

## CHAPTER II

### DEVELOPMENT OF THE PROGRAMMED TEXT

Development of programmed learning material in India began around the year 1963. Since then more than 60 programmes have been developed on school and college subjects. Topics of these programmes cover a variety of subject areas studied at the primary level to college level. Majority of these programmes have been the products of efforts made by individual researchers working for their master's or doctoral degrees. Sharma (1974), reviewing the research in programmed learning carried out at Meerut University, reports about 35 programmes developed in various subjects. Of these, 2 programmes have been designed for primary classes, 16 for secondary classes, 7 for graduate level students and 10 for B.Ed. students. Yadav and Govinda (1974) provide a list of 16 programmes developed at the Centre of Advanced Study in Education of the M.S. University of Baroda. These programmes are meant for use with students of different classes at primary and secondary levels. All the programmes developed in the country, with a few exceptions, have been written in the linear style. Hussain (1974) has developed

a programme in Geography in both linear and branching styles. Krishnamurthy (1974) wrote a programme in Physics in seven different forms including linear and branching styles.

Thus, research and development activities in the area of programmed learning have been going on in the country for the last one decade. However, utilisation of programmed learning material by educational institutions in their classrooms or for other instructional purposes has still remained a scene aspired for rather than accomplished. Although, the situation apparently seems to be surprising, as has already been pointed out, it is not unaccounted either. First, the programmes that have been developed are, generally, fragmentary in nature covering only one or two topics of the course of study prescribed in the respective subjects. Secondly, on the same account, the validation data have been less reliable; it is possible that the students would have considered the programme more as something additional or supplementary to the routine instructional work than as an integral part of it. An attempt has been made to overcome these two commonly found limitations, while developing the programmed text under the present study.

The programmed text was developed following the usual steps prescribed for preparing a valid programme. Details regarding the main features of the developmental process such as specification of terminal behaviours, task analysis, target population, and criterion tests have been presented in the following. Description about certain technical aspects of the Programmed Text such as style, format, and response mode has also been given.

#### Course Content and Task Analysis

The Programmed Text covers the content of the course "Educational Testing and Techniques of Evaluation" which is prescribed as a compulsory course for the B.Ed. students of the M.S. University of Baroda. Instruction in this course is given in one full semester. During the instruction, periodical assessment of the student is done by the teacher providing instruction. At the end of the semester a comprehensive test is administered. Students' learning in the course is evaluated on the basis of their performance in the periodical tests and the final comprehensive test.

As the first step in developing the programmed text the course contents were analysed in detail. Based

on this analysis it was decided to deal with the contents of the course under five heads. However, after further analysis the first part on introduction to educational evaluation and measurement was divided into two parts as A and B. Thus, for the purpose of presentation to the students, the course was finally divided into following six units.

- Unit I     -   Educational Evaluation and  
                  Measurement - A
- Unit II    -   Educational Evaluation and  
                  Measurement - B
- Unit III   -   Essential Characteristics of a  
                  Good Instrument of Evaluation
- Unit IV    -   Major Evaluation Tools and  
                  Their Uses
- Unit V     -   Teacher-made Achievement Tests
- Unit VI    -   Elementary Statistics in Education.

Proper sequence for the presentation of contents was decided on the basis of a flow chart prepared to discover the interdependency of the different concepts to be covered and the demands they make on the sequencing

of content material. Flow Chart I presents a total picture of the contents of the complete course. Flow Chart II presents the analysis of the contents included in Units I and II. Flow Charts III to VI presents the analysis of the contents included in the Units III to VI.

Based on the detailed task analysis made, specific outlines of the topics to be covered under each unit were prepared, specifying the different content points in exactly the same sequence in which they ought to appear in the programmed text. These content outlines of the course have been given below.

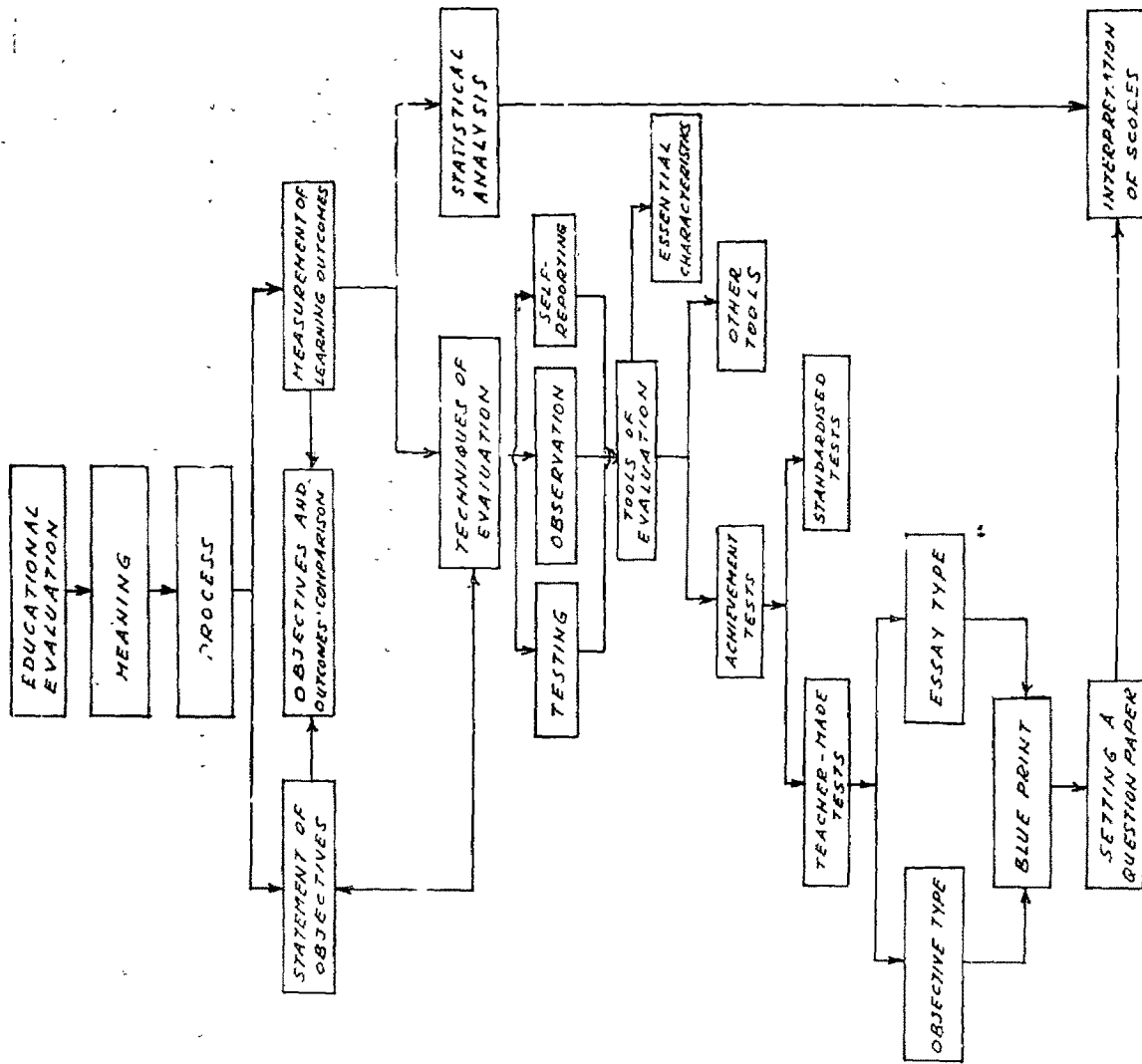
#### Content Outlines of the Course

##### "Educational Testing and Techniques of Evaluation"

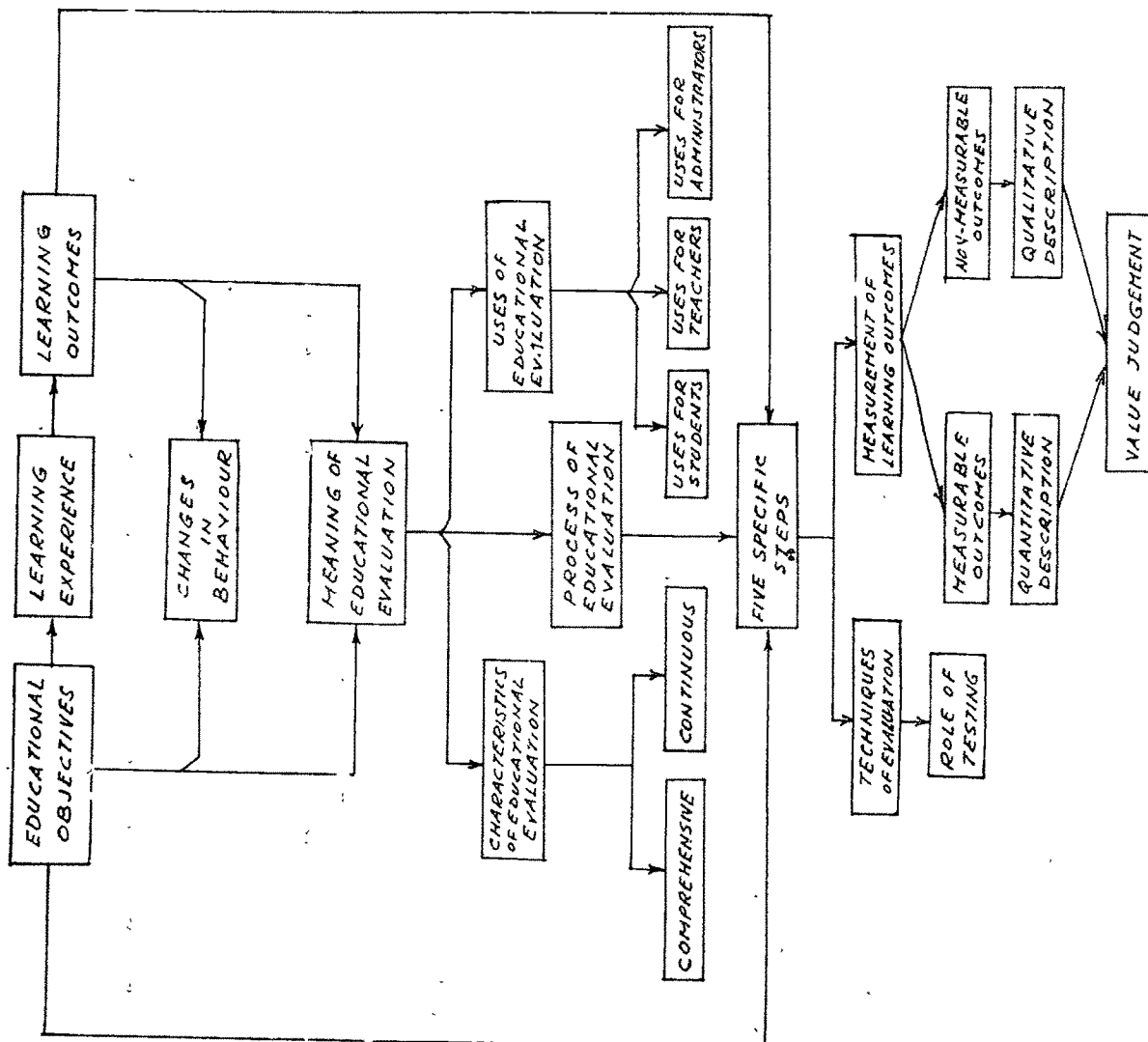
#### I. Educational Evaluation and Measurement - A

- (i) Educational objectives as specifications of desirable changes in knowledge, understanding, etc. of the students.
- (ii) Relationship between educational objectives, learning experiences and learning outcomes.

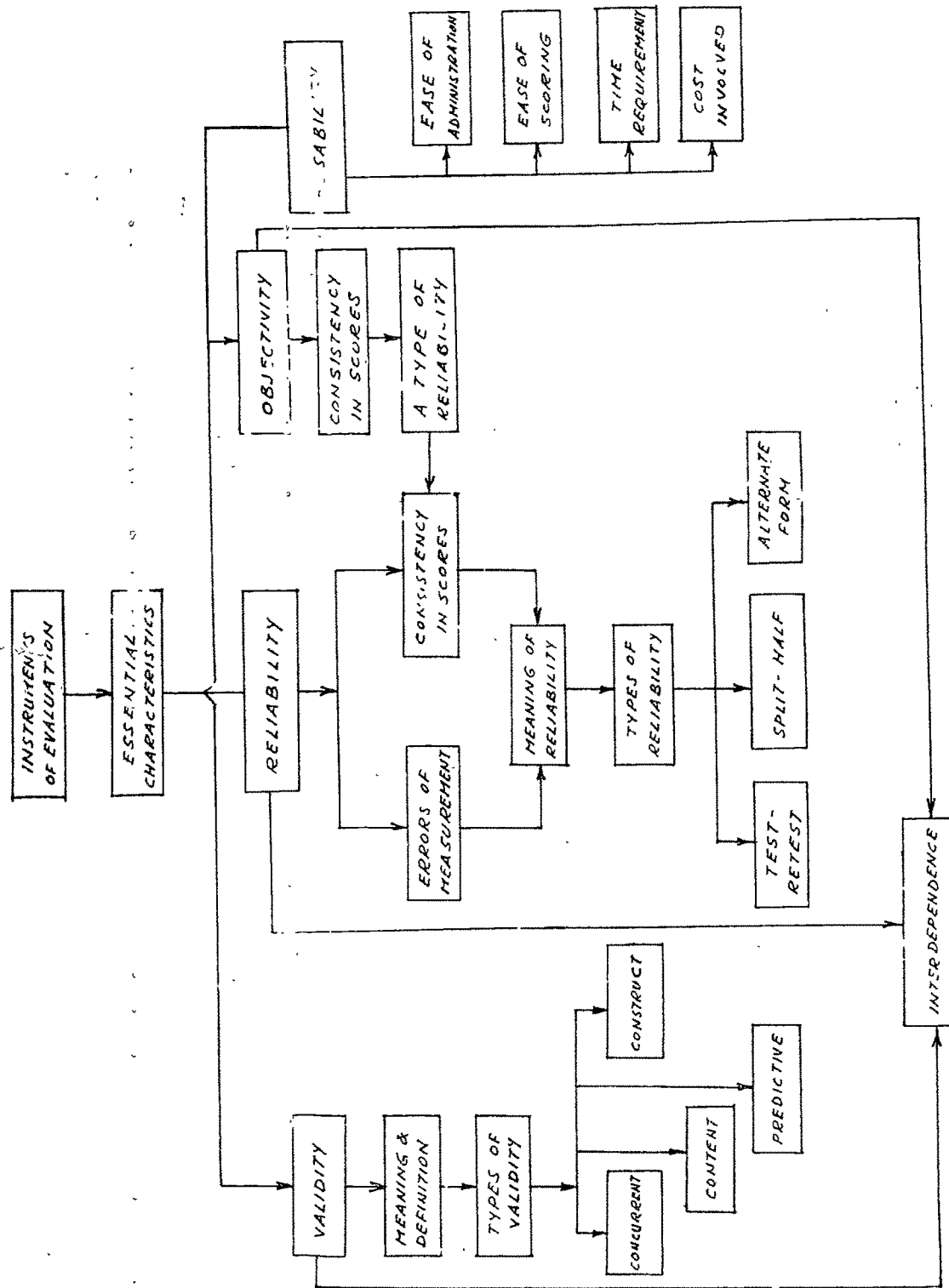
# **FLOW CHART - I** **AN OVERALL PICTURE OF THE COURSE-EDUCATIONAL TESTING & TECHNIQUES OF EVALUATION**



# **UNIT I & II: EDUCATIONAL EVALUATION & MEASUREMENT** **FLOW CHART - II**

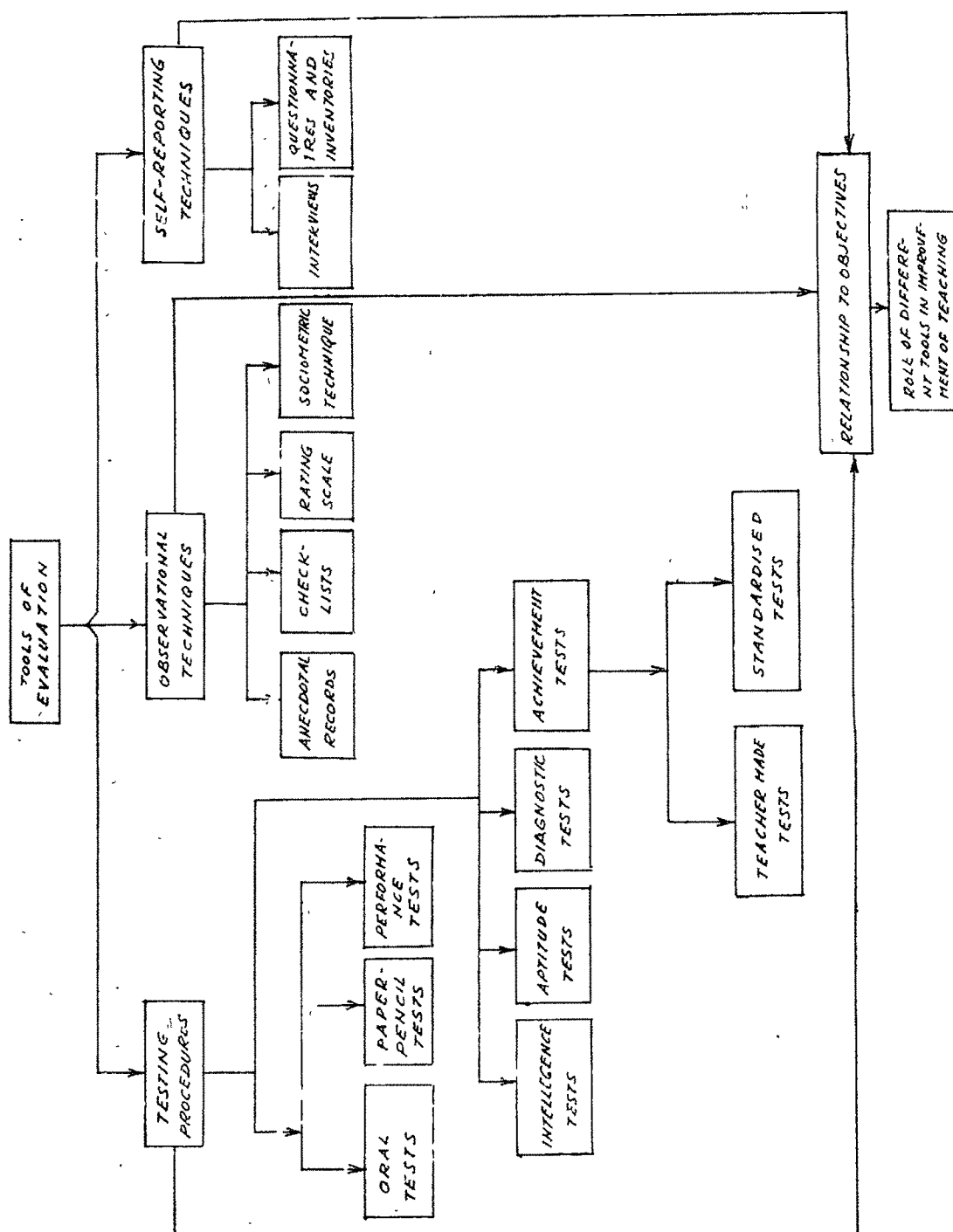


# UNIT III: ESSENTIAL CHARACTERISTICS OF A GOOD INSTRUMENT OF EVALUATION FLOW CHART - III

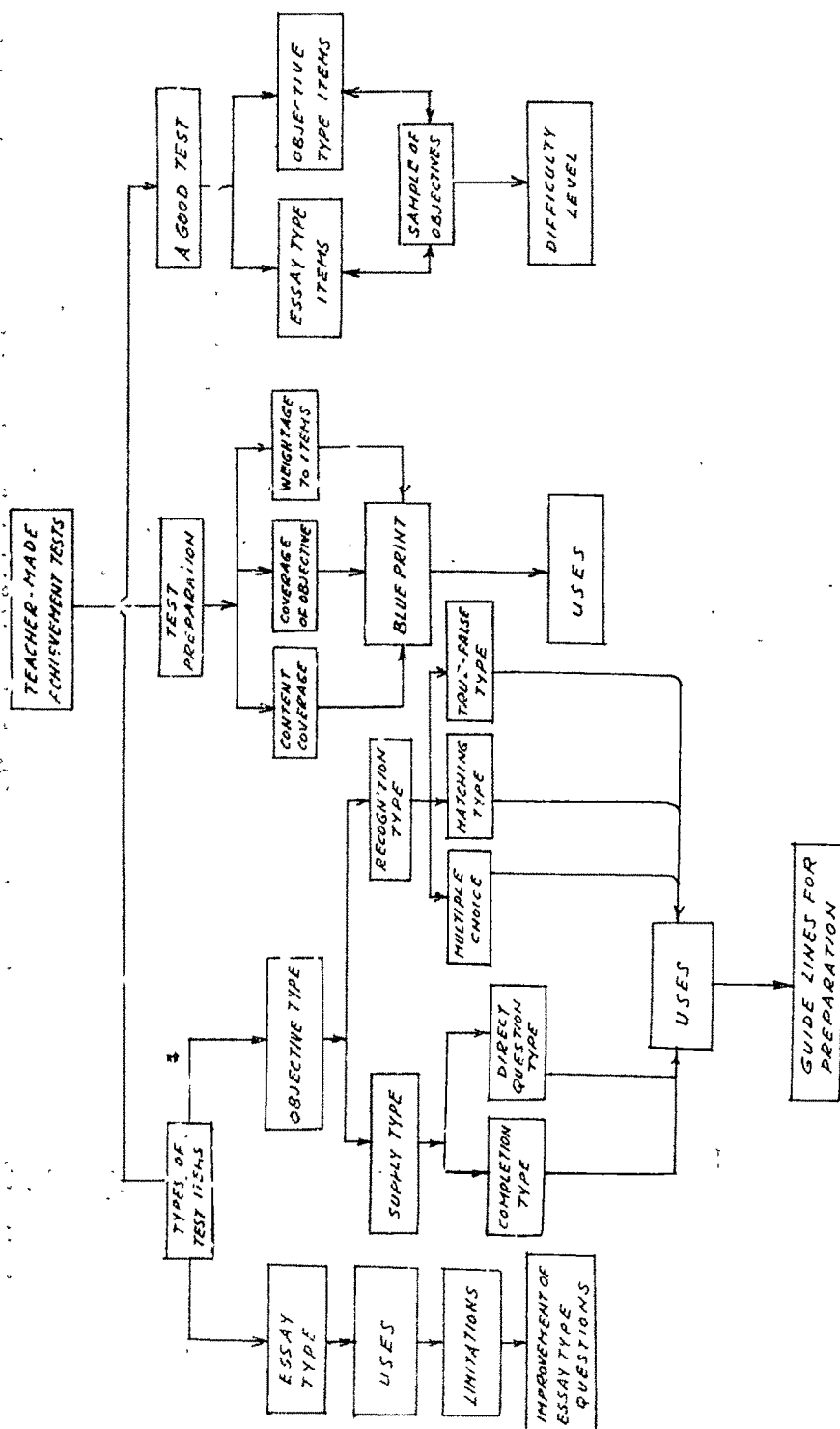




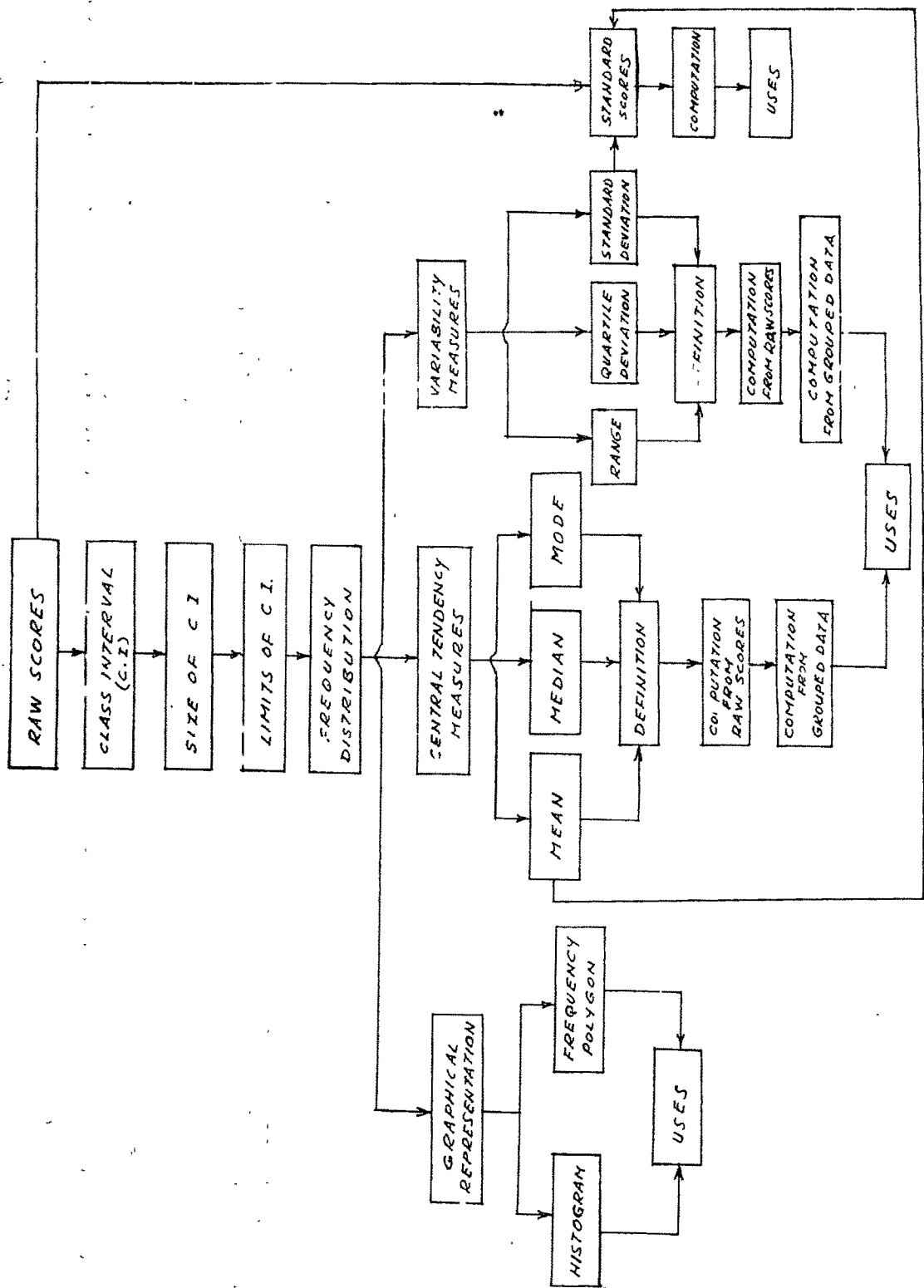
# **FLOW CHART - IV** **UNIT IV: TOOLS OF EVALUATION AND THEIR USES**



# FLOW CHART - V UNIT V: TEACHER MADE ACHIEVEMENT TESTS



# FLOW CHART - VI UNIT VI: ELEMENTARY STATISTICS IN EDUCATION



- (iii) Meaning of educational evaluation.
- (iv) Five specific steps involved in the process of educational evaluation.
- (v) Evaluation of the whole child - i.e. of all aspects of development of the child; a good evaluation programme should be comprehensive.
- (vi) Evaluation is a continuous process.
- (vii) Uses of evaluation for teachers, pupils and administrators.

## II. Educational Evaluation and Measurement - B

- (i) Learning outcomes as behavioural changes.
- (ii) Vagueness of objectives stated in terms of changes in knowledge, understandings, etc.; necessity of stating objectives in terms of post-instructional behaviours.
- (iii) Three major techniques of evaluation for determining learning outcomes - technique of testing, technique of observation and self-reporting technique.
- (iv) Test-just an instrument of evaluation.
- (v) Measurement in education.

(vi) Measurable and non-measurable learning outcomes.

(vii) Evaluation as

<ul style="list-style-type: none"> <li>Quantitative description of learning (measurable outcomes)</li> <li>+ value judgement</li> <li>and</li> <li>Qualitative description of learning (nonmeasurable outcomes)</li> <li>+ value judgement.</li> </ul>
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### III. Essential characteristics of good instruments of evaluation

1. Validity - different types (conceptual)
2. Reliability - different types (conceptual)
3. Objectivity.
4. Interdependence of validity, reliability and objectivity of an instrument of evaluation (in brief).
5. Usability and other characteristics.

### IV. Major evaluation tools and their uses

1. Testing procedures
  - (a) Oral testing and paper pencil tests.
  - (b) Achievement tests - standardised and teacher made tests.
  - (c) Performance tests.

- (d) Diagnostic tests.
- (e) Intelligence tests and aptitude tests.

2. Observational techniques

- (a) Anecdotal records
- (b) Checklist
- (c) Rating scale.
- (d) Sociometric technique

3. Self-reporting techniques

- (a) Interviews
- (b) Questionnaires and inventories.

Relating educational objectives and techniques  
of evaluation.

V. Teacher made achievement tests.

- Essay and objective type tests; improving essay type questions.
- Different types of objective type tests; their characteristic advantages and disadvantages.

Relating test items and specific behavioural  
objectives : preparation of blue print.

How to set a good question paper?

## VI. Elementary Statistics in Education.

1. Raw scores
2. Frequency distribution.
3. Graphical representation of grouped data.
4. Measures of Central Tendency.
5. Measures of Variability.
6. Fundamental idea of standard scores.

### Target Population and Entering Behaviour

The Programmed Text is specifically prepared for utilising it as self-instructional material in the course on 'Educational Testing and Techniques of Evaluation' for the B.Ed. students of the M.S. University of Baroda. As this university is a purely teaching university, instruction in B.Ed. is provided only at the Department of Education of the University. Generally, the strength of B.Ed. class ranges from 140 to 170. The M.S. University specifies the minimum qualification for admission to B.Ed. Course as that either the candidate should possess a second class bachelor's degree in Arts, Science, Commerce and Home Science, or he should hold a bachelor's degree alongwith teaching experience of 2 years or more in a recognised institution. The B.Ed. students, in general,

can be classified into three groups, viz., post-graduates who constitute about 15 percent of the total strength, first class and second class graduates constituting about 60 percent of the total strength, and graduates with teaching experience of 2 years or more forming the remaining 25 percent of it. Further selection of students for admission to the B.Ed. class is done on the basis of their performance on a test of aptitude for teaching, tests of English language reading and listening comprehension, and an oral examination. As English is the medium of instruction, it is also made sure before admission that the candidates have studied English language as a subject at least at the secondary level.

The Programmed Text does not require any specific entering behaviour in relation to the content or subject matter included in it. All that it presumes on the part of the student is basic ability to read and comprehend simple English and ability to carry out fundamental operations in Arithmetic. Entering behaviour related to language ability may be stated as follows :

- Students correctly read English passages of 5 to 6 lines and answer questions based on them.



It may be noted that the entering behaviour related to language ability is already ensured through the selection procedures adopted for admission to the course. Entering behaviours related to arithmetical ability may be spelt out as follows :

- Students correctly carryout the four fundamental operations with numbers involving decimals.
- Students calculate square and squareroot of a given number.

#### Terminal Behaviours

Considering the proficiency a B.Ed. student should acquire, through the course, for carrying out evaluation work in schools, and in consideration to the different content areas included in the course, terminal objectives were specified in behavioural terms, for the complete course. They were then organised suitably under different units of the course. The list of terminal behaviours for the six units of the course have been presented in the following.

Units I and II

1. Students will write the definition of 'Educational Evaluation in about 2-3 lines.
2. Students will mention in proper order the five specific steps involved in the process of educational evaluation.
3. Students will specify four uses of evaluation to teachers.
4. Students will specify two uses of evaluation to students.
5. Students will specify atleast one important use of evaluation to administrators.
6. Students will specify the two characteristics of educational evaluation as (1) it is comprehensive (2) it is a continuous process, in about 2-3 lines each.
7. Students will state the definition of the term 'educational objectives'.
8. Students will explain, in 2-3 lines, how evaluation is a continuous process.

9. Students will point out, in about 2-3 lines, the need for making evaluation comprehensive.
10. Students will specify learning outcomes as actual changes in behaviour.
11. Students will specify educational objectives as expected behavioural changes.
12. Students will point out the need to specify educational objectives in behavioural terms.
13. Students will state atleast two objectives in behavioural terms for any topic from school subjects.
14. Students will specify that answers written by pupils in a test represent the product of certain tasks performed by them.
15. Students will write the definition of 'observational technique of evaluation' in about 2-3 lines.
16. Given the definition, students will recognise that it refers to self-reporting technique.
17. Students will explain in 2-3 lines, the way in which educational objectives be stated for the purpose of evaluation in specific instructional situations.

18. Students will give reason as to why educational objectives may not be stated in terms of changes in knowledge, understanding, etc. for evaluation purposes.
19. Students will recognise the relationship between testing, measurement and evaluation.
20. Students will recognise that there are both measurable and non-measurable learning outcomes.
21. Given a list of statements of objectives, students will pick out those which have been stated in terms of observable behaviour.
22. Students will recognise whether a given statement of objective specify the expected level of performance.
23. Students will name the three techniques of evaluation used in schools.
24. When the description of a situation of evaluation is presented students will name the particular technique of evaluation employed.

### Unit III

25. Students will give the definitions of the terms validity, reliability and objectivity in about 2-3 lines each.

26. Students will name the four characteristics one should look for while choosing a particular instrument of evaluation.
27. Students will specify the relationship between the reliability of a test, marks obtained by a student on a test, and amount of learning represented by the marks obtained.
28. Students will give the definitions of the four types of validity, in about 3-4 lines each.
29. Students will point out the four practical aspects to be considered while selecting an instrument of evaluation.
30. Students will recognise the relationship between the three characteristics of an instrument, viz., validity, reliability and objectivity.
31. Students will recognise that both reliability and objectivity refer to the same aspect, namely, consistency of scores.
32. Students will explain, in about 2-3 lines the meaning of reliability in terms of errors of measurement.
33. Students will recognise that there cannot be an instrument which is perfectly valid, reliable and objective.

34. Students will recognise the dependency of validity on reliability and objectivity.
35. Given a situation describing the particular purpose for which an instrument of evaluation has to be selected, students will name the type of validity to be looked for in the instrument.
36. Students will define the three types of reliability, viz., split-half, test-retest, and equivalent form, in about 2-3 lines each.

#### Unit IV

37. Students will recognise that performance tests involve dealing with objects.
38. Students will state atleast two uses of oral tests for teachers, in about 2-3 lines each.
39. Students will point out the difference between verbal and non-verbal tests in about 2 lines.
40. Students will state, in about 2-3 lines, the purpose of using an achievement test.
41. Given the definition, students will recognise that it refers to diagnostic tests.

42. Given the uses of different types of tests, students will pick out the one that refers to aptitude tests.
43. Students will point out that observational techniques are, in general, less objective.
44. Students will point out that observational techniques, generally, provide only qualitative description of behaviour.
45. Students will recognise that particular type of tool, such as a rating scale, may be used under all the three techniques of evaluation.
46. Students will recognise the relationship between teacher-made tests and instruction provided in the schools.
47. Students will recognise that particular aspect to be evaluated as the basis for selecting a specific tool of evaluation.
48. Students will define sociometric technique as a method of determining social relationships among the members of a group.
49. Students will define, in about 2-3 lines, intelligence test in terms of its uses.

50. Given a list of tools of evaluation and a list of their characteristics, students will match each tool with the corresponding characteristic.
51. Given the description of an evaluation situation, students will name the specific tool of evaluation that should be used.
52. Students will specify the three characteristics of a standardised achievement test, in 2-3 lines each.
53. Students will give three reasons, in about 2 lines each, as to why results obtained on different teacher-made tests cannot be compared.
54. Students will explain, in about 8-10 lines, with two illustrations as to how tools of evaluation other than achievement tests can be used by the teacher for improving his teaching.

#### Unit V

55. Students will point out the need to formulate standard answers to essay type questions.
56. Students will specify the purpose of using essay type questions in an examination.



57. Students will recognise the relationship between choices in a question paper and its validity.
58. Students will point out, in 2-3 lines, how multiple choice items are superior to true-false items.
59. Students will compare completion type tests with other objective type tests regarding the scope for guessing.
60. Given a list of statements specifying characteristics of either essay type or objective type tests, students will identify those related to essay type tests and objective type tests, and mark them suitably.
61. Students will give two reasons, specifying each in about 2-3 lines, as to why a question paper should contain both objective type and essay type questions.
62. Students will write two uses, each in 2-3 lines, of a table of specifications (blue print) to the teacher in preparing a good question paper.

#### Unit VI

63. Students will name the three measures of central tendency.

64. Students will define the terms mean, median and mode in about 3-4 lines each.
65. When class intervals are presented, students will recognise whether they are specified in terms of actual limits.
66. Given a set of class intervals, students will find out the length of class interval.
67. Students will write, in 2-3 lines, the meaning of 'measures of central tendency'.
68. Students will name the three measures of variability.
69. Students will write, in 2-3 lines, the meaning of 'measures of variability'.
70. Students will define the term 'range' of a set of scores, in 2-3 lines.
71. Students will specify the percentage of scores considered in calculating the quartile deviation and the standard deviation of a set of scores.
72. Given a set of raw scores, students will find out the range.
73. Given a set of raw scores, students will calculate the mean, the median and the mode.

74. Students will name the two ways in which a frequency distribution can be graphically represented.
75. Given a set of 40 to 50 raw scores and the first class interval is specified, students will form the remaining class intervals and find out the frequency of each class interval.
76. Students will write, in 2-3 lines, the use of converting raw scores into standard scores.
77. Given the raw scores and other necessary data, students will calculate the standard scores in two subjects, and determine the subject in which the performance is better.

#### Criterion Tests

Suitable test items have been developed to cover all the terminal behaviours for the Programmed Text. These test items are set into six criterion tests which correspond to the six units of the Programmed Text. These criterion tests have been given in Appendix 'A'. However, a brief description of the item types included in these tests is presented here. About 90 percent of the items in each test are of objective type. Even the essay type

items require the students to write only short answers. Further, for such questions, the length of the required answer and the number of points to be included in the answer are clearly specified in order to make them as objectively scorable as possible.

Example

1. Give three reasons as to why results obtained on different teacher-made tests for the same subject cannot be compared. (Specify each reason in 2-3 lines only).

The objective type questions include a wide range of item types in order to cover the different objectives specified. These item types are listed below.

- A. Multiple choice items
- B. Completion items
- C. True-False items
- D. Matching items
- E. Recognition items

Example

I. In the following are given a list of objectives, some of which are stated in behavioural terms while others are not. Read each statement carefully and encircle the serial number of the objectives which have been stated in behavioural terms.

1. Student appreciates the music.
2. Student draws the diagram of the electric circuit without any error.
3. Student knows the meaning of the term 'velocity'.
4. Student states in writing the definition of the term 'density'.

F. Direct questions requiring answers in the form of 'Yes' or 'No'.

Example :

1. Does the validity of a test guarantee its reliability?  
(Write only 'Yes' or 'No').

G. Interpretive exercise

These items require the student to interpret a situation presented and express his answer in a word or two.

Examples

1. You find that a particular aspect of behaviour of a student cannot be evaluated by observing the student at a particular time. And, it has to be evaluated through certain incidents as they take place during the course of several days. What tool of evaluation will you use in this situation?  
(Write only the name of the tool)
  
2. You have to select students for a new branch of study which they have not studied earlier. For this you want to test the students to make sure that the selected students would succeed well in their future performance. What type of validity is essential in such a test? (Specify the type of validity)

In addition to the six criterion tests, a comprehensive test covering all the six units of the course is prepared. This test also includes all the item types described above and covers a representative sample of the objectives set for the complete course.

**Format and Style**

Several types of formats have been adopted in presenting the frames and correct answers in a programmed

text. In the present case, frames have been presented in between horizontal lines; and, the correct answer to the question asked in a frame is given immediately after the frame. Students are provided with a card for covering the correct answer and also a separate response sheet. In the response sheet, frame numbers are specified and the necessary space is provided for writing the answers. Students read each frame covering the correct answer with the card provided, write their own answers in the response sheet and compare the answer with the correct answer provided in the programmed text.

Suitability of a presentation format has to be considered in view of the style of programming adopted. The present Programmed Text has been written in the linear style, although it is not a linear programme of the traditional Skinnerian type such as the one written by Holland and Skinner (1961). Any how, the programme style is basically linear only as all the students have to proceed through the same sequence of frames. The style of programming adopted in writing the present Programmed Text bears certain similarities with the one followed by Popham and Baker (1970).

A question may arise as to why a linear style has been preferred for branching style of programming. However, linear style has been adopted in the present case because of certain specific reasons. An advantage that is acclaimed in favour of branching style is that it is more adaptive in its structure for individual differences among the students regarding content mastery. Obviously, a programme written in the linear style does not provide for the above in its structure. However, it may be noted that in the present case, as has already been pointed out, practically no entering behaviour is presumed on the part of the students for using the 'Programmed Text'. This rules out, therefore, the possibility of any fundamental difference among the students in respect of the content prerequisites for using the Programmed Text. Secondly, it is, generally, assumed that branching style accommodates individual differences in learning ability of students by including remedial frames. But, it should be noted that when a uniform entering behaviour in respect of content mastery is assumed, the purpose of remedial frames boils down to providing explanations as to why a particular answer chosen by a student is incorrect, and leading him to the correct path. This remedial purpose can, perhaps, be achieved in a more economical way by making some departures in the set patterns of frame



construction and organisation in the linear style. In the present Programmed Text, this has been accomplished by interpolating suitable explanatory material in between the frames or as part of succeeding frames. Illustration of how this has been accomplished is presented in a forthcoming section entitled 'extra-frame material'.

### Frame Components

Each frame in the Programmed Text, including the correct answer, may be taken to consist of four main components. These components can be clearly made out in the following example of a typical frame in the Programmed Text.

#### Example

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86.\* Thus, a test may be considered as reliable if the scores obtained are consistent over two equivalent forms of the test.

That is, here, reliability is specified in terms of \_\_\_\_\_cy of scores over two equivalent forms of the test.

(Write the missing word in the above sentence in the answer sheet)

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The correct answer is : consistency

\*This is the frame No. as it appears in the Programmed Text. This point may be noted regarding examples of frames appearing in the forthcoming pages also.

The first component consists of one or more sentences presenting some information. This is followed by a question which forms the second component. The third component consists of instruction given to the students (put in parantheses) as to the way they should write their answer. The correct answer given immediately after each frame constitutes the fourth component. The third component, viz., instruction to students, which is not generally found in the programmes, has been included in the present case for certain specific reasons. First, the frames in the Programmed Text include a variety of question types requiring different types of answers from the students; and, it is, therefore, necessary to instruct the students suitably within each frame as uniform instructions in the beginning of the Text may not suffice. Secondly, after a student has read a frame and thought over the answer, if specific instructions are not provided therein, he would be required to think of the way in which he has to write his answer. This would obviously mean sidetracking him from his thinking about the learning material. On the other hand, when the student is clearly instructed in this regard in operational terms, it would facilitate the organisation of his answer without additional strain on him. Thirdly, since the correct answers would have been given in

a specific way, it would be easier for the student to compare his answer with it if he is directed to write his answer also in the same specific way.

### Frame Structure

The term 'frame structure' has been used to mean the specific types of questions included in different frames of the programme. Programmes written in the traditional linear form as the one by Holland and Skinner (1961) adopt completion type question as the uniform type of frame structure. The assumption made for using this frame structure uniformly is that students learn better if they have to construct their own answers instead of simply choosing the correct answer from a given set of answers. Further these questions would be such that students are required to write restricted responses of only one or two words; and, accordingly direct questions requiring construct responses but longer ones are not included. On the contrary, programmes in branching style, almost as a rule, use only those types of frame structures which require students only to select the correct answer from a given set and not to construct on their own. However, in the present Programmed Text, the frame structure does not fall in line with the traditions of

any one style of programming. Different types of questions are used, although completion type questions would be more frequently found than the other types. Examples of different type of frame structures appearing in the Programmed Text are presented in the following :

Example 1 : Long answer type

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103. Obviously, our experience would suggest that we cannot expect the different teachers to give same marks for an answer to such a question. That is, scoring of answers to such questions may not be objective.

But, why do different teachers assign different marks to the same answer?

(Write your answer in one sentence in the answer sheet)

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You are right if your answer is similar in meaning to the following :

Because, teachers differ in their opinion about the correctness or suitability of the answer given by the student.

Example 2 : 'Yes' or 'No' or Alternate answer type

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109. Now, for measuring the learning outcome teacher has to assign specific numbers which should indicate the actual amount of learning that has taken place.



Can he assign specific numbers to the learning which he has noted through observation of the performance?

(Write 'Yes' or 'No' in the answer sheet)

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The correct answer is : No

Example 3 : Multiple Choice type

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44. Suppose, you have taught two pupils, 'X' and 'Y', with the above objective in view. After teaching you ask them to write the summary. You find that both 'X' and 'Y' have written the summary. But, 'X' has written it in 5-6 lines bringing out all the five ideas in the poem while 'Y' has written it in about 15 lines although he has not mentioned all the ideas. Who has achieved the objective 'X' or 'Y'?

Possible answers to this question are :

- (A) 'X'
- (B) 'Y'
- (C) We cannot decide

(Indicate your answer by writing (A), (B) or (C) in the answer sheet)

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The correct answer is : (C)

Example 4 : Completion type

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9. We may also adopt a different procedure of obtaining answers. Instead of asking the students to supply the answers we may ourselves give a few possible answers and require the student only to \_\_\_\_\_ the correct one.

(Write the missing word in the above sentence in the answer sheet)

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The correct answer is : recognise

Long answer type questions have been included in such situations where the students need greater freedom to express their answers which would conform to the correct answer only in the theme and not in the structure. For instance, in a situation of the type appearing in Example 1, given above, a question requiring restricted response may not be appropriate. Similarly, in Example 3, presented above, it can be observed that multiple choice question is more suitable than any other type. Thus, the frame structure in each situation has been decided on the basis of the suitability of a particular type of question; no set pattern or rule has been followed in this regard.

### Extra-frame material

One would frequently come across, in the Programmed Text, some material presented in between two frames. This material is, here, referred to as 'extra-frame material'. Such material has been included with certain specific purposes. The first purpose is to provide explanation, wherever necessary, as to the correctness or otherwise given by the student to a specific frame. Secondly such material has been provided in certain places where it would help the learner consolidate the points that have been learnt in the previous frames. Thirdly, extra-frame material are used to bring in continuity in the sequence of frames and to relate newly learnt material with behaviour already acquired. In several situations, the extra-frame material also help establish rapport with the student and maintain his motivation.

### Response Mode

Although, frame structure has not been kept uniform, the response mode is uniformly 'overt' in nature. For each frame, whether the question in it is completion type or multiple choice type or any other, the student

has to indicate in writing his answer on the response sheet. Then, he compares his answer with the correct answer provided in the programme. He proceeds to the next frame if his answer is correct; but, if his answer is incorrect he reads the previous frame or frames again, understands the point, and then proceeds further.

#### Frame Size

A major principle envisaged in linear programming is to make the frames as small as possible. In writing frames, in the present Programmed Text, this principle of small steps has not been strictly followed. One would frequently find several large sized frames in the Text. However, a closer scrutiny of the frames would reveal that the difference in size is only in respect of the space occupied; but, each frame strictly presents only one single point for learning. This aspect can be clearly observed in the following three successive frames in the Programmed Text, which are apparently of different size but each of them convey only one point for learning.

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117. In such cases as explained above, we may record the incident or anecdote when it happens. From these recordings we may finally, evaluate the particular aspect.



Tools of this type where information is provided  
in terms of records of anecdotes are called

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(Write the missing words in the above sentence)

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The correct answer is : anecdotal records

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118. Suppose, you find that a pupil in the school always remains separate from others and tries to avoid taking part in any group activities. In other words, you find the pupil socially not well adjusted. In order to make him better adjusted you have organised certain programmes through which the student may try to change his behaviour. Suppose you want to evaluate the changes in behaviour of this student through observation.

Can you determine the changes in the pupil's behaviour, particularly regarding his loneliness, by observing just once only?

(Write 'Yes' or 'No' in the answer sheet)

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The correct answer is : No

Obviously, we cannot say anything by observing him just once. Because, changes in such aspects do not take place all of a sudden.

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119. As we know, at the school the pupil gets several situations where he may either mix with others or stay alone.

Therefore, in order to determine the change in the pupil's behaviour we may record the several incidents or anecdotes which describe whether the student remained alone or he made any attempt to mix with others.

This record may be considered as an \_\_\_\_\_  
\_\_\_\_\_°

(Write the missing words in the above sentence)

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The correct answer is : anecdotal record

### Prompts

Prompting is a basic technique employed in frame writing with a view to helping the student arrive at the correct answer for the question posed in the frame. In the present Programmed Text all the different types of prompts such as thematic prompts, formal prompts and visual prompts have been used considering their suitability in the particular learning situation. Following are three frames from the Programmed Text, which include thematic, formal and visual prompts, respectively.

#### Example 1 : Thematic Prompt

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76      Again, in the measurement of length, volume, weight, etc., we know that the amounts of changes

are specified by assigning specific numbers such as 2 ft., 20 litre, 3 kg., etc.

Similarly, learning outcomes are measured by assigning specific \_\_\_\_\_ which indicate \_\_\_\_\_ of \_\_\_\_\_ in the students' behaviour.

(Write the missing words in the above sentence in the answer sheet)

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The correct answer is : numbers; amount or quantity of changes

Example 2 : Formal Prompt

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63. Another method adopted under the supply type is that students are presented with a statement in which one or two words would be missing. And they are to complete the statement by supplying the missing word or words.

Tests consisting of this type of items are known as \_\_\_\_\_ tion tests.

(Write the missing word in the above sentence in the answer sheet)

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The correct answer is : completion

Example 3 : Visual Prompt

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91. As in this case, reliability is checked by splitting the test into two and considering the scores on each half. It is referred to as \_\_\_\_\_ -  
\_\_\_\_\_ reliability.

(Write the missing word in the above sentence in the answer sheet)

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The correct answer is : split-half

In certain frames, if found necessary, a combination of thematic and visual prompts or a combination of formal and visual prompts have been used. However, the basic principle of fading of prompts as the student makes progress towards the criterion frame has been strictly followed.

### Frame Sequence

It is stated almost as a rule that frames in a programme should be arranged in a logical sequence. However, different approaches of frame sequencing have been evolved, each approach being quite logical as well. The two major approaches of frame sequencing adopted in

linear programmes are 'ruleg' and 'egrule'. In the ruleg system it is considered advantageous to present the rule first and then give or get the student give examples. On the other hand, in the egrule system it is preferred to present a series of examples first and then to get the student derive the rule for himself.

In the present Programmed Text, generally, the egrule system has been adopted. It has been done so because the concepts in the material being presented are completely unfamiliar to the target population; and it is assumed that in such situations the egrule system would work better than the ruleg system. Furthermore, the research evidences also strongly suggest that the egrule approach undoubtedly enhances the learning, retention and transferability of material (Davies, 1972). However, no orthodoxy is kept in the adoption of the particular frame sequencing system. In certain instances, ruleg system has also been adopted considering its suitability; but, these are very few in number.

### Types of Frames

Frames are the basic units of any programmed learning material. Since by reading the programme a

student's behaviour gets transformed into terminal behaviour status from entering behaviour status, frames may be called the basic units of the process of behaviour change. In a programme, the frames would, therefore, be of different nature corresponding to the sequential position they occupy in the behavioural change process. Frames can be, broadly, classified into teaching frames, practice frames and review frames considering the purposes they serve in the learning process. Following are two teaching frames appearing in the present Programmed Text.

#### Example 1

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70. That is, we may say that different procedures may have been adopted in the interpretation of scores for different groups of students. For instance, in one group a score of 60 may be considered as good, while in another group it may be in the average level.

Thus, grades on different teacher-made tests cannot be compared as they may not adopt a standard \_\_\_\_\_ for \_\_\_\_\_ of scores.

(Write the missing words in the above sentence in the answer sheet)

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The correct answer is : procedure for interpretation

Example 2


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90. This implies that the total scores of the students on each half should be consistent.

Thus, here, reliability of the test is specified in terms of the \_\_\_\_\_ in scores over two halves of the same test.

(Write the missing word in the above sentence in the answer sheet)

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The correct answer is : consistency

These frames are essentially carriers of new learning material and they, generally, include suitable prompts. The practice frames serve the purpose of strengthening the associations already established. Such frames are essential to make the learning durable. In the present Programmed Text such frames have been profusely used. Following are two examples of practice frames.

Example 1


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18. Or, in other words, we may say that educational evaluation is the process of determining the \_\_\_\_\_ to which \_\_\_\_\_ have been achieved.

(Write the missing words in the above sentence in the answer sheet) .

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The correct answer is : extent; educational objectives

### Example 2

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137. We also noted that both characteristics, reliability and objectivity, relate to the same aspect of measurement, namely, \_\_\_\_\_ in scoring. And, that is why objectivity is also referred to as inter-scorer \_\_\_\_\_.

(Write the missing words in the above sentence in the answer sheet)

---

The correct answer is : consistency; reliability

Review frames are included to serve the purpose of consolidation of the associations established. They also help the student see the relationship between the various points they have already learnt in the preceding frames. Two examples of review frames appearing in the Programmed Text are presented below :

### Example 1

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61. Thus, objective tests can be broadly classified into two types. These two types are :



1. \_\_\_\_\_ type tests.
2. \_\_\_\_\_ type tests.

(Write the missing words in the above sentence in the answer sheet)

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The correct answer is : 1. supply; 2. selection

### Example 2

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72. Thus, in order to study the general achievement level in various school subjects for large groups of students, such as all those belonging to a particular age group or class, we need a test with the following qualities.

1. It should be prepared with reference to a standard set of \_\_\_\_\_.
2. It should adopt standard procedure of \_\_\_\_\_.
3. It should adopt standard procedures for \_\_\_\_\_ of scores.

Tests of this type are generally known as \_\_\_\_\_ tests of achievement.

(Write the missing words in the above sentences in the answer sheet)

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The correct answer is : objectives; testing;  
interpretation; standardised

## Evaluation and Revision

Frames for the present Programmed Text were written following the specifications described in the preceding sections regarding the nature of frames, their sequence and presentation. The first draft of the programme written with these specifications was edited by an expert (the guiding teacher) from the point of view of content as well as programming principles. Alongwith the programme the criterion test for the different units were also scrutinised for their content validity by the expert keeping in view the terminal behaviours specified for the respective programmed units. Whenever, a need was felt, the frames were also discussed with other knowledgeable people in the field of educational evaluation. As a result of these discussions and editing made by the expert several modifications were made in the structure of the frames as well as their presentation sequence. Another aspect of the frames that was checked during editing was regarding the language of the frames. The language was made as simple as possible so that differences in language ability would not interfere in learning process.

Tryout Study : The edited programme was tried out on a group of ten B.Ed. students of the M.S. University of Baroda. These students were chosen randomly

from all the students admitted to the B.Ed. class during that year. It was made clear to these students beforehand that for the particular course, viz., Educational Testing and Techniques of Evaluation, they should read only the programmed learning material given to them and not any other text. Before giving the Programmed Text, the students were oriented about the nature of the learning material and the procedure of using it. Students were to study the material during the regular classhours allotted for the particular course. The Programmed Text was presented to the students unitwise; material for each unit was given away to the students after they completed the particular unit. At the end of each unit the corresponding criterion test was administered. Performance on these criterion tests constituted the periodical assessment for the students. The six units of the Programmed Text were covered in one full semester.

Difficulties encountered by the students regarding the language, frame sequence and the like were noted. Errors committed by the students on the programme frames were analysed. Error analysis was also done for each item of the criterion tests. The average scores obtained by the students on different criterion tests have been presented in Table 2.1

Table 2.1  
Mean Percent Scores on Criterion Tests

Unit No.	I	II	III	IV	V	VI
Mean percent score	68.0	71.1	69.9	73.0	62.2	59.6

Based on the analysis of errors on programme frames and on criterion test items, and also considering the difficulties reported by the students, the programme frames were revised. Revision was effected regarding the language, the frame sequence, structure of certain frames and other related aspects. Wherever found necessary frames were split into smaller ones and also additional frames were introduced. The Programmed Text after the revision was made ready for being used in the next phase of evaluation, namely, the validation experiment which would be described in the following chapter.

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