



Construction and Standardization of Scientific Aptitude Test for 12⁺ Age-Group Students

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Abstract:

The present time is of science and technology. The students have to get internal ability in themselves in this time. So that they can face blind trust and non-scientific things and can lead the society towards a newer change. For this, the students who are to build up the future society have to develop positive approach towards science and technology. The present study will be helpful in developing an scientific approach of seeing the daily activities of the society, government, teachers and parents of the children studying in schools and the incidents happening around them. This study can give a new direction to the problems of environment running in the world today and its solutions. According to Osho, science is needed from impregnation; hence science awareness is very important for new society.

Keywords: *Aptitude, Attitude, Scientific aptitude, Science and technology*

1. Introduction

From the primary discovery of wheel and fire by an ancient man to the present world developed by a modern human being are the results of the great discoveries of science. Today's human life has become easy and fruitful only because of the scientific and technological growth. In today's world, there is a situation like a cold competition of science and technology among the developed nations and the developing nations. Each and every nation wants to reach the moon. But it is not easy to have all these achievements in a short time. Therefore, the subjects like science and technologies are given significance in the Education systems of these nations.

Psychology also says – “From the birth of a child to the age of ten or twelve is time of maximum growth.” The child takes its primary education in this age. The child is full of curiosities and creativities. It shows the child's scientific curiosity. If he is given scientific and satisfied answer of his question, the scientific attitude is developed in him. According to Psychological belief, every child has different capacities in him. It is possible to develop the desired capacities in a child at the stage of upper primary level. But it is noticed that there is a lack of proper tests for evaluating these kinds of aptitudes in child. So these aptitudes are not developed and the nation lacks the people who can provide it scientific leadership. The nation needs such impressive children for the betterment of science. Hence, it is a big necessity to have such psychological tests that can find out scientific aptitude in students.

2. Statement of the Problem

In Gujarat state, Science is taught as an individual subject in Std.5 to 8. The students, born in different atmospheres of rural and urban areas, study Science in different atmospheres, too. The researcher has done this study in order to know the Scientific Principle Aptitude remained in these students. The problem of the study is defined as '**Construction and Standardization of Scientific Aptitude Test for 12⁺ age-group Students**'.

3. Terms and Practical Definitions

The understanding of some terms included in the present study is given as follow.

3.1 Students of 12+ Age Group

The students of 12+ Age group are those between the age of 12 years to 14 years studying in school.

3.2 Scientific Aptitude Test

Scientific Aptitude means the scores of Scientific Aptitude test in the present study.

3.3 Standardization

Standardization means to examine the reliability and standard by constructing a test. The process of establishing the criteria is standardization.

4. Significance of the Study

- The Scientific Aptitude of 12⁺ age-group students can be known.
- The gender effect in Scientific Aptitude according to the area can be known.
- The parents and teachers can have guidance about the future education of the students on the basis of the Scientific Aptitude.
- The present study can be useful to create equal groups of the students in the innovative experimental researches of Science.
- The present study can be useful in recognizing the impressive students and in providing them extra program in the Community Science Centre institutes of Science.
- The present study can be useful for understanding the Scientific Aptitude of those students whose reading ability is low.

5. Scope of the Study

There are many scopes of educational researches. There are 37 main scopes according to the fifth educational research survey. The subject of assignment work is selected according to this. The present study is related to educational psychology, science and technology field.

6. Type of the Study

The present study is a Descriptive Survey type.

7. Objectives of the Study

The objectives of the present study are as under.

Part-1

To construct and standardize Scientific Aptitude test for 12⁺ age-group students.

Part-2

1. To examine the effect of gender on the scores of Scientific Aptitude test for 12⁺ age-group students.
2. To examine the effect of area on the scores of Scientific Aptitude test for 12⁺ age-group students.

Part-3

To examine the effect of reciprocal interaction of area and gender on the scores of Scientific Aptitude test for 12⁺ age-group students.

8. Hypotheses of the study

- Ho₁** There will be no significant difference between the mean scores of Scientific Aptitude Test of 12⁺ age-group boys and girls of rural area.
- Ho₂** There will be no significant difference between the mean scores of Scientific Aptitude Test of 12⁺ age-group boys and girls of urban area.
- Ho₃** There will be no significant difference between the mean scores of Scientific Aptitude Test of 12⁺ age-group boys of rural and urban area.
- Ho₄** There will be no significant difference between the mean scores of Scientific Aptitude Test of 12⁺ age-group girls of rural and urban area.
- Ho₅** There will be no significant difference between the mean scores of Scientific Aptitude Test of 12⁺ age-group boys and girls.
- Ho₆** There will be no significant effect of reciprocal interaction of area and gender on the scores of Scientific Aptitude Test.

9. Variables of the Study

The following variables are included in the present study.

9.1 Independent variable

(A) Gender of the Students

- Boys
- Girls

(B) Area

- Rural
- Urban

9.2 Dependent Variable

The scores achieved by students in Scientific Aptitude Test.

10. Method of the Study

Research method is the key to every research work. The practice conducted by the researcher between the two matters as clarification and achievement of results can be said research method.

11. Population of the Study

Population is the group of samples that is selected from any one unit for the scope of the study. All the boys and girls of 12⁺ Age-group studying in all schools of Gujarati Medium in Gujarat State are the population of the present study.

12. Sample of the Study

The area of Gujarat State was divided into four zones for the present study so that the proper representativeness of the whole Gujarat State can be maintained.

1. North Gujarat
2. South Gujarat
3. Middle Gujarat
4. Kutch and Suarashtra

The sample was selected from each of these sections through Purposive Sampling Method. Its details are given in table: 1.

Table 1: Numbers according to Gender of the students and Area (Zone) included in the Sample

Zone	Area	Boys	Girls	Total
Middle Gujarat	Urban	120	120	240
	Rural	120	120	240
North Gujarat	Urban	120	120	240
	Rural	120	120	240
South Gujarat	Urban	120	120	240
	Rural	120	120	240
Saurashtra and Kutch	Urban	120	120	240
	Rural	120	120	240
Total	-	960	960	1920

13. Construction of Tool

A tool is a medium through which special type of details can be collected. If a tool is standardized, the reliability of data increases. It is necessary to select a proper tool and construct a proper tool for the true results of the research. In the present study, the researcher constructed Scientific Aptitude Test for measuring the scientific aptitude of the students of 12⁺ Age-group. In the present test, the researcher tried to get understanding about the rules, theories and concepts coming in the curriculum and the real environment of the 12⁺ Age-group students for measuring scientific theory aptitude. The scientific theory, scientific concepts and scientific truth are included as the major points of the content in it. Multi-optional questions were constructed for this.

Finally, total 58 items were included in this form of pre-prospection. Then, 7 items were removed according to the suggestion of the guide and 51 items were kept for the test. Thus, the test of 51 items was sent for expert opinion by well arranging the items of scientific aptitude.

14. Data Analysis

The data is collected through various tools and techniques in any research work. It is very fundamental thing to analyze and interpret the achieved data. A research work isn't completed only by data collection. The researcher collects wide range of data but if its proper interpretation is not done, the research becomes meaningless. It is very necessary to analyze and properly interpret the achieved data to examine the research hypotheses and to get results. The major objective of the present study was to construct and standardize Scientific Aptitude Test for 12⁺ age-group students of Gujarat state. The researcher analyzed the data in the following way on the basis of the achieved data.

- Organization of data for analysis
- Description of Data
- Examining the Hypotheses

The scores of Scientific Aptitude Test were collected and the data was analyzed through MS Excel Program.

1. The data was arranged in context of the variables of the study and Scientific Aptitude Test.
2. The data file of MS Excel was prepared.
3. Statistical calculation was done in the context of Scientific Aptitude Test.
4. Frequency deviation and Graphs were prepared.
5. t-value was calculated for examining the hypotheses and the results were interpreted.
6. Significance of difference between two groups were examined.

15. Final Implementation

The present Scientific Aptitude Test is to be standardized for 12+ Age-group students of Gujarat State. So, the sample has to be selected in a way that the representation of each section of Gujarat is

maintained. Thus, the researcher decided to divide Gujarat State into Zone (Section). The sample was selected from each of these zones through Purposive Sampling method. Its details are shown in table-2.

Table 2: Details of Sample for Final Implementation of the test

No.	Zone	Area	Number of Students		Total
			Boys	Girls	
1	Middle Gujarat	Urban	120	120	240
		Rural	120	120	240
2	North Gujarat	Urban	120	120	240
		Rural	120	120	240
3	South Gujarat	Urban	120	120	240
		Rural	120	120	240
4	Saurashtra and Kutch	Urban	120	120	240
		Rural	120	120	240
Total		-	960	960	1920

Thus, total 960 boys and 960 girls were given the Scientific Aptitude Test prepared for final implementation. First of all, necessary details were filled in giving important instructions. Then they gave their opinions doing tick mark in front of the given option for the items. The researcher collected the data through personal interview of the schools. Then the scientific aptitude scores of students were calculated by marking the items.

16. Reliability of the Scientific Aptitude Test

The reliability of test means any test is given to any one person frequently for more than one time and there isn't seen any big difference in its results. It means the continuity is maintained in the result and so it can be said that the test has high reliability. Though the psychological tests are not so reliable as the physical measurement tools; because some factors like health, mental condition of students, change in concentration, learning, memory etc. affect on the results. However, it can be said that the test is reliable if there is not much difference between the results of the test. The reliability number is the co-efficient number between the test scores and the scores that were achieved time to time.

There are four methods to find the reliability of test.

- Test Retest Method
- Method of Parallel form test
- Semi-dividing Test Method
- Logical Equality or Cooder Richardson Method

17. Test Retest Method

120 students from the sample were given the same test after 15 days for final implementation to find reliability of Scientific Aptitude Test. Frequency Deviation was prepared to find correlation between the scores of both the time and the correlation between test retest was found with help of Ms-Excel program. Its details are given in table-3.

Table 3: Sample for Test Retest

No.	Name of School	Gender		Total
		Boys	Girls	
1	Amarapura Primary School, Ta. Mohamedabad, Dist. Kheda	60	60	120

Total 120 students were selected from the school in test retest as shown in table-1.5. It included 60 boys and 60 girls. Frequency deviation of the scores of test retest was prepared for each. Correlation was found with the help of Excel program adding the scores of test retest in computer. Moreover, standard deviation of correlation was also found. Here, the calculation of correlation was done

through computer program and so it was prepared for factor multiplication. It was not needed to prepare correlation tables. Therefore, the scores of test retest are put in form of frequency deviation.

Table 4: Frequency Deviation and Correlation of the Scores of Test Retest

Series	Frequency	
	Test	Retest
46-50	2	3
41-45	12	14
36-40	25	16
31-35	31	17
26-30	22	13
21-25	17	28
16-20	10	21
11-15	1	8
Total	120	120

Correlation = 0.674

Table 5: Reliability through Test Retest Method

No.	Method of finding Reliability	Reliability Number
1	Test Retest Reliability Number	0.674

Thus, the test retest reliability of Scientific Aptitude Test can be said satisfactory.

18. Examining Null Hypotheses

No.	Null Hypotheses	t-value	Remark
1	There will be no significant difference between the mean scores of Scientific Aptitude Test of 12 ⁺ age-group boys and girls of rural area.	1.2	Hypothesis accepted at 0.05 level
2	There will be no significant difference between the mean scores of Scientific Aptitude Test of 12 ⁺ age-group boys and girls of urban area.	2.33	Hypothesis unaccepted at 0.05 level
3	There will be no significant difference between the mean scores of Scientific Aptitude Test of 12 ⁺ age-group boys of rural and urban area.	4.6	Hypothesis unaccepted at 0.01 level
4	There will be no significant difference between the mean scores of Scientific Aptitude Test of 12 ⁺ age-group girls of rural and urban area.	0.93	Hypothesis accepted at 0.05 level
5	There will be no significant difference between the mean scores of Scientific Aptitude Test of 12 ⁺ age-group boys and girls.	0.77	Hypothesis accepted at 0.05 level
6	There will be no significant effect of reciprocal interaction of area and gender on the scores of Scientific Aptitude Test.	3.79	Hypothesis unaccepted at 0.01 level

19. Findings of the Research

1. The 12+ age-group boys and girls studying in rural area schools have the same scientific aptitude number. Thus, it can be said that there is no significant effect of gender on the scientific aptitude of the students studying in rural area schools.
2. The 12+ age-group boys studying in urban area schools have more scientific aptitude number. Thus it can be said that there is an effect of gender on the scientific aptitude of the students studying in urban area schools. The higher scientific aptitude is seen in boys.

3. The 12+ age-group girls studying in rural and urban area schools have the same scientific aptitude number. Thus, it can be said that there is no significant effect of area on the scientific aptitude of the girls studying in rural and urban area schools.
4. The 12+ age-group boys and girls studying in schools have the same scientific aptitude number.
5. The 12+ age-group students studying in urban area schools have the more scientific aptitude number. Thus it can be said that the scientific aptitude of the students studying in urban area schools.

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