CHAPTER IV

CONSTRUCTION OF THE TEST

Introduction

After defining the quality to be measured, the next task is to construct an instrument which is capable of assigning some number or score to a quantity of that quality. The instrument which is capable of measuring the innate ability (intelligence) is called an intelligence test. It may be one test consisting of number of objective type questions called items or it may be a battery consisting of different types of tests, each test containing number of items to be solved in one particular way.

"A psychological test is essentially an objective and standardized measure of a sample of behaviour".[1/] So an intelligence test is objective in nature. The individual is asked to perform small and simple intelligent activities. Inference, regarding the magnitude of intelligence of an individual, is drawn from the number of these activities correctly done by him. For this purpose the test is standardized. In mental testing standardization is "..... the process of establishing standard procedures and normative values for the comparision and evaluation of the performances of individu-

1/Anatasi Anne, Psychological Testing, The Macmillan Company, New York, 1965. pp 21.

als and groups".[1/]

While selecting these activities, usually called as items, attempts are made to tap wider breadth of experiences both in and out of schools. However they depend more on older learning than do achievement tests.

Study of Different Tests.

The factor hierarchy model of the structure of mental ability is used as the basis of this test because the test is to be used for assessment and prediction of an individual in a general way. Hence the test is to be as heterogeneous as possible. The items are to be based on varieties of experiences from different fields of life and ask for number of mental abilities to function for their solution. To get guidance in constructing the items, following available intelligence tests are studied critically:-

1. Otis Group Test of intelligence
2. Army Alpha Tests
3. Burt's Test of intelligence
4. 1937 Stanford Revision
5. Kamat's Test of Intelligence (Marathi & Kannad)
6. Phatak's Test of intelligence (Marathi)
7. N.V.T.I. by Nafade
8. Desai's Test of Intelligence (Gujrati)
9. Shah's Test of Intelligence
10. Stanford Binet Intelligence Scale (Hindi Adaptation)

Some of these tests are verbal and others nonverbal. Some

1/Goodenough F.L., Mental Testing, Holt, Rinehart and Winston, New York, 1961. pp 566

are group tests and others individual tests. The various types of activities that are used in these tests and suitable for use in a verbal test of intelligence are as below:-

1. Following Directions
2. Finding Similarities (Classification)
3. Finding Opposites
4. Analogies
5. Arranging Disarranged Sentences
6. Completion of Sentences
7. Memorization
8. Giving Reasons
9. Proverbs
10. Finding Synonyms
11. Making Practical Judgements
12. Drawing Inferences
13. Solving Arithmatic Problems
14. Completion of Number Series.

Out of these following eight types of activities have been selected for constructing this test:-

1. Finding Synonyms
2. Finding Antonyms
3. Analogies
4. Classification
5. Giving Reasons
6. Drawing Inferences

7. Solving Arithmetic Problems

8. Completing Number Series.

So this battery consists of eight tests.

Description of Tests:

1. Synonyms

Against a given word four words are given in a row. From these, a word is to be selected which is a synonym or nearly a synonym of the first word. The remaining three words are such that they are able to conceal the correct response to some extent.

The individual has to perceive similar relationships and possess adequate verbal ability.

2. Antonyms

This test is similar to the first one. However in this test, antonym of the given word is to be found out from the given set of four words, in that row.

The test aims at measuring ability to perceive opposite relationships and verbal ability.

3. Analogy

Three words are given to the left hand side and four words are given to the right hand side in a row. The first two words of the left hand side bear certain relationship with each other. The individual has to find out a word from the right hand side which bears the same relationship with the third word in the left hand side.

This asks for the functioning of ability to perceive relation-

ships and ability to make judgement. This is a very common test found in many batteries of intelligence tests.

4. Classification

In this test, a set of five words are given in a row. They bear different types of relationships between each other. But there is only one relationship which is common to four words but absent with the fifth one. Only these four words can be grouped into a class. The fifth word does not belong to that class, according to that criterion. This word which does not belong to the class of words is to be singled out by the individual.

This test demands the functioning of ability to perceive relationships, ability to make judgement, and ability to reason.

5. Reasoning

In this test, statements are made and four reasons for making each of these statements are given below each of them. Those four reasons are not altogether incorrect. One of them is the most appropriate one. The individual has to select it.

One has to weigh the alternate responses, reason and make correct judgement. The test involves the ability to reason and ability to make judgement.

6. Logical Inferences

In this test, problems are given. Three possible solutions are given below each problem out of which one is correct. It is to be found out.

It involves the ability to reason, ability to draw inference

and ability to solve problems.

7. Arithmetic Problems

Simple Arithmetic problems are given in this test. They involve the use of the fundamental mathematical operations, of units of measurement and of the Arithmetic concepts used in everyday life. The problems are from the daily life of the individuals. These problems are to be solved mentally and the correct answer is to be written in the space provided. No written calculations are expected. Even the units in which the answers are expected are given. So the individual has only to write the number.

The test involves the functioning of numerical ability, ability to perceive relationships, ability to reason, ability to draw inferences and ability to solve problems.

8. Completing Number Series

In this test, a set of six numbers is given in a row. The numbers in the set are arranged in such a way as to follow a certain order of relationship. The individual has to recognize this order and find out two more numbers as would fit in the same series.

This test involves the use of numerical ability, ability to perceive relationship, ability to infer, ability for abstract thinking and ability to make judgement.

In every test there are directions given for solving it. The performance of the individual is affected if he does not follow the directions. Thus the performance on the test is indirectly measuring the ability to follow directions.

In every test the performance is affected by memory because the individual has to recall words, multiplication tables, etc.

Though the test has been timed very liberally, still the individual has to complete the test in the fixed time. So it measures the speed of response of the individual indirectly.

Thus any measure of performance on this test is the measure of the functioning of the following abilities:-

1. Verbal Ability
2. Numerical Ability
3. Ability to Perceive Relationships
4. Ability to Make Judgements
5. Ability to Draw Inferences
6. Ability to Reason
7. Ability to Abstract Thinking
8. Ability to Solve Problems
9. Ability to Follow Directions
10. Memory
11. Speed of Response.

Description of the Poplation

The test was originally meant for the pupils studying in standards VIII to XI. The pupil is generally admitted in standard I when his age is six plus. So he enters standard VIII at the age of 13 and leaves the standard XI when his age is sixteen plus. Due to failure it is just possible that he may be in the school though his age is seventeen plus. So the test is planned for the

age group 13 years to 17 years. (In June 1971 new educational structure has been introduced. According to it standard XI has been abolished from the secondary schools. So now the test is meant for the pupils in standards VIII to X).

Preparation of Items

The test is to be used by any person who is able to administer and evaluate the performance objectively as per instructions. There should be no variation in the assessment of the performance of an individual if it is done by different persons. This is possible only with the use of objective questions. So all items in all the tests are objective questions. In test 1 to 6, the individual has to select an answer from the given alternatives, whereas in tests 7 and 8 he has to construct answers in the form of numbers.

Number of items were prepared which were based on varieties of experiences from different fields of life, generally experienced by the individuals of the age group 13-17 years in this area. These items call for the functioning of one or more mental abilities listed above. The critical study of different intelligence tests was of great help in this task.

While preparing alternatives for the correct answer of each item, care was taken to see that these alternates would conceal the right response adequately.

To avoid a particular pattern in the arrangement, their order was decided by drawing the lots.

Along with the test items, a list of correct answers was also prepared.

To ensure uniformity in administration of the test, instructions to the administrators and pupils for taking the test were written down. Instructions to the administrators were regarding sitting arrangement, physical environment, an initial casual talk, distribution of tests, answersheets, instructions to pupils and demonstration of the way of recording answers etc. Instructions to pupils were regarding the way of solving the items and recording the answers.

Scrutiny of the Items

A good objective question is that which has one and only one correct response. A good objective question is never ambiguous. While constructing the items, care was taken to see that each item was unambiguous.

To make the items absolutely faultless, they were scrutinised by four Marathi language experts. These persons are holding M.A. degrees in Marathi. Two of them possess the experience of teaching Marathi to degree classes and the other two guide B.Ed. students in preparing Marathi lessons. They were not shown the list of correct answers in order to keep them unbiased while scrutinising the items. The items which were pointed out by them as ambiguous and faulty were discarded.

The items and the tests were arranged in the ascending order of difficulty decided arbitrarily.

First Try Out

The tests were printed for a preliminary try-out. Each test was printed on a separate sheet, so that one test could be given at a time.

The answers were to be recorded on the test itself.

The main objectives of this preliminary try-out are as follows:-

1. To find out the faulty items which are interpreted by pupils in a way different from the one anticipated,
2. To find out items which are effective
3. To find out the effectiveness of the alternatives
4. To find out the adequacy of the recorded instructions for administering the test
5. To find out the adequacy of the recorded instructions to pupils for taking the test

and 6. To gain experience in administering the test.

The test was then administered to 370 pupils studying in standards VIII to X in three high schools. Two of them are local schools located in urban area and the remaining one is in the neighbouring rural area. One of these three schools is a purely boy's high school, second purely a girl's high school and the third, a mixed high school. One division of each standard namely VIII, IX, and X from each of these high schools was selected for this purpose.

One test was administered at a time. The test was first distributed and the instructions for solving the test were read.

One practice example was solved on the black board. The other three practice examples were written on the board and pupils (one at a time) were asked to give the answersof these practice examples. This assured that pupils had followed the instructions. Then they were asked to solve all the items in that test. They were given as much time as they wanted. The time required for the test was recorded. When all the pupils completed the test, it was collected and the next one was given. The same procedure was repeated. Four tests were given on one day and the other four on the next day. The inadequacies in the instructions were also noted. The instructions were revised in the light of the experience, and the revised ones were used while administering it to next class.

The tests were corrected with the help of the list of correct answers and the performance of pupils on each item of each test was tabulated. It was found that,

(a) Some items were not at all attempted by any of the pupils,

(b) Some items were solved by all the pupils,

and (c) Some of the alternates were not selected by any.

All such items were discarded.

It was anticipated that a large number of items were likely to be discarded at different stages. So a large number of items were prepared which was slightly twice the number of items that were to be retained in the final form.

Table 3. Number of Items Originally Prepared and Retained.

Serial No.	Description of the Test	Number of Items		
		Originally prepared	Retained for first try-out	Retained in the Final Form.
1	Synonyms.....	51	38	24
2	Antonyms.....	58	38	24
3	Analogy.....	46	38	21
4	Classification.....	49	37	24
5	Reasoning.....	30	22	15
6	Logical Inferences.	26	18	11
7	Arithmetic Problems	31	23	18
8	Number Series.....	30	22	17
	Total.....	321	236	154

Arrangement of Tests and Items

While administering the test, the time required for each test was recorded. This gave a rough estimate of the difficulty of each test. It was found that Test III "Classification" was slightly more difficult than Test IV "Analogy". Otherwise the order of other tests arbitrarily decided and that observed during this preliminary try-out was the same. As this try-out was meant to remove only the gross lapses, the order, decided arbitrarily, was retained for second try-out.

The arrangement of the items had also been done arbitrarily. The preliminary try-out gave a rough estimate of the difficulty of the items. The criterian used for deciding the difficulty of items was the total number of pupils attempting it correctly. The

difficult item was that which was attempted correctly by few individuals. The items in each of these tests were arranged in the ascending order of their difficulty.

Answer Sheets.

There are different ways of recording the responses of the objective questions. One way is to mark the selected responses on the test itself and the other way is to record them on a specially prepared answer sheet.

"The use of separate answer sheets and answer pads with objective tests is based on the simple but fundamental idea that a subject's choice among several alternative responses may be represented by a mark placed in a numbered position to agree with the response which examinee considers to be right".[1/]

Advantages of using the separate answer sheets for recording answers are given below:-

1. The answer sheet is small and hence inexpensive
2. It saves the turning of pages of the answer sheets
3. The time required for recording the answer is comparatively very small
4. Evaluation of these sheets is speedy and accurate
5. The same Test booklets can be used number of times.

A special answer sheet has been prepared for recording the answers. (Appendix A).

1/Traxler A.E., "Administering and Scoring the Test". Chapter 10, Educational Measurement, Edited,by E.F.Lindquist, American Council on Education, Washington D.C., 1966, pp 382-383.

The answers of items in tests 1 to 6 are to be recorded by scoring, in the answer sheet, the appropriate alphabets denoting the alternative answers of the respective items, which the individual selects as correct ones. In that answer sheet, answers of the items in tests 7 and 8 are to be recorded in the respective boxes bearing the serial numbers of items. Wherever necessary, the units in which the answers are expected are also given in the respective boxes. The pupils have merely to write a number in the box, as an answer to that item.

Preparation of Key.

As there are no facilities for mechanical scoring at this place, the answer-sheets are to be scored manually. To ensure speedy and accurate scoring generally a key is used. The four types of keys generally used for hand scoring are (a) fan or accordance key, (b) strip key, (c) cut-out key and (d) transparent key. The cut-out key is more suitable for scoring this type of answer sheets.

Cut-out key is one in which windows are cut which reveal the alphabets denoting the correct responses. For this some of the above stated answer sheets were printed on stiff paper, and holes were punched at the places of all alphabets denoting the correct answers of all items of tests 1 to 6. By super-imposing this stensil on the answer sheet to be scored, red marks may be made through the windows of the stencil on the answer sheet. The alphabet having two marks one by the examinee and the other by the

scorer is the correct response.

For scoring the tests 7 and 8, strip key was prepared. It consists of a strip of paper bearing serial numbers of items infront of which are written the correct answers. This strip can be placed adjacent to the respective columns of the answersheet to be scored and tick marks may be placed on serial numbers of correct responses in the answersheet. In test 8 if both the figures are correct the individual is to be assigned one score. The answer is treated as incorrect even though one number out of the two is correct.

Printing the Test for Second Try Out.

The test was to be timed as a whole so it was printed in the form of a book-let of 8 sheets (Appendix A). On the front page of each sheet instructions for solving a test and on the back of it the test proper were printed.

During the first try-out three or four examples were used to demonstrate the way of solving each test. These four examples are also printed on the front side as practice examples in tests 1 to 5 and test 8. The demonstration of the solution of the first item is given and the pupils have been asked to solve the remaining three. They have been asked to verify their solutions with the answers supplied to them, on separate cyclostyled sheets. This assures pupils that they are following the instructions accurately. In case of tests number 6 and 7 no need of giving practice examples was felt. So one example is given for demonstration purpose.

Instructions for the administrators, and the pupils taking the

test, had already been prepared and revised during the first try-out. To this were added instructions regarding the use of specially prepared answer sheets.

About four thousand copies of the answer sheets were printed for the second try-out.

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