REVIEW OF RESEARCH

ACADEMIC ACHIEVEMENT IN SCIENCE – A RESEARCH REPORT

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Abstract :

Education, in its broadest sense, may be defined as a process designed to inculcate the knowledge, skills and attitudes necessary to enable individuals to cope effectively with their environment. Its' primary purpose is to foster and promote the fullest individual self- realization for all people.

Keywords:Achievement In Science , Education, Environment, Self- Realization .

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INTRODUCTION

Achieving this goal requires understanding of commitment to the proposition that education is a primary instrument for social and economic advancement of human welfare (Verma, 1990).

Definitions of Science

John Woodburn and E.O.Obourn consider science as that human endeavour that seeks to describe with even increasing accuracy, the events and circumstances which occur or exist within our natural environment.
According to J.H.Poincare, "Science is built up with facts as a house is with stones. But a collection of facts is no more a science than heap of stones is a house."

Need for the Present study

Achievement refers to the scholastic or Academic achievement of the student at the end of an educational programme. A good number of variables such as personality characteristics of the learners, the socio-economic status, the organizational climate of the school, curriculum planning, students IQ, health, peer group, past experience, attitude towards the school subjects and teachers, the emotional care, parents love and affection, family environment, socio-economic status etc., influence achievement in different degrees. Independent and dependent variables selected for the study are explained in the following

Academic Achievement Test in Science

Since the available tests for the assessment of Academic achievement in Science of IX Standard was not found to be satisfactory in terms of its comprehensiveness and relevance. The Academic achievement test was developed using the standard scientific procedure.
The scientific procedure used for the construction and validation of test is described in detail in the following paragraphs.

a) Construction of an Achievement Test in Science for IX Standard

In all, 80 items were listed under three areas of Science such as Physics, Chemistry and Biology.

Construction and/or Pooling of Test Items

As the test was to be administered to students who were studying in secondary schools of Bijapur district, whose mother tongue/regional language was Kannada. The test items in Science were constructed in their regional language only.
The Test items in science were constructed for First Semester syllabus of IX Standard of Karnataka State.
The following sources were consulted for construction and/or pooling of test items in Science:
(I) A text book of IX standard Science published by the Government of Karnataka, Bangalore.
(ii) Review of research and/or theoretical underpinnings.
(iii) Other similar tools.
(iv) Requesting representative teachers of Science to write test items (such a process ensures content validity).
(v) A text of Science for IX standard published by National Council of Educational Research and Training, 2007.
(vi) Personal experience of the investigator and subject teachers.

Preparation of Blue-Print

A three dimensional blue-print showing coverage of content, instructional objectives and types of items were prepared by referring the IX Standard textbook of Science, and in consultation with the guiding teacher and personal experience. The blue-print is as follows:

Table – 1 : Blue-print for the Academic Achievement Test in Science

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Sl. No.	Objectives Questions / Content	Knowledge			Under-Standing			Skill			Application			Total
		O	S	E	O	S	E	O	S	E	O	S	E	
	PHYSICS													
1	Magnetism & Electricity	6(6)	-	-	2(2)	-	-	2(2)	-	-	1(1)	-	-	11(11)
2	Motion	4(4)	-	-	2(2)	-	-	4(4)	-	-	1(1)	-	-	11(11)
	CHEMISTRY													
1	Characteristics of Metals	2(2)	-	-	6(6)	-	-	-	-	-	-	-	-	8(8)
2	Non-Metals	3(3)	-	-	5(5)	-	-	1(1)	-	-	1(1)	-	-	10(10)
	BIOLOGY													
1	Living World	2(2)	-	-	4(4)	-	-	-	-	-	1(1)	-	-	7(7)
2	Study of Cell	3(3)	-	-	4(4)	-	-	-	-	-	3(3)	-	-	10(10)
3	Micro-Organisms	3(3)	-	-	8(8)	-	-	1(1)	-	-	6(6)	-	-	18(18)
4	Life Process	3(3)	-	-	1(1)	-	-	1(1)	-	-	-	-	-	5(5)
	Grand Total	28(28)			32(32)			9(9)			11(11)			80(80)

O – Objective type,   S – Short answer type,   E – Essay type

Note: 1) Figures within the parentheses indicates – Number of questions.
2) Figures outside the parentheses indicates – Number of marks

Table – 2 : Preparation of 3 - Dimensional Charts

* Objective wise Weightage

Sl.No.	Objectives	Marks	Percentage of marks
1	Knowledge	28	35.00
2	Understanding	32	40.00
3	Skill	09	11.25
4	Application	11	13.75
	Total	80	100.00

* Content wise Weightage

Sl.No.	Unit	Marks	Percentage of marks
1	Physics	22	27.50
2	Chemistry	18	22.50
3	Biology	40	50.00
	Total	80	100.00

* Question Type Weightage

Question Types	Marks	Percentage of marks
Objective type-Multiple Choice questions	80	100
Total	80	100

Screening of Test Items

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The test was referred to representative of high school students. This was done with a view to retain one of the synonymous items, and the items which could fit into the framework of the competency. Items which were vague were discarded and remaining items were edited to make it clear.

Writing of Directions

Suitable directions were given on the top of the each item in each competency. Further, the mode of giving response to various items of the competency was illustrated with specific example.

b) Tryout

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Before constructing the test items, the investigator has done, a thorough study of the methodology and objectives of Science teaching. Initially Eighty (80) items were prepared. The test was tried out in 2 secondary schools in Bijapur District. In order to administer the test, the co-operation of the school teachers was sought. The students were specifically given to understand that: i) there was 1½ hour time limit for completing the test; ii) the scores of the test would be used only for research purpose; and iii) the honest and accurate answers of the students to test items would help the study in developing a reliable test in Science. The test was administered to 100 students studying in IX standard.

Scoring

The test items were of objective type (multiple choice) questions. Therefore, one mark was awarded for each correct answer given by the student. Some of the item scores gave the scores on performance in science. The score for each student was calculated separately.

Item Analysis

Each test item was subjected to analysis in terms of: (i) Difficulty value, and (ii) Item validity. For this purpose the scores of 100 Ss taken for the tryout were selected. The scores obtained by the Ss (n = 100) were first arranged in the descending order. The two groups - 'high scoring' and 'low-scoring', each composed of 27 per cent, that is 27 of the Ss of the sample 100, formed the basis for the computation of validity and difficulty indices.

For determining item validity, numerous indices and procedures were available. In the present study, the correlation approach, that is correlating the item score with the test score was followed. For computing item test correlation the 'point-biserial correlation method' (Guilford, 1954, p.427) was used. The choice of this method was based on two considerations: (i) One of the variables, namely, item score is in the form of genuine dichotomy (-1 or 0); (ii) Labour saving 'abac' is developed by Flanagan for determining estimates of rpbis.

The item validity values of the test items are also shown in the Table - 3.

The difficulty value of each test item was determined by using the following formula:

Where,

D = Difficulty value of the item;

U = Percentage of students scoring the item correctly in the upper or higher scoring group; and

L = Percentage of students scoring the item correctly in the
    lower or low scoring group.

The difficulty values of the test items are shown in the Table-3.

Table - 3   :   Difficulty Index and Discrimination Index Values of Science for IX Standard

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Test Items	Upper Limit (U)	Lower Limit (L)	Difficulty Index	Discrimination Index	Significance
1	2	3	4	5	6
01	30	59	44.50	-0.32	Rejected
02	70	33	51.50	0.48	Yes
03	52	26	39.00	0.36	Yes
04	63	19	41.00	0.55	Yes
05	48	44	46.00	0.10	Rejected
06	67	37	52.00	0.41	Yes
07	52	37	44.50	0.25	Yes
08	67	37	52.00	0.41	Yes
09	56	30	43.00	0.36	Yes
10	74	30	52.00	0.56	Yes
11	48	44	46.00	0.10	Rejected
12	78	44	61.00	0.44	Yes
13	78	41	59.50	0.49	Yes
14	48	26	37.00	0.32	Yes
15	56	41	48.50	0.25	Yes
16	67	26	46.50	0.52	Yes
17	56	37	46.50	0.29	Yes
18	70	19	44.50	0.60	Yes
19	59	30	44.50	0.40	Yes
20	56	33	44.50	0.34	Yes
21	56	19	37.50	0.46	Yes
22	74	33	53.50	0.55	Yes
23	30	22	26.00	0.25	Yes
24	56	15	35.50	0.57	Yes
25	56	22	39.00	0.53	Yes
26	52	41	46.00	0.17	Rejected

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27	59	26	42.50	0.46	Yes
28	30	37	33.50	-0.16	Rejected
29	74	30	52.00	0.56	Yes
30	52	33	42.50	0.25	Yes
31	67	33	50.00	0.45	Yes
32	59	26	42.50	0.46	Yes
33	41	19	30.00	0.34	Yes
34	67	15	41.00	0.60	Yes
35	44	22	33.00	0.34	Yes
36	52	33	42.50	0.25	Yes
37	44	19	31.50	0.36	Yes
38	52	33	42.50	0.25	Yes
39	56	30	43.00	0.36	Yes
40	52	26	39.00	0.36	Yes
41	48	30	39.00	0.27	Yes
42	67	19	43.00	0.55	Yes
43	44	22	33.00	0.34	Yes
44	56	19	37.50	0.46	Yes
45	56	33	44.50	0.34	Yes
46	41	26	33.50	0.25	Yes
47	70	22	46.00	0.56	Yes
48	44	19	31.50	0.36	Yes
49	52	22	37.00	0.43	Yes
50	48	26	37.00	0.32	Yes
51	56	3	43.00	0.36	Yes
52	44	22	33.00	0.34	Yes
53	59	33	46.00	0.38	Yes
54	33	15	24.00	0.29	Yes
55	52	37	44.50	0.25	Yes
56	52	44	48.00	0.14	Rejected
57	56	22	39.00	0.53	Yes
58	52	30	41.00	0.30	Yes
59	63	22	43.00	0.53	Yes
60	37	37	37.00	0.08	Rejected

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61	63	26	45.00	0.49	Yes
62	67	48	58.00	0.29	Yes
63	56	33	45.00	0.34	Yes
64	37	37	37.00	0.08	Rejected
65	52	33	43.00	0.25	Yes
66	56	37	47.00	0.29	Yes
67	56	37	47.00	0.29	Yes
68	44	19	29.00	0.36	Yes
69	67	26	47.00	0.52	Yes
70	52	41	47.00	0.17	Rejected
71	56	33	45.00	0.34	Yes
72	48	52	50.00	0.02	Rejected
73	56	44	50.00	0.20	Rejected
74	59	67	63.00	-0.06	Rejected
75	52	48	50.00	0.09	Rejected
76	63	63	63.00	0.05	Rejected
77	56	47	52.00	0.16	Rejected
78	63	67	65.00	-0.02	Rejected
79	70	74	72.00	-0.01	Rejected
80	41	74	58.00	-0.37	Rejected

Final Tool

Items with 100 per cent and 0 per cent difficulty value and items with less than 0.25 validity coefficients were deleted (Thorndike, 1966). As a result of the first analysis – determination of 'D' values, and as a result of the second analysis – determination of 'r' values out of the total number of 80 items, constructed by the investigator, 18 items were rejected. The final tool consisted of 62 items in all. The directions for using the test were found to work well and were retained without any modification. (See Appendices-IV and IV(A)) for the scale and answer sheet-cum-scoring key)
c) Reliability of the Achievement Test
i) Coefficient of Stability

The coefficient of stability of the achievement test was determined by the test – retest method. For this purpose, the achievement test was re-administered to a random sample of 50 students out of 100 involved in the first tryout two weeks after the first administration. Then correlation between the test and retest scores was computed. The coefficient of correlation between the two sets of scores on the achievement test was found to be 0.8817, which is quite significant at 0.05 level. This implies that the achievement test has stability reliability.

ii) Coefficient of Consistency

The coefficient of consistency of the achievement test was determined by the split-half method. For this purpose, scores obtained on re-administration of the achievement test to the 50 Ss involved for determining stability reliability value were used. The total scores were divided into two halves – one relating to odd numbered items and the other to even numbered items. The obtained coefficient of correlation between the scores on the halves was corrected for full length of achievement test in science by means of Spearman-Brown Prophecy formula (Garrett, 1966, p.339).

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The coefficient of consistency of the achievement test was found to be 0.8665 for full length of scale, which is significant at 0.05 level. This implies that the achievement test has consistency reliability.

d) Validity of the Achievement Test
i) Intrinsic Validity

Intrinsic Validity of the achievement test was computed from its reliability coefficients, (Guilford, 1954, p.399). The range of validity coefficients was between 0.9389 and 0.9308, which speaks of the intrinsic validity of the test.

ii) Content Validity

Five teachers of secondary schools teaching Science acted as judges in establishing content validity of the achievement test. They examined the test items, instructions and the scoring procedure. The judges were fully satisfied with the relevance of the test items and the scoring procedure. They were also satisfied with the adequate coverage of the content of Science at IX Standard. This implies that the achievement test in Science is comprehensive and relevant.

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