67
53.	96	.59	.67
54.	97	.51	.52
55.	99	.59	.31
56.	100	.60	.44

After the deletion of items which did not fulfil the said criteria items were retained. Since those items satisfied the investigation criteria and hence retained for the final draft. The list of the retained items is given in the table.

Preparation and administration of the final draft

After items analysis 56 items were retained. These items were arranged on the basis of difficulty value. In other words the items were placed in the final draft from easy to complex, depending upon their difficulty value. The final draft of achievement was administered to 100 students for calculating the reliability of the test. The list of the schools where the final draft of the test was administered is given below in table 4.3.

TABLE 4.3 SHOWING THE NUMBER OF STUDENTS TAKEN FROM THE DIFFERENT SCHOOLS

S.No.	Name of the Institution	No. of Students
11.	S.D. Girls Inter College Sadar Meerut	50
12.	B.A.B. Inter College, Tehsil Meerut	40
13.	Chavli Devi Girls Inter College Meerut	40
14.	D.N. Inter College Meerut	50
15.	K.K. Inter College Meerut	45
16.	Saheed Mangal Panday Inter College Meerut	25
17.	Sardar Patel Municipal Inter College Meerut	35
18.	Seth B.K. Maheswari Girls Inter College Meerut	20
19.	Mahaveer Siksha Sadan Inter College Jain Nagar Meerut	40
20.	Neharu Smarak Inter College Ganesh Puri Meerut	25
	Total	**370**

Estimation of reliability coefficient of the achievement test-

The reliability of a test score is manipulated in the form of trustworthiness and stability consistency The items of the first half have been presented in table 4.4 and second half in table 4.5.

TABLE 4.4

ITEMS OF FIRST HALF SELECTED FOR ESTABLISHING RELIABILITY

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 39, 41, 43, 45, 47, 49, 51, 53, 55

TABLE 4.5

ITEMS OF SECOND HALF FOR ESTABLISHING RELIABILITY

2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48,50,52,54,56

TABLE 4.6

ODD AND EVEN SCORES OF STUDENTS IN FINAL DRAFT

S.No.	Odd Score	Even Score
1.	5	5
2.	9	19
3.	13	7
4.	14	3
5.	2	4
6.	7	4

7.	4	4
8.	10	6
9.	5	4
10.	5	4
11.	15	12
12.	13	10
13.	6	10
14.	6	12
15.	4	6
16.	4	6
17.	2	8
18.	8	4
19.	4	5
20.	4	3
21.	20	15
22.	15	16
23.	11	10
24.	4	6
25.	7	6
26.	9	4
27.	5	8
28.	15	5
29.	6	4
30.	8	10
31.	15	10
32.	12	12
33.	4	3
34.	5	4
35.	6	4
36.	8	6
37.	10	8
38.	12	10
39.	5	4
40.	6	3
41.	4	6
42.	5	5
43.	8	6
44.	6	4
45.	4	3
46.	10	12
47.	12	10
48.	13	11

49.	14	12
50.	6	4
51.	10	10
52.	12	10
53.	11	6
54.	10	8
55.	5	4
56.	8	3
57.	4	6
58.	3	8
59.	6	8
60.	5	10
61.	12	10
62.	11	20
63.	20	10
64.	20	4
65.	7	4
66.	7	6
67.	9	8
68.	4	8
69.	5	9
70.	6	10
71.	8	10
72.	10	8
73.	12	4
74.	12	3
75.	10	10
76.	6	6
77.	4	5
78.	4	4
79.	3	5
80.	5	4
81.	10	8
82.	12	8
83.	6	6
84.	6	4
85.	5	4
86.	7	8
87.	5	10
88.	4	10
89.	3	12
90.	2	4

91.	10	6
92.	12	10
93.	11	6
94.	7	8
95.	7	10
96.	12	10
97.	10	13
98.	4	14
99.	5	3
100.	6	7

To calculate the reliability of the whole co-relation between the two sets of scores (odd and even) was calculated by Pearson Product Moment Method:

$$r = \frac{N\sum XY - \sum X.\sum Y}{\sqrt{\left[N\sum X^2 - \left(\sum X\right)^2.\right]\left[N\sum Y^2 - \left(\sum Y\right)^2\right]}} \quad \text{.....(i)}$$

r = co-relation between odd and even scores

$\sum X$ = sum of odd scores

$\sum Y$ = sum of even scores

$\sum XY$ = sum of the4 product of odd and even scores

$\sum X^2$ = Sum of squares of all the odd scores

$\sum Y^2$ = Sum of squares of all even scores

The details of these values are given in Appendix E. In the present study these values are:

N = 100

$\sum X$ = 816

$\sum Y$ = 735

$\sum XY$ = 6609

$\sum X^2$ = 8008

$\sum Y^2$ = 6489

$$r = \frac{N\sum XY - \sum X.\sum Y}{\sqrt{\left[N\sum X^2 - \left(\sum X\right)^2.\right]\left[N\sum Y^2 - \left(\sum Y\right)^2\right]}}$$

$$r = \frac{100x6609 - 816x735}{\sqrt{\left[100x8008 - (816)^2\right].\left[100x6489 - (735)^2\right]}}$$

$$r = \frac{660900 - 599760}{\sqrt{(800800 - 665856)(648900 - 540225)}}$$

$$r = \frac{61140}{\sqrt{(134944)(108675)}}$$

$$r = \frac{61140}{121100.601}$$

r = 0.50

Thurs, r = 0.50

Substituting these values in the formula (1) given above, the correlation between odd and even comes to be 0.50. The reliability co-efficient of the whole test was calculated using Spearman Brown Prophecy Formula. The formula is

$$rtt = \frac{2roe}{1+roe} \text{.....(2)}$$

Where rtt = reliability coefficient of the total test found experimentally by calculating co-efficient of different correlation between odd and even scores. Here the value of r was 0.50. By substituting this value in the formula (2) mentioned above, we get

$$rtt = \frac{2\times 0.50}{1+0.50} = \frac{1.00}{1+.50} = 0.67$$

The reliability co-efficient of 0.67 of the achievement tests is considerably high. So the obtained reliability has more or true score component and very less of error component.

Conclusion

The achievement test in science constructed by the investigator at school level is valid, reliable and having items of optimum difficulty. The science achievement test is functional in nature because it is easy in administration, error variance is minimum because the items are multiple choice, administration time is manageable etc. Apart from it there is least chance of subjectivity in scoring as the test is scored on the basis of scoring keys prepared objectively. It is the test of developed skill or knowledge. It is to measure skills and knowledge learned in a given grade level. It also measures aptitude and stable cognitive trait. Achievement test is also important for the improvement of the students; also, there understanding level and to know above their level for studying. Their competitive stamina is also improved by this test. An achievement test measures the outcome or result of learning or training in a given area. In schools also it is used as a tool for measuring the nature and extents of student. They are various subjects like Hindi, English, Maths, S.St., Science is specifically a structured test. In other words, it is test which fulfil its purpose with maximum success.

Reference

1. Ahman, J.S. Testing Students Achievement and Attitude. Prentice Hall of India (Private) Ltd., New Delhi, **1965.**
2. Bhatnagar, Amita, Educational & Mental measurement, International Publishing House College Road, Meerut.
3. Bitu, 1967. In Survey of Research in Education (CASE) by M.B. Buch The M.S. University of Baroda, 1974,pp. 418.
4. Bountro, R.K. Construction and Standardization of Achievement Test in Science for High School Classes in Uttar Pradesh, Ph.D. Education, Agra Univ. 1970. In a Survey of Research in Education (CASE) by M.B. Buch, the M.S. University of Baroda, 1974, pp. 373.
5. C.I.E. Construction and Standardization of an achievement test in Hindi for Class VIII, New Delhi, 1992. In a Survey of Research in Education (CASE) by M.B. Buch. The M.S. University of Baroda, 1974, pp. 376.

6. Ebal, Robert L. Measuring Educational Achievement, Prentice Hall of India, Private Ltd. New Delhi, 1966.
7. Garrett, H.E. Testing for Teachers. Eruasia Publishing House (P) Ltd., New Delhi, 1959.
8. Garrett, Henery E. Statistics in Psychology and Education, Vakils, Peffer and Simons, Private Ltd., Bombay, 1973.
9. General Science Sub-Committee of the Science Masters Association Saraf, S. Report on the teaching of General Science. John Murray Albenasic Street, London, v. 1950 Construction and Standardization of an Achievement Test in Indian History, Ph.D. Education, Delhi University, 1964. In a Survey of Research in Education (CASE) by M.B. Buch. The M. S. University of Baroda, 1974, pp.
10. Guilford, J.P. Fundamental Statistics in Psychology and Education. Mc Graw Hill Kogakusha Ltd., New Delhi, 1973.
11. Kapil, H.K., Elements of Statistics (In Social Sciences), Vinod Pustak Mandir, Agra.
12. Mangal, S.K. & Shubhra Mangal, Teaching of Physical Science, International publishing House, Meerut.
13. Saxena, K.N. "Construction and Standardization of an attainment test in Science for class VIII in Uttar Pradesh schools (for use in Education Guidance), Ph.D. Psychology, B.H.U. 1960. In a Survey of Research in Education (CASE) by M.B. Buch, The M.S. University of Baroda, 1974, pp. 411.
14. Sharma, R.A., Measurement Evaluation and Statistics, International Publishing House, Meerut.
15. Sidhu, Kulbir Singh. Statistics in Education and Psychology. Hero Printing Press, Hoshiarpur Road, Jullundur City, 1973.
16. Sood, J.K. Understanding of the nature of Science among Science teachers and Science students. Innovative ideas and practices in Education, Educational Monograph Series No. 2, Regional Cottage of Education, Ajmer, 1976.
17. Srivastava, D.D. "Construction and Standardization of Achievement List of Civics", Ph.D. Psychology,
18. Thorndike, R.E. and Hagan Elizabeth. Measurement and Evaluation in Psychology and Education, Villey Eastern Private Limited Publishers, 1970.
19. Vanjakshi, A. The Construction and Standardization of the Achievement Test in Non-Language subjects for class 7th of Andhra Pradesh, Ph.D. Education, Spy 1970 (In a Survey of Research in Education) (CASE) by M.B. Buch, The M.S. University of Baroada, 1974.
20. Verma, M. An Introduction to Educational Psychological Research. Asia Publishing House, New Delhi (1965).
21. Ebel, Robert L., (1966): Measuring Educational Achievement, Prentice-Hall of India, New Delhi.
22. Ebel, Robert L. and Frisbie, David A., (1991): Essentials of Education Achievement, Prentice-Hall of India, New Delhi.
23. Harper, A. Edwin, J. and Harper, Erika S., (1992): Preparing Objective Examinations. A Handbook for Teacher, Students and Examiners, Prentice-Hall of India, New Delhi.
24. Popham, W.James, (1990): Modern Educational Measurement: Pracatitioners Perspective. Prentice-Hall, USA.
25. Remmers, H,.H. etal., (1967): A Practical Introduction to Measurement and Evaluation.7