

CHAPTER NO. : 4
:CONSTRUCTION AND
STANDARDIZATION OF
RESEARCH TOOL:

- 4.1 Introduction
- 4.2 Construction of Research Tool
 - 4.2.1 Writing up the sentences
 - 4.2.2 Expert Opinion
 - 4.2.3 Scrutiny of Statements
 - 4.2.4 Pre-Pilot test
 - 4.2.5 Pilot Test
 - 4.2.6 Item Analysis
 - 4.2.7 Final attitude scale
 - 4.2.8 Final attitude scale for
English medium
students
- 4.3 Standardization of tool

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:CONSTRUCTION AND
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RESEARCH TOOLS:

4.1 INTRODUCTION:

In the present study researcher has decided to prepare an attitude scale as per Likert method. There are particular steps for making this scale. It also needs standardization. In this chapter researcher present all steps of preparing research tool. In this chapter researcher also give information about standardization of tool.

4.2 CONSTRUCTION OF RESEARCH TOOL:

Because attitudes are so much a part of human behavior, researchers have spent a great deal of time figuring out ways to measure attitudes. There are numerous attitude scales. I will describe one of more common approaches here, the Likert scale, as researcher has selected to prepare an attitude scale by this method. The reasons for the are given below :

- 1) It is very simple to construct Likert scale.
- 2) Likely to produce a highly reliable scale.
- 3) Easy to read and complete for participants.

ñ Steps of likert scale construction :

- 1) Collect statements
- 2) Judge direction
- 3) Discard neutral (or unable to judge) statement
- 4) Format items to measure intensity.
- 5) Pre-pilot test
- 6) Pilot test
- 7) Validating of tool

4.2.1 Collecting and writing up sentences :

To prepare an attitude scale the investigator tried to understand the subject and read necessary related literature. The researcher herself being a higher secondary teacher, could understand students and their ideas about this particular subject. The researcher constructed nearly 67 statements expressing attitude of students towards statistics among them 33 were positive and 34 were negative statements.

[The list of 67 statements is given in appendix-2]

4.2.2. Construction of research tool :

After preparing the scale of 67 sentences it was computerized and sent to the language expert as well as tool experts for further guidance. The letter which was written to the experts is given in **appendix-1** List of experts and their suggestions are summarized in table : 4.1

TABLE : 4.1**List of experts for attitude scale and their suggestions**

Sr. No.	Name of the expert and designation	Institution where he/she working	Suggestions
1	Dr. Binaben Trivedi Professor of Gujarati	Shri Haribapa Arts and Commerce College, Jasdan	Correct the grammatical mistakes
2	Amitbhai Vyas Professor of Gujarati	Shri Haribapa Arts and Commerce College, Jasdan	Use simple language
3	Dr. B.D. Trivedi, Principal	B.Ed. College, Palanpur	Select only those sentences that will cover interest field of subject
4	Dr. M. K. Patel Lecturer	B.Ed. College, Palanpur	Avoid double negative sentences Change some statements.
5	Dr. D. C. Bhatt Lecturer	Prakash College of Education, Ahmedabad	Use simple language change some sentences.
6	Dilipsinh Dodiya Lecturer of statistics	Shri Haribapa Arts and Commerce College, Jasdan	Be more specific about statistics as a subject.

Sr. No.	Name of the expert and designation	Institution where he/she working	Suggestions
7	Dr. J.H. Pancholi Principal	B.Ed. College, Patan	See that nearly 25 to 30 statements remain in final scale.
8	Shivrajbhai Khachar Teacher of English	Zenith Classes, Jasdan	Correct the grammatical mistakes in the sentences
9	Kavitaben Dave Teacher of English	Shri Kanya Vinay Mandir, Jasdan	Use the simple language.
10	Dr. S.P. Sharma Lecturer	S.V.S. B.Ed. College, Mehsana	The thought or idea in each should be expressed briefly.

The experts checked the statements and gave the above stated suggestions.

4.2.3 Scrutiny of Statements :

Returned copies with suggestions were collected. According to their advice the investigator made changes and corrected the sentences. A few statements were discarded which were –ir-relevant and 50 statements were selected for pre-pilot test.

[List of 50 statements is given in (appendix-3)]

4.2.4 Pre pilot test :

The experimental try out should be made on a representative sample of the population on whom the final test is to be administered.

The pre try-out of the test may be highly informal and may involve the administration of the tentative try-out units to form half a dozen to a hundred examiners, fairly representative of the population.

This scale was not standardized yet all steps were followed to make it a reliable and valid tool.

The pre-pilot scale was administered with the following objectives :

- To determine, defective and ambiguous statements.
- To ascertain whether the directions of the subjects were comprehensive.
- To decide the time limit that would be required for the final administration of the tool.
- To get acquainted with the administration procedure of the scale.
- To observe the reactions of the students closely.

Try out Administration :

For this try out a representative sample was selected from the students of a school of Jasdan. The scale was administered on 25

students. Table 4.2 shows the sample selected for the pre-pilot administration of the test.

[Scale for pre-pilot test of 50 statements is given in appendix-3]

TABLE : 4.2
Sample for pre-try out

School name	Boys	Girls	Total
Shri Venilal Kalyani Higher Secondary School, Jasdan	15	10	25

Observations and necessary changes :

With the suggestions from the experts and from the administration of the scale it was found that the students could understand the statements easily. It was found that the approximate time required in responding to all the statements was nearly 25 to 30 minutes.

The language employed in the construction of a few statements was above the level of comprehension of average student of average students. These statements were modified.

Some ambiguities and inadequacies observed in the statements were suitably remedied.

It was realized that a few items required exactness and clarity. While preparing attitude scale for the pilot testing due care was taken to construct statements using simple language.

On the whole, students showed deep interest in this scale. Thus the pre-try out study helped to make necessary changes in the scale

and to take decisions in preparing the pilot from of the scale for item analysis.

4.2.5 Pilot Test :

After pre-pilot testing 42 statements were retained. Out of 42 statements 21 were positive and 21 negative.

[List of 42 statement for pilot test is given in appendix-4]

Following were the specific objectives of the pilot test :

- To know the reactions of the students on the general instructions printed on the first page.
- To collect the data for statement analysis.
- To select statements for the final scale after statement analysis.

A good pilot test is good only, if it is administered to the subjects properly. The investigator should take care of time limit, instructions for the subject, sample for administration, scoring of the scale and statistical procedure.

One the gross deficiencies in the try out form have been eliminated on the basis of pre-try-out, it becomes necessary to obtain accurate information concerning the test users, similar to those with whom the final form of the test is to used.

In view of the purpose of the present work the scale was administered to a sample which represented Std. 12th schools population, comprising of a sample of 70 students from Std. 12th as shown in Table 4.3. The selected 50 statements were put on Likert

type five point scale with the points- Strongly Agree, Agree, Undecided (Neutral), Disagree and Strongly Disagree.

The preliminary attitude scale thus constructed is given in **Appendix-4**

TABLE : 4.3
Sample for pilot try out

School Name	Boys	Girls	Total
Shri Vivekanand Vidyalaya	35	0	35
Shri Kanya Vinay Mandir	0	35	35
TOTAL	35	35	70

The sample is quite representative and similar to the sample on which the final form of scale is to be administered.

4.2.6 Item Analysis :

Item analysis of students responses to an attitude scale is a powerful tool for scale improvement. Item analysis sometimes suggests why an item has not functioned effectively and how it might be improved. A test composed of items revised and selected on the basis of item-analysis data is almost certain to be much more reliable than one composed of an equal number of untested items. Item analysis begins after the test has been administered and scored. In the present study, after the scale has been administered on the basis of the score obtained, an analysis of the relationship between item scores and total scores is carried out.

In the previous try out test, the objective was to remove ambiguities, but this being the final stage for the selection of items statistical calculations are involved to check all the statements. The major objective of item analysis is to obtain objective information concerning the items for the final scale and to compose the final form.

Items can be analysed qualitatively and quantitatively. For qualitative analysis one has to take the content and form into consideration whereas for quantitative analysis, the statistical properties are considered. It is said that an item itself is a test in a miniature form, carrying with it a single problem. The test which includes many items conveys a meaning that it and hence every problem of the test also differs.

The response received from 70 students on the attitude scale measuring attitudes towards statistics were then scored by assigning scale value in the following manner.

The response received from 70 students on the attitude scale measuring attitude towards English were then scored by assigning scale value in the following manner.

For Positive Attitude Statement

Option	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Scale Value	5	4	3	2	1

For Negative Attitude Statement

Option	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Scale Value	1	2	3	4	5

This was with view that the category of responses should have the scale value in such a way that the respondents with the most favorable attitude will always have the highest positive weight.

To select those statements which most effectively obtain information required and to eliminate the rest, the total score of each respondent was calculated. The total score thus obtained was arranged in a descending order of the 70 respondents.

From this 27 percent high score and 27 percent low score were identified as the 'criterion group' in terms of which to evaluate the individual statements. These data were used to prepare an item wise frequency of responses in each option separately for the high and low score groups. The remaining responses were discarded. With the help of the frequency, thus obtained each statement was calculated, giving the measure or ratio of extent to which given statement differentiated between the high scores and the low scores. Thus investigator used following formula to compute the 't' value of each statement.

$$t = \frac{M1 - M2}{\sqrt{\frac{\Sigma x1^2 - \Sigma x2^2}{N(N - 1)}}$$

Where : M1=Mean score of high group

M2=Mean score of low group

N= Number of respondent in each group.

The investigator calculated correlation 'r' with the help of the following formula.:

$$r_{xy} = \frac{\sum xy}{N\sigma_x\sigma_y}$$

Where

r_{xy} = Correlation between x any y, where x means score obtained by the respondents on a statement and y means total score obtained by the respondent in scale/test.

x = The difference of any x score from the mean score of x score.

y = The difference of any y score from the mean score of y score.

σ_x = Standard deviation of x scores

σ_y = Standard deviation of y scores

N = Total numbers of respondents.

Only those statements having 't' value more than 2.63 and correlation 'r' more than 0.38 were accepted. The remaining statements were declared. Thus after the computation of 't' value and 'r' the researcher finalized the items. The calculated 't' value and 'r' of each statement with new number assigned is give in table 4.4 and 4.5 respectively.

TABLE : 4.4**Positive sentences as per t-value and correlation (r)**

Statement No.	't' score	Correlation (r)	Remarks	New Number
1	7.35	0.67	Accepted	1
3	7.39	0.49	Accepted	3
4	5.18	0.52	Accepted	5
7	4.58	0.46	Accepted	6
8	2.99	0.51	Accepted	9
9	11.50	0.60	Accepted	11
11	2.37	0.37	Rejected	--
13	-0.95	0.16	Rejected	--
16	3.35	0.47	Accepted	14
17	10.50	0.50	Accepted	17
18	5.96	0.51	Accepted	18
20	9.63	0.59	Accepted	21
22	2.15	0.31	Rejected	--
24	9.51	0.69	Accepted	22
28	8.53	0.54	Accepted	19
30	11.50	0.74	Accepted	28
32	8.56	0.57	Accepted	25
34	-0.90	0.18	Rejected	--
37	2.13	0.02	Rejected	--
38	2.18	-0.40	Rejected	--
42	5.33	-0.51	Accepted	24

Graph : 4.1

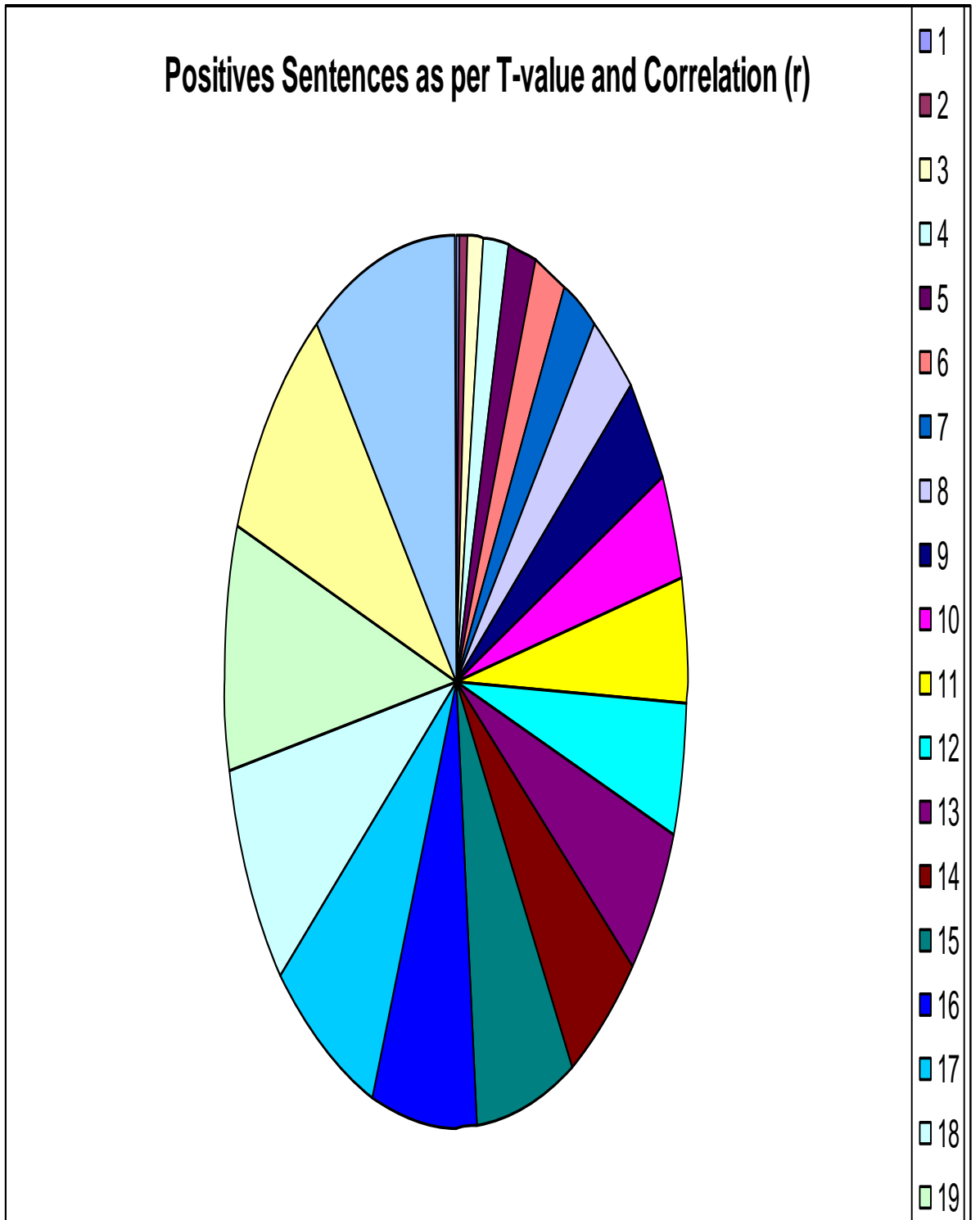
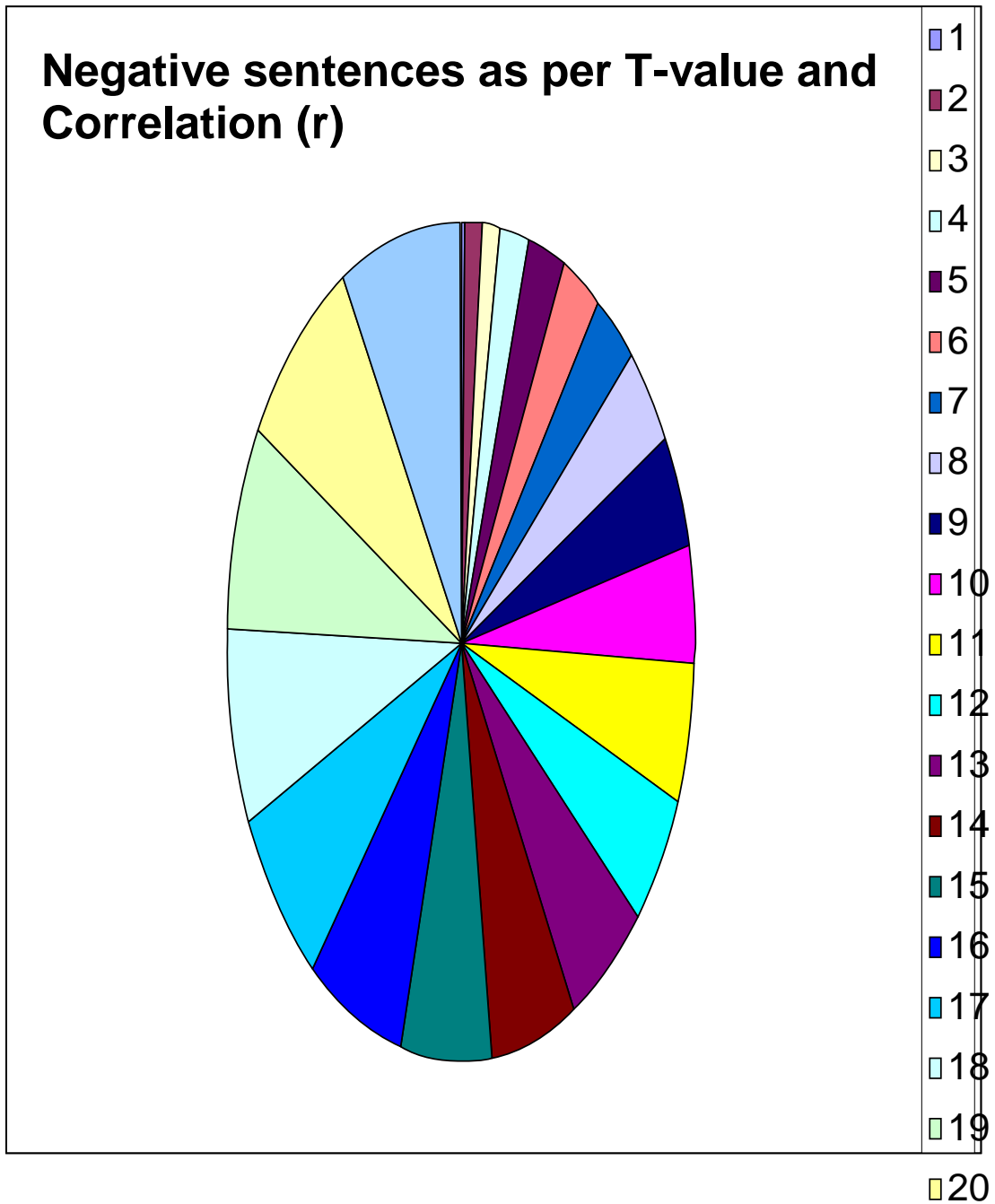


TABLE : 4.5**Negative sentences as per t-value and correlation (r)**

Statement No.	't' score	Correlation (r)	Remarks	New Number
2	3.89	0.41	Accepted	2
5	4.65	0.49	Accepted	4
6	4.27	0.46	Accepted	8
10	7.98	0.42	Accepted	10
12	11.08	0.52	Accepted	7
14	1.33	0.09	Rejected	--
15	6.39	0.61	Accepted	12
19	5.36	0.63	Accepted	15
21	2.65	0.41	Accepted	16
23	8.16	0.51	Accepted	19
25	-3.20	0.01	Rejected	--
26	6.36	0.62	Accepted	20
27	7.35	0.61	Accepted	23
29	7.64	0.48	Accepted	27
31	7.29	0.63	Accepted	13
33	4.72	0.46	Accepted	29
35	5.09	0.45	Accepted	30
36	-2.30	0.30	Rejected	--
39	2.20	0.03	Rejected	--
40	-1.15	-0.69	Rejected	--
41	-5.66	0.19	Rejected	--

Graph : 4.2



The graphic presentation of the 't' value or 'r' of the selected statements is given in Graph 4.1 and 4.2 respectively.

4.2.7 Final attitude scale :

According to expert's suggestions are pre try out of the scale of 67 statements 42 were selected for pilot test. After the administration of the 42 statements in the pilot test, the data collected was analysed. The t-value and correlation 'r' for each item was found to range between -3.20 to 12.50 and e0.02 to 0.88 range respectively. The statements with 't' values 2.63 to 12.50 and 'r' 0.38 to 0.88 were selected for final form. The graphic presentation of the 't' value and 'r' of the selected statements is given Graph 4.1 and Graph 4.2 respectively.

In the final form clear instructions, explanations etc were put on the front page. The method of answering was explained with one example. The meaning of each point was also explained clearly, to help the respondents in answering with ease and clarity. The final attitude scale with instructions on the front page and 31 statements was printed. From which 16 were positive and 15 were negative. The final scale is given in **(Appendix-5 & 6)**.

4.2.8 Final attitude scale in English for English medium students

After preparing final attitude scale in Gujarati which is presented in Appendix-6 researcher translated it in English, because in Gujarati students of 12th standard commerce study same books both in Gujarati and English medium. In Gujarat syllabus of Gujarati as well as English medium is same. Most of the English medium schools affiliated to Gujarat Higher Secondary Education Board, Gandhinagar. The translated attitude scale is given in **Appendix-7&8**.

4.3 STANDARDIZATION OF ATTITUDE SCALE

Standardization of a research instrument requires reliability and validity.

4.3.1 Reliability :

The first important quality of measuring instruments is reliability. Reliability refers to consistency; a reliable test is one on which pupils get approximately the same scores in repeated testing's. A test which is highly valid or measures exactly what the user wishes to measure would also undoubtedly be reliable since it should continue to get such results. High validity be reliable since it should continue to get such results. High validity of an instrument as a rule is also accomplished by high reliability. The reverse relationship is not true.

Three characteristics of reliability are commonly evaluated : ⁽¹⁾

- 1) Stability
- 2) Internal consistency
- 3) Equivalence

There are mainly three methods of reliability: ⁽²⁾

- 1) Test-retest reliability or Stability.
- 2) Half-spilt reliability or internal consistency.
- 3) Interpreter reliability or the notion of equivalence.

Anastasi rightly states, "The reliability of a test refers to the consistency of scores obtained by the same individuals on different occasions or with different sets of equivalent item." ⁽³⁾

Reliability is an important feature for high quality in educational and psychological testing. Henry E. Garrett says, " A test

score is called reliable when we have reasons for believing the scores to be stable and trustworthy. Stability and trustworthiness depend upon the consistency of test score.⁽⁴⁾

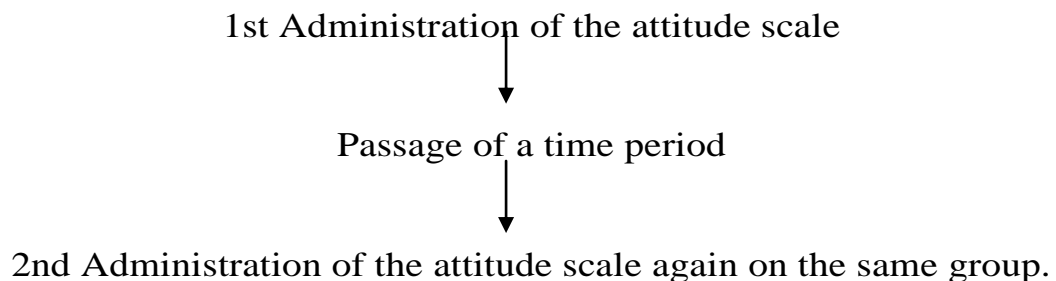
For establishing the reliability of the scale mostly the following methods are widely used by the researchers.

- (i) Test-Reset method
- (ii) Spearman-Brown's Split-half method
- (iii) Kuder Richardson method
- (iv) Alternate or Parallel form method

For the present research, the investigator used the test-retest method to find out the reliability of the attitude scale.

- Test-Retest Method :

Repetition of a test is the simplest method of determining agreement between two sets of scores. The scale is repeated on the same group, over a time period and the correlation computed between the first and the second set of scores is known as the test-retest reliability coefficient. This paradigm looks like this –⁽⁵⁾



For this purpose, the investigator gave the scale to a group of 54 students. The first scale was given in the first week of August, 2013. After two weeks, the same scale was readministered on the

members present of the same group. The scores of 50 students on the test-retest were tabulated in scatter diagram, which is given in **Table : 4.6**

TABLE : 4.6
Scatter Diagram for Test Retest scores

:FIRST TEST SCORES :

SECOND TEST SCORES	Interval	159	140-149	130-139	120-129	110-119	100-109	90-99	80-89	Total
	80-89	--	--	--	--	--	2	1	--	3
	90-99	2	1	2	--	2	1	2	--	10
	100-109	5	3	--	--	3	--	--	1	12
	110-119	4	--	--	--	1	4	--	--	9
	120-129	1	--	1	--	--	1	--	1	4
	130-139	--	--	--	1	1	1	--	--	3
	140-149	1	--	--	--	--	1	1	--	3
	150-159	--	--	--	--	1	1	--	--	2
		13	4	3	1	8	11	4	2	46

r=0.79

As shown in the table, reliability index according to test-retest method is found to be 0.79 which is a positive and high index. Thus, we can say the reliability of the scale is very high.

4.3.2 Validity of Research Tool :

Validity is unquestionably the most important of three qualities of a measurement instrument. Validity has customarily been used to refer to the extent to which an instrument measures that which its user intends to measure. The validity of the instrument used and validity of research design as whole are important criteria in evaluating the worth of the results of the results conducted. Internal

validity refers to the likelihood that experimental manipulation indeed was responsible for the differences observed. External validity refers to the extent to which the result of the study can be generalized to the larger population.

There are mainly four types of validity used to judge the accuracy of an instrument. ⁽⁶⁾

- 1) Content validity
- 2) Predictive validity
- 3) Concurrent validity
- 4) Construct validity

In the present study validity of an attitude scale determine by the method of co-current validity. 50 students of Gujarati medium and 50 students of English medium school were selected for this. Their responses on attitude scale made of researcher taking into consideration for validity. Correlation of their responses is shown in table 4.7

Correlation of student's responses on attitude scale of Gujarati and English medium school.

TABLE : 4.7

English medium students responses

Gujarati medium students responses	Interval	150	140	130	120	110	100	90	80	Total	
		-	-	-	-	-	-	-	-	-	
		159	149	139	129	119	109	99	89		
80-89	--	--	1	1	1	1	1	1	--	5	
90-99	1	1	1	1	1	1	1	1	1	8	
100-109	--	1	5	14	--	3	1	1	--	24	
110-119	8	--	5	1	1	1	1	1	--	17	
120-129	4	--	3	--	2	2	2	1	--	12	
130-139	10	--	--	2	--	3	3	1	--	16	
140-149	--	5	--	5	--	5	5	--	--	15	
150-159	--	1	--	--	--	--	1	1	--	3	
		23	8	15	24	5	17	7	1	100	

r=0.69 Good correlation

As shown in the table 4.7 validity index according to co-current validity is found to be 0.69 which is very good for this scale. thus we can say the validity of the scale is very good.

This chapter described in detail the construction and standardization of research tool. The next chapter includes the presentation, analysis and interpretation of gathered data.

[Chapter-5]

CHAPTER NO. : 4
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