# PREPARATION AND STANDARDIZATION OF SCIENTIFIC ATTITUDE SCALE FOR THE SECONDARY SCHOOL STUDENTS

*Ketan K. Mehta*
*Asst. Professor,*
*Collage of Education, Vadasma*
*Mehsana*

*Dr. K. S. Likhia*
*Professor,*
*Department of Education*
*Sardar Patel University*
*V.V. Nagar*

**Abstract:**

Science teaching programme is prepared in the way that the learners can develop the ability of solving problems, skills of decision and understand the relation of science with health, agriculture, industry and other aspects of life. In this way it is necessary to know the relation between the teaching of science and development of scientific attitude in students at secondary level. It is also necessary to know how much the curriculum is digested by students and to what extent the scientific attitudes are developed as a result of the teaching and the relation between both of them, so that we can say that the objectives of science curriculum are fulfilled by students. In this way the investigator made scientific attitude scale for secondary school.

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*Keywords: Education, Science teaching, Scientific attitude*
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**Introduction:**
Changes have always taken place in society time by time. It can be concluded that the first wave of such changes was caused by agriculture revolution. The second wave was of industrial revolution and science. That wave of science was so immense that the science was spread all over the world. Everyone knows now that this is science era. Science had been existed since human being came into existence Today's great human is standing on the basis of the process which going on from 'Amiba' to 'Adam' and 'Adam to 'human'. A normal living object which was a small part of nature, has become human and ruled over living environment and tuned with nature. Though centuries had passed away but human being has done it. He proved himself the best among other creatures. Which was the factor helpful to human being to reach this peak and development? The answer heard from every month is none but 'Science and Technology'. The present world is the world of science and technology. Every incident happening around us has the base of any scientific truth or principles. So without the basic knowledge and information of science, we will be in great loss. The science has now become 'daily science' and science for all. Means, in such situation, science is

'science for all' and 'science of all'. Science is such a knowledge by which human being can develop. His facilities and comfort abilities can be developed. Science is a journey by intelligence. It is intelligent hard work which has given birth to strength and the standard of human life is reached higher with the positive use of that strength. In this modern age, we can find impact of achievements and benefits of science on all the fields and at all the levels. Modern man has used science and technology to make his life happy and comfortable. In this way the girt of science has immense contribution to make human life comfortable and uplift the human life.

Deep impact of science is also found on culture and cultural life. Thinking, feelings actions and reactions of an individual is always led by Science. Science is connected to interactions behaviour and feelings of human beings directly or indirectly.

So at secondary level, science education is compulsory. According to National education policy – 1986, science education has given great importance to develop courage and zeal to ask questions, awareness to beauty, values, wish to innovative creation in students. Science teaching programme is prepared in the way that the learners can develop the ability of solving problems, skills of decision and understand the relation of science with health, agriculture, industry and other aspects of life.

**Statement of the Problem**
The problem is stated as following:
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FOR THE SECONDARY SCHOOL STUDENTS
**Objective of the study**
The objective of this study was as under. To construct and standardize the scientific attitude scale.

**Limitation of the study**
The sample was not selected randomly but stratified cluster sampling method was used. So the sampling error may affect the results of the study. Prepared tool was standardized on the students of 8th and 9th standard students of Gujarati medium schools during the year 2009-10.

**Construction of Tool**
According to H.O. Joshi, tool means the medium by which specific information can be collected. For any research data collection is must. Using the data, hypothesis can be examined. Such information can be collected only by using standardized tool.

In this study the investigator has tried to measure the scientific attitudes of secondary students studying in schools situated in north Gujarat. For this scientific attitude scale was constructed. Lincort method was used to construct the Attitude scale.

**Steps of construction of Attitude scale**
**Stage - 1 Construction of Positive and negative statements**
The investigator had decided the following components for this study and the statements were constructed on the basis of those components. After defining scientific attitudes the components were decided related the attitudes which had to measure. The list of those components according to problem and objectives of the study is mentioned as follows.
(1) Observation and subtlety (2) Endurance (3) Work without bias and orthodoxy (4) Finding proof of facts (5) Faith in scientific method (6) Respect to other's opinions (7) Logicity (8)

Curiosity (9) Investigation of fact and avoidance of excessive speech (10) Finding relation of causal effect (11) Awareness towards health and environment .

**Collection of statements**
To measure the decided components, statements were collected. They should be started from entirely favour to entirely oppose attitudes. The investigator had studied the previous researches books and experiments related to scientific attitudes and based on their analysis, he had tried to collect 135 statements with 50 components were collected according to advise from friends and experts of this field. The numbers of statements for each component are mentioned in table 1.

**Table 1**
**Number of Statements for each component of scientific attitude**

| No | Component | Nos. of Statements |
|----|-----------|--------------------|
| 1 | Observation and subtlety | 10 |
| 2 | Endurance | 11 |
| 3 | Work without bias and orthodoxy | 15 |
| 4 | Finding proof of facts | 11 |
| 5 | Faith in Scientific method | 11 |
| 6 | Respect to other's opinions | 06 |
| 7 | Logicity | 11 |
| 8 | Curiosity | 16 |
| 9 | To investigate fact and avoid excessive speech | 08 |
| 0 | Find out relation of causal effect | 09 |
| 11 | Health and environmental awareness | 27 |
| | Total | 135 |

The numbers of statements for each component were mentioned after deciding 11 components of scientific attitude according to table – 1.1. Maximum 27 and Minimum 06 statements for each component were collected. Total 135 statements were sent to experts after guidance from guide.

**State –2 The evaluation by experts in relation to linguistic and technical accuracy of statements.**
The investigator had received the opinions from experts of Gujarat sate. The guidance from the experts was received after their minute examining of the scale. The suggestions were followed and statements were corrected according to their opinions. The investigator had constructed 135 statements with 11 components. This attitude scale of primary form was sent to 15 experts of various universities of Gujarat State. Some suggestions were received from them. They were like- Remove I word from statement; Take care of use of Grammar, Read book by Allen Edwards, Keep equal numbers of positive and negative statements etc. Necessary corrections were made in statements.

**Stage - 3 Primary tryout of statements on responders of target group**
After needed corrections in statements according to suggestions of the expert, the scientific attitude scale was primarily tried out on a group of 384 students Secondary School. Eighty statements were included in the scale. For the primary tryout investigator chose schools from rural and urban area equally from the four district of North Gujarat. The details are shown in table 2.

**Table 2**
**Sample for Primary Tryout**

| No | School Name | Area | Class - 8 | | Class - 9 | | Total |
|---|---|---|---|---|---|---|---|
| 1 | Adarsh VIdhyalaya, Palanpur | Urban | 14 | 11 | 14 | 12 | 100 |
| 2 | Sarswati Vidhyalaya, Adarna | Rural | 14 | 12 | 12 | 10 | |
| 3 | Takhsheela Vidhyalaya, Mehsana | Urban | 18 | 10 | 10 | 10 | 100 |
| 4 | Seth H.B.Sarswati Vidhyalay, Vadasma | Rural | 14 | 08 | 12 | 08 | |
| 5 | H.G. Arya Secondary School, Matarvadi-Patan | Urban | 18 | 10 | 12 | 08 | 94 |
| 6 | Adarsh Uttar Buniyadi Sec. School, Mota Joravarpura | Rural | 12 | 10 | 14 | 10 | |
| 7 | Saurabh Sanskar Vidhya Sankul, Himatnagar | Urban | 12 | 10 | 14 | 10 | 90 |
| 8 | NAvchtan High School, Kishan Gadh | Rural | 12 | 09 | 14 | 09 | |

Item analysis was calculated on the basis of score obtained by students. The upper group of 27% students having higher score and lower group of 27% students having lower score were separated on the basis of respond to scientific attitude scale. The average score and SD were calculated for each item of both the group. The significant of average difference of statements was calculated using t-test. The statement having 2.58 t-ratios is significant at 0.01 levels so such statements were selected for final scale. Total 35 statements were selected with 7 components in the final scale of scientific attitude.

**Stage - 4 Reliability and Validity of Scale**
The reliability and validity of the scale was established according to data of pre-primary and primary try out of the scale.

**Reliability of scientific Attitude scale**
The detail of reliability value of the test by various methods is mentioned in table 3.

**Table 3**
**Reliability value of scientific Attitude scale**

| No | Techniques | NOS | Reliability value |
|---|---|---|---|
| 1 | Test-Retest | 120 | 0.94 |
| 2 | Split half method | | |
| | 1. I - s - B formula | 120 | 0.85 |
| | 2. Flagon formula | 120 | 0.66 |
| | 3. Rulone formula | 120 | 0.82 |
| 3 | Logical equal method | | |
| | KR – 21 | 120 | 0.88 |
| 4 | Crone Bank α | - | 0.89 |

Table 1.2 shows that the reliability value of scientific attitude scale is between 0.66 and 0.94 found by various methods. It has higher and deep correlation so the tool constructed by investigator was very reliable.

**Validity of scientific attitude scale**
   The detail of validity value of the test by various methods is mentioned in table 4

**Table 4**
**Validity value of scientific attitude test**

| No | Method | Nos. | Correlation |
|---|---|---|---|
| 1 | Face Validity | The face validity of scientific attitude scale is significant which was tried out on 806 students. | - |
| 2 | Congruent Validity | | |
| | 1. Correlation between the scientific attitude scale and science achievement of the school | 120 | 0.83 |
| | 2. Correlation between the scientific attitude scale and school achievement | 120 | 0.87 |
| 3 | Component Validity | 806 | Extraction value is more than 0.40 for each component |
| 4 | Concept or characteristically Validity | 806 | Proper |
| 5 | Factorial validity | | Main two factors of scientific attitude were found by factorial analysis method |

**Norms**

In the present study to compare two groups' data or to confirm position of Secondary students, Norms were calculated in the form of PR and Stenine. After analyzing data investigator found significant difference between Rural and Urban area, same in type of school, Grant-In-Aid and Non Grant-In-Aid. For the present study, area norms and school types norms are established.

**Table 5**
**The classification of standard scores on the scientific attitude scale**

| No | Standard sore | Scientific Attitude | Theoretical Classification | | Practical Classification | |
|---|---|---|---|---|---|---|
| | | | Number | Percentage | Number | Percentage |
| 1 | 154 to high | Very High S.A | 29 | 3.6 | 26 | 3.23 |
| 2 | 137 to 153 | High S.A | 192 | 23.84 | 207 | 25.68 |
| 3 | 120 to 136 | Average S.A | 364 | 45.14 | 358 | 44.42 |
| 4 | 103 to 119 | Low S.A | 192 | 23.84 | 201 | 24.94 |
| 5 | 119 to low | Very low S.A | 29 | 3.6 | 14 | 1.74 |
| Total | | | 806 | 100 | 806 | 100 |

## Conclusions of the study:

- In Final Scientific Attitude Scale there was 35 items were selected.
- The Reliability value of the scale was between 0.66 to 0.94.
- The Validity value of the scale was between 0.83 to 0.87.

Present time is the age of science and technology. The students will have to enrich themselves internally So that they can face the orthodoxy and non scientific practices and lead the society to innovative changes. They must develop positive approach towards science and technology. This scale will be useful to society, teachers, Govt. and parents to what the incidents and daily happening with scientific vision.

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