

COMPULSORY COURSE 03 (CC-03)
TEACHER FUNCTIONS

BLOCK 04
EVALUATION AND DATA PROCESSING

B.Ed. CC-03 : TEACHER FUNCTIONS

Block

4

EVALUATION AND DATA PROCESSING

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BLOCK - 4 EVALUATION AND DATA PROCESSING

INTRODUCTION

Evaluation is a word that is familiar to every teacher and it is considered as an essential component of educative process. However the word is used in too many different contexts and its meaning is vague. Evaluation may be said to be the process by which judgements of the educational status or achievements (If students are formed. The main emphasis in classroom evaluation is on the extent to which learning outcomes are achieved. How much more accurately and quickly can a p does multiplication problem? How much greater is his understanding of the number system? Has he made any improvement in working with other pupils in small groups without constant supervision? Answers to such questions can be given through, evaluation.

This Block helps you to understand the process of Evaluation and processing educational data of students. This Block consists of six Units. Unit 19 explains the meaning and concept of evaluation, the characteristics of evaluation and types of evaluation. In Unit 20 different techniques of evaluation are explained. Characters tics of good tool and types of tests are also explained.

Unit 21 Explains tools of evaluation. It includes classification of test items, type of items, meaning, characteristics of well balanced question paper and steps in construction of question paper. In Unit 22 the techniques of Rating Sc1aes, Check lists and Anecdotal records are described. Unit 23 deals with graphical representation of test data. It explains about the preparing of Frequency Distribution Table, importance of graphical representation of data, construction of polygon, histogram and pi diagram.

Unit 24 contains information about processing of test data. You will learn about processing of test data of students. You learn about measures of Central Tendency, Measures of variability and Co-efficient and Correlation.

UNIT 19 □ EVALUATION–AN INTRODUCTION

Structure

- 19.1 Introduction**
- 19.2 Objectives**
- 19.3 Evaluation**
 - 19.3.1 Concept, Meaning**
 - 19.3.2 General Principles**
 - 19.3.3 Characteristics of Good Evaluation Programme**
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- 19.5 Let Us Sum Up**
- 19.6 Answers to ‘Check Your Progress’**
- 19.7 Unit-End Exercises**
- 19.8 References**

19.1 Introduction

Evaluation is an integral part of education. At any point of time we are expressing our dissatisfaction with the system of education and say it is evaluation which has failed to assess the achievement of the pupils very accurately. There is an urgent need to establish faith in the evaluation system among the learners. In order to improve the process of education, continuous evaluation of sub systems is necessary. Evaluation as a sub system in the process of education needs to be improved continuously to assess the achievement of pupils in different school subjects and other personality traits. Due importance must be given to understand the process of evaluation and its application. This would help the

learners know their strengths and weaknesses in learning, and the abilities of the teacher in the curriculum construction.

Like education, teaching and learning, evaluation is also a highly generic term. It is a broad concept covering a variety of activities and processes. Evaluation involves judgement - value judgement based on sound criteria. As a process evaluation is not only a comprehensive one but also continuous one. Collection of relevant evidence is important. For this it uses a variety of appropriate tools focus on persons - students and teachers, processes and products, institutions and programmes, on the total system or component thereof. In this Unit, you will be learning about the concept and meaning of evaluation, general principles of evaluation and characteristics of evaluation programme. In the later part of the Unit you also learn about the types of evaluation. Evaluation is a systematic process. It is based on sound principles. These principles provide direction to the evaluation process and serve as criteria for appraising the effective of evaluation. Now let us learn about the principles of evaluation.

19.2 Objectives

After learning the Unit you will be able to:

- define Educational Evaluation
- explain the means of Evaluation
- state the principles of Evaluation
- state the characteristics of good Evaluation tools
- explain different types of evaluation
- differentiate Formative and Summative Evaluation
- differentiate Process and Product Evaluation
- differentiate achievement and diagnostic evaluation
- explain placement evaluation

19.3 Evaluation

19.3.1 Concept and Meaning

Educational evaluation is the process of ascertaining the extent to which the pre-determined objectives of education have been achieved by the learners. Evaluation makes use of qualitative result for its qualitative judgment.

Evaluation = Measurement + Value judgement

Evaluation is not synonymous with measurement. But it is depending On measurement and the pre-determined objectives (standard). Evaluation refers to the act or process of determining the value of something. In Education it means estimating the probable worth of the activities involved in the teaching learning process, judging the worth of methods or devices or techniques of teaching used. Evaluation helps the classroom teacher to estimate the various outcomes of the activities organised for pupil's learning.

Evaluation includes measurement which is the process of quantifying the pupils' performance of achievement. Evaluation is more than measurement. It includes qualitative assessment/discrimination also, although evaluation includes measurement it is not synonymous with it. From the instructional point of view, evaluation may be defined as "a systematic process of determining the extent to which, instructional objectives are achieved by pupils".

Here you find two important aspects.

- a. Evaluation implies a systematic & continuous process.
- b. Evaluation always assumes that educational objectives have been previously identified and properly formulated.

Without previously determined objectives we cannot judge the exact of educational progress. Evaluation includes both qualitative and quantitative description of pupils' behaviour and value judgement concerning the desirability of that behaviour.

According to James M. Boad field "Evaluation is the assignment of symbols to phenomena in order to characterise the worth/value of a phenomenon with some standards. In education, it is a study designed to determine the effectiveness of instruction in respect of an individual child, a group of children or school programme".

19.3.2 General Principles

- Evaluation should be specific to the purpose. It is both formal and Non-formal.
- Evaluation is both objective and subjective.
- It is both a process and a product.
- It is both formative and summative.
- It is both qualitative and quantitative.
- It depends upon tools and techniques.
- It is a comprehensive and a continuous process.

1. The purpose of evaluation should be carefully defined. Hence the instructional objective to be achieved should be clearly determined and defined. The evaluator should be aware of these objectives. Defining the objectives help us to decide what is to be evaluated. This principle provides a guide to plan the evaluation programme.
2. Appropriate evaluation tools / techniques should be selected so that, evaluations is done properly. They should be in accordance with the aims and objectives of evaluation and suitable to the students to be evaluated. Care should be taken in selecting appropriate tools and techniques. A wide variety of tools and techniques should be selected.
3. Evaluation should be as comprehensive as possible. Several aspects of behaviours have to be assessed by using a variety of evaluation techniques. To get a complete picture of pupils' achievements, there is a need to combine the results using a variety of tools and techniques of evaluation.
4. Proper evaluation techniques require an awareness of their limitations as well as their strengths. Some of the evaluation techniques are fairly good measuring instruments, while a few tools are crude. An evaluator should be aware of possible errors in evaluation and should have mastery in using them, so that the results are free of errors.
5. Evaluation must be both qualitative and quantitative. Qualitative procedure helps us to describe the aspects valued in qualitative terms. For example social, emotional and moral behaviour are better evaluated qualitatively. Quantitative evaluation helps to assess achievement or characteristics in terms of amount or level. Abilities and achievements are better evaluated quantitatively.
6. Evaluation is a means to an end, not an end in itself. The use of evaluation techniques imply that definite useful purpose will be served by them and that the teachers are clearly aware of the purpose. Proper decisions must be taken about the use of evaluation results before implementation of evaluation programme. No evaluation procedure should be used unless contributes to the improvement of instruction and guidance of students.
7. Persons concerned with the task of evaluation must have a thorough knowledge of evaluation procedures. They should be well-versed in administering tests, scoring and interpretation of results.
8. Evaluation should be as objective as possible. Many errors and limitations in evaluation occur due to personal bias, wrong attitudes, prejudices and negligence of evaluators. These factors reduce the objectivity of assessment. Care should be taken to reduce such errors in evaluation.

9. Evaluation results must be used appropriately and effectively. There should be transparency in the evaluation procedures. Feedback should be provided to teachers, students, administrators and parents.
10. Evaluation should be continuous. It is a common practice to evaluate students at the end of a course or term. This is also necessary to help students to go further. But educationists emphasise continuous evaluation of students. It helps teachers and students continuously, periodic tests and casual observations help in continuous evaluation.

19.3.3 Characteristics of a Good Evaluation Programme

- a) **Validity:** If the evaluation tools test what it might to test then that tool is said to be valid. For example, the tool or an instrument used to know your height should show your height. If it shows anything other than the height, then the tool is invalid
- b) **Reliability:** If the evaluation tool reveals consistency while measuring at different intervals then the tool is said to be reliable.
Note: A reliable tool may not be valid but the valid tool is reliable. Validity implies reliability but the reverse is not true.
- c) **Objectivity:** If the tool gives very accurate results what it supposed to give then that tool is said to be objective.
- d) **Discrimination:** One of the characteristics of a good evaluation tool is discrimination i.e. it should be able to separate the good from the bad or it should be able to divide the big group into small sub-groups of similar abilities.
- e) **Practicability:** The evaluation tool must be simple and easy to use on a large scale and it should be affordable by majority.

(Acronym to recall – VROCDP: V- Validity, R – Reliability, O – Objectivity, D – Discrimination, P – Practicability)

“Check Your Progress” -1

1. Define Evaluation

2. List the principles of evaluation

3. What are the characteristics of good evaluation tool?

19.4 Types of Evaluation

One of the distinctive features of evaluation process is the use of large variety of procedures. Hence there are many types of evaluation depending on the purpose and procedure followed. In this subsection you will study them. They are:

- a. Formation Evaluation
- b. Summation Evaluation
- c. Process Evaluation
- d. Product Evaluation
- e. Achievement Evaluation
- f. Diagnostic Evaluation and
- g. Placement Evaluation

19.4.1 Formative Evaluation:

If we evaluate, when a thing is in the process of making then that evaluation is called formative evaluation. In the educational Evaluation if the teacher evaluates the day to day performance of the learners then that evaluation is called formative evaluation. It is assessing at each stage of development or in simple words it is periodical examination in the process of development. For example, while constructing the house we evaluate the quality of work at different stages before going ahead with the work (It is to check and ascertain the quality and continue the work)

19.4.2 Summative Evaluation

Summative Evaluation describes judgments about the merits of an already completed programme, procedure or product. It is giving grades or marks at the end of the course for the purpose of promotion. It is not coming to conclusion by mere observation or one instance. Take into account good number of observations before arriving at conclusion by this chance factor is eliminated. It is a whole approach to evaluate an object.

Summative evaluation is more useful to maintain regularity and discipline among the learners and teachers. It demands regular study and thorough attention throughout the year. The learner has to keep in mind that each day is an examination day. Because “There is no teaching without testing”

9.4.3 Process Evaluation

Education is both a process and a product; so evaluation is also a process and a product.

Process evaluation: It is evaluating when a thing is in the process of making or it is giving weightage for different stages of an answer. For example, in Mathematics the examiner is not giving full marks just by looking-at the answer. He looks at different steps and how the student has arrived at the answer this is process evaluation.

Another Example: In science practical-examination the student may not get the exact answer at the end of the experiment. But the examiners observe the performance at different stages of experiment and give marks accordingly. Even though the answer is not correct the student is awarded marks for the process.

19.4.4 Product Evaluation

It is evaluating the desired outcome or result at the end of the process or programme. After the completion of any work if the work is evaluated as a whole then that evaluation is called product evaluation:

Illustration 1: In Mathematics if the teacher evaluates only by looking at the expected answer then that evaluation is product evaluation.

Illustration 2: In any craft work, if the finished product is evaluated with certain criteria then that evaluation is called product evaluation.

Illustration 3: A newly constructed house is evaluated with certain principles of construction then that evaluation is called product evaluation.

Example 4: In evaluation the end result or the performance of the pupils in the examination is evaluated with reference to the standard answer, then that evaluation is called product evaluation.

19.4.5 Achievement Evaluation

If the purpose of a test is to know the achievement of the pupils in different subjects then that test is called achievement test. The purpose of an achievement test is to determine the extent to which the educational objectives have been achieved by the pupils. The

purpose of this test is promotion to the next class or giving grades or ranks to the learners based on their academic achievement. This is also called as teacher made achievement test. The achievement test contains sample test items constructed by the teacher.

At the end of the year the school is interested to know the achievement of the pupils in different subjects that the school has taught for the purpose of promotion to next higher class. This is achievement evaluation.

19.4.6 Diagnostic Evaluation

If the purpose of a test is to know the specific difficulties of the learners in learning a subject then that test is called diagnostic test. In this type of test an elaborate test items are given to know the strong and weak points of the learners if the teachers prepares a plan to overcome the specific problems of the learners in learning a subject then that is called as remedial teaching

Example: In Mathematics the teacher has to know the strong and weak points of the learners then the teacher has to prepare a programme that helps the learners to overcome the difficulties in learning in the diagnostic test all possible test items are given about the unit or topic then only the teacher is in a position to know the specific area of weakness in a unit

19.4.7 Placement Evaluation

If the purpose of test is to give the ranking like first, second, third etc in the subject then that evaluation is called placement evaluation. At the end of the year the teachers are interested to give the ranking or placement in their subjects to the pupils based on their performance in the examination. This is a simple test for the purpose of promotion and grading. It is to find out the position of the learners in a group with respect to learning

Example: When the athletes complete in any sports event generally the competitors are given places as first second third etc this is placement evaluation

‘Check Your Progress’ - 2

1. List the types of Evaluation.

19.5 Let Us Sum Up

In this Unit, you studied about the meaning and concept of evaluation, principle of evaluation and characteristics of Evaluation. You studied that Evaluation is a systematic process of determining the extent to which the instructional objectives are achieved by pupils.

- i. Evaluation is a systematic process and continuous process.
- ii. Evaluation always assumes that educational objectives have been previously identified and properly formulated. Evaluation includes measurement and qualification assessment.

You studied the principles of evaluation. There the purpose should be carefully defined, appropriate tool / techniques should be selected, it should be comprehensive as far as possible, it should be both qualitative and quantitative etc; You also studied the qualities of a good evaluation tool. They are validity, reliability, objectivity discrimination power & practicability.

In the last part of this unit, you studied about the different types of evaluation and their importance. They are formative evaluation, summation evaluation, process evaluation, product evaluation, Achievement evaluation, diagnostic evaluation and placement evaluation.

19.6 Answers to ‘Check Your Progress’

‘Check Your Progress’ - 1

1. Evaluation can be defined as a system process of determining the extent to which, instruction objective are achieved by pupils.
2. Refer section 19.3.2
3. Characteristics of a good evolution tool are: (VROCDP)
 - Validity
 - Reliability
 - Objectivity
 - Discrimination power and
 - Practicability

‘Check Your Progress’ - 2

1. The types of evaluation are:
 - Formative Evaluation

- Summative Evaluation
- Process Evaluation
- Product Evaluation
- Achievement Evaluation
- Diagnostic Evaluation and
- Placement Evaluation

19.7 Unit-End Exercises

1. Prepare an Achievement Test (any subject) in for the class you are teaching and analyse the responses.
2. List the defects of the present day examination system.
3. What reforms you would suggest to improve evaluation system at school level?
4. Explain evaluation as both a process and a product.
5. Differentiate the tools and techniques of evaluation.
6. Bring out the importance of continuous evaluation.
7. How can you eliminate memorising / cramming in examinations? Provide five suggestions.

19.8 References

1. Aggarwal. J .C., *Essentials of Examination System, Evaluation, Tests and Measurement*. Vikas Publication, Pvt Ltd, New Delhi 1997.
2. Bhatia. K. K., *Measurement and Evaluation in Education*. Prakash Brothers, Ludhiana 1973.
3. Dandekar. W. M., *Evaluation in schools*, Srividya Prakashana, Poova, 1970.
4. Gronlund. W. E., *Measurement and Evaluation in Teaching*. McMillan Publishing Co, New York, 1976.
5. Rawat. D. S., *Measurement Evaluation and Statistics in Education*. New Raj Book Depot. New Delhi 1970.

UNIT 20 □ TECHNIQUES AND TOOLS OF EVALUATION AN INTRODUCTION

Structure

- 20.1 Introduction**
- 20.2 Objectives**
- 20.3 Techniques and Tools - Differences**
- 20.4 Need for a variety of Techniques and Tools**
- 20.5 Most used Techniques - Measuring relative Merits**
 - 20.5.1 Testing**
 - 20.5.2 Observation as a Technique**
- 20.6 Characteristics of a Good Tool**
 - 20.6.1 Reliability**
 - 20.6.2 Validity**
 - 20.6.3 Objectivity**
 - 20.6.4 Comprehensiveness**
 - 20.6.5 Practicability**
- 20.7 Types of Tests - Meaning, characteristics Relative Merits**
 - 20.7.1 Criterion Referenced Test (CRT)**
 - 20.7.2 Norm Referenced Test (NRT)**
 - 20.7.3 Teacher Made Test (TMT)**
 - 20.7.4 Standardised Test (ST)**
- 20.8 Let us sum up**
- 20.9 Answers to ‘Check Your Progress’**
- 20.10 Unit-End Exercises**
- 20.11 References**

20.1 Introduction

A large number of tests are being used by teachers these days. The tests are conducted to determine the level of achievement of the pupil in various school subjects. In this unit a wide variety of tools and techniques are described to assess all round development of

pupils' personality. In this unit you will be presented with characteristics, merits and limitations of different tools and techniques. In the last part of the unit criterion referenced, normal referenced, teacher made and standardised tests are discussed.

20.2 Objectives

After going through this Unit you will be able to:

- Differentiate between tools and techniques
- List the needs for a variety of tools and techniques
- Explain various types of testing and their merits and limitations
- Explain the characteristics of a good tool
- Explain the characteristics, merits and limitations of Criterion Referenced, Normal
- Describe Referenced, Teacher Made and Standardised tests in depth.

20.3 Techniques and Tools-Differences

Now, let us study about different techniques and tools of evaluation.

The technique of evaluation is method or procedure in carrying out a scientific or mechanical operation or a degree of expertness shown in the method procedure or in carrying out an operation. The technique of evaluation in the field of education is the degree of skilfulness dexterity shown in the process of collecting information or evidences with regard to a characteristic quality of a person or performance process.

The term tool literally means implement or appliance for an operation. In educational evaluation it is a means of collecting evidences for students' performance.

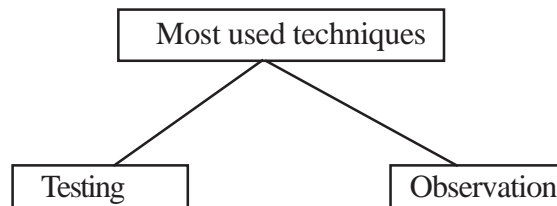
20.4 Need for A Variety of Techniques and Tools

There is a great need for variety of techniques and tools of evaluation the reasons are as follows:

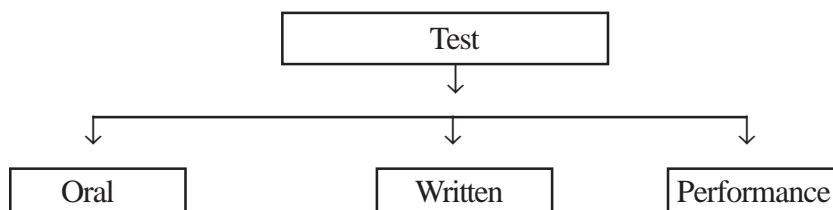
1. There are individual differences. One individual differs from the other in his capacities.
2. To test the different aspects of growth and development of an individual.
3. To test the personality of the individual

4. To test the individual interest, attitude, Aptitude, Values etc.
5. To test an individual's achievement in cognitive, affective and psychomotor domain

20.5 Most Used Techniques–Measuring Relative Merits



20.5.1 Testing: There are three types of testing a pupil's ability, knowledge, skill etc.



Oral Tests: Meaning: Oral examination is a face-to-face question-answer activity between the examiner and the examinee. It is generally used by teachers in classroom situations to measure the actual level of knowledge gained by the students.

Merits of Oral Tests

- Help to probe into pupils insight
- Help to identify and analyse pupils presence of mind
- Pupils cognitive affective and psychomotor abilities can be evaluated
- Pupils spontaneity and mannerism can be evaluated

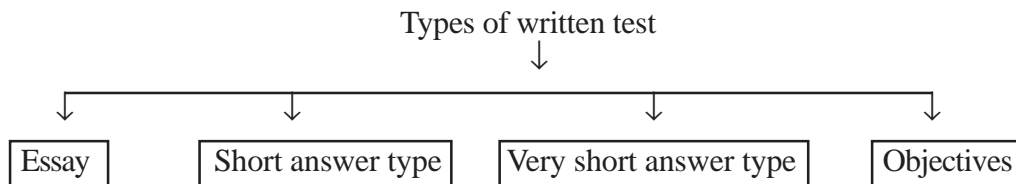
Limitations

- Tend to be subjective
- They are usually unplanned
- They are time consuming
- Oral examination may open doors of prejudice, partiality and discrimination.

- May cause unnecessary anxiety, fear, tension in the pupil

a) **Written Examination**

Meaning: In this type the pupils give their responses in writing. This is the most popular means of evaluation at all levels of education. If it is based on rote memory and recall questions it will lead to cramming.



Merits of Written Tests

1. A written test can provide us a reliable, stable and valid type of evaluation
2. It can be planned carefully, keeping in view the objective, contents and learning experience
3. Easy to construct and use several students can be evaluated at a time out at various
4. Easy to construct and use
5. Easy to list educational aims

Limitations

1. Difficult to give equal importance to all units
2. Difficult to assess the quality of the answer
3. The examiner may be carried away by the flowery language or hand writing of the pupils (In essay type)
4. There is less reliability and more subjectivity.
5. Leads to clustering

Performance Test

Meaning: Performance test, tests the ability of the pupil or pupils in manipulating objects. Performance tests are used when pupils' achievement is expressed by means of a 'product' or a 'procedure' which is a direct indication of the pupils' skills understands and application. Evaluating speech, performance in music, physical education, laboratory work, necessitates performance test

Merits

1. Performance tests are widely employed particular in clinical practice.
2. They are essential in the examination of persons with language handicaps.
3. They are a good supplement to verbal tests

Limitations

1. Performance test does not measure the same thing as verbal tests
2. Single Performance tests are less reliable than verbal tests
3. These tests are time consuming and involve personal bias

‘Check Your Progress’-1

1. How can the language ability of the language handicap be measured?

2. You want to know the skill of drawing the map of India in your students. Which type of test can you use?

3. Which test come to your help in answering the spontaneity and mannerism of your pupils?

4. Among the following test which is easy to construct and correct?

- a) Oral b) Performance c) Written

20.5.2 Observation as a Technique

Meaning: Observation is one of the most ancient and widely used instruments of assessing personality observation have been defined as “Measurement without instruments”

In education, Observation is the most commonly employed at all measurement technique.

1. Observation can be done in partially controlled situations
2. Observation can be done in free situations also

Merits

1. As the actual behaviour of the child is recorded it is more reliable and objective.
2. It can be used in every situation.
3. It is adaptable to both the individuals and groups.
4. This method can be used with children of all ages.
5. It can be used with some training and experience. Almost all teachers can use it.

Limitations

1. There is a great scope for personal prejudice and bias of the observation.
2. Only overt behaviour of an individual is observed. This overt behaviour does not provide reliable information regarding the internal process.
3. Observation is subjected to two kinds of errors sampling error and observation error.
4. Problem-solving skill in cognitive domain is difficult to evaluate in this system.

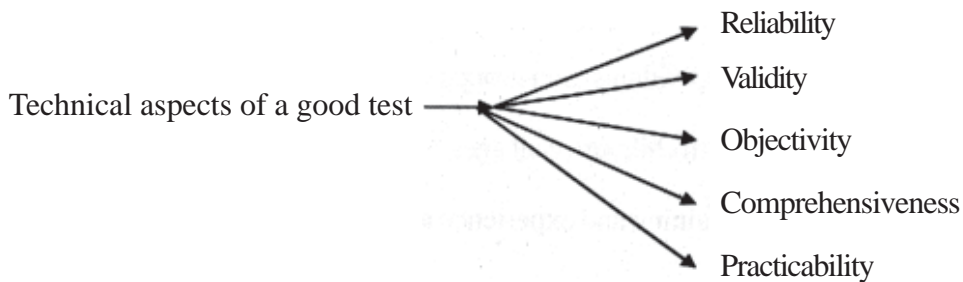
‘Check Your Progress’-2

1. Which are the places where a teacher can observe the pupils?

2. Why is the technique of observation used by the researches?

20.6 Characteristics of a Good Test

Whenever we have to construct a test or make a selection out of many available tests, we have to ensure that the test is up to the mark, suitable and has some good points we must be sure of some of the requirements which make the test good. In this Sub-Unit we shall discuss the criteria of a good test one by one.



20.6.1 Reliability

A measurement procedure is reliable to the expert when it provides constant results on repeated measurements. Consistency of results means that an individual obtains same score on' repeated measurement. According to Anne Anastasi, "Reliability refers to the consistency of the scores obtained by the same score individuals when re-examined with the same test on different occasions or with different sets of equivalent items or under other variable examining condition"

20.6.2 Validity

Validity of a test means truthfulness. If a test measures what it intends to measure, it is said to be valid. Every test has certain objectives of its own. It is constructed for some specific purpose and so it is valid for that purpose. A test of English for 8th standard is valid for 8th student alone.

20.6.3 Objectivity

A test is objective when the scorer's personal judgement does not affect the scoring. In an objective test, test item can readily be scored as right or wrong.

Example: 1) The true false type 2) The matching type

20.6.4 Comprehensiveness

A test is comprehensive if it tests all the aspect of behaviour

20.6.5 Practicability

A test should be practicable and it means that a test can be administered easily in a less time and cost and it should be easily scorable.

'Check Your Progress' - 3

Match the Following

A

1. Reliability
2. Validity
3. Objectivity
4. Comprehensiveness

B

- a. Personal prejudices
- b. Wide coverage
- c. Consistency
- d. Truthfulness

20.7 Types of Tests Meaning, Characteristics Relative Merits

There are many types of questions based on Administration, Standardisation, Scoring and Traits to be measured. Now let us understand some of the tests.

20.7.1 Criterion Referenced Test (CRT)

CRT ascertains an individual's status with reference to a well defined behaviour domain. It enables one to describe what an individual can do without reference to the performance of others:

CRT measurement tells about the absolute standard or quality of the attained knowledge of an individual. It describes a pupil's performance in terms of his mastery of the content in a well defined content domain or his achievement with respect to a specific instructional objective or criterion for success. Objective based questions find place in these tests and the teacher, thus, can aim at constructing a balanced test paper to find out how far the objectives set or the methods used are appropriate.

Characteristic of CRT

1. Its main objective is to measure students' achievement of curriculum based skills.
2. It is prepared for a particular grade or course level.
3. It has balanced representation of goals and objectives.
4. It is used to evaluate the curriculum plans, instruction progress and group students interaction.
5. It can be administered before and after instruction.

Merits:

1. To discover the inadequacies in learner's learning and assist the weaker section of learner to reach the level of other students through a regular programme of remedial instruction.
2. To identify the master learners and non -master learners of a class
3. To find out the level of attainment of various objectives of instruction
4. To find out the level at which a particular concept has been learnt.
5. To better placement of concepts at different grade levels

Limitations

1. CRT tells only whether a learner has reached proficiency in a task area but does not show how good or poor is the learner's level of ability.
2. Task included in the criterion-referenced test may be highly influenced by a given teachers interest or biases, leading to general validity problem.
3. It is important for only a small fraction of important educational achievements. On the contrary promotion and assessment of various skills is a very important function of the school and it requires norm-references testing

20.7.2 Norm-Referenced Test (N R T)

Meaning: NRT is designed to measure the growth in a student's attainment and to confer the level of attainment with the level reached by other students and norm group

Characteristics

1. Its basic purpose is to measure students' achievement in curriculum based skills.
2. It is prepared for a particular grade level.
3. It is administered after instruction.
4. It classifies achievement as above average, average or below average for a given grade.

Merits

1. In aptitude testing for making differential prediction.
2. To get a reliable rank ordering of the pupils with respect to the achievement we are measuring.

3. To identify the pupils who have mastered the essentials of the course more than the others.
4. To select the best of the applicants for a particular programme.
5. To find out how effective a programme is in comparison to other possible programme.

Limitations

1. Test items that are answered correctly by most of the pupils are not included in these tests because of their inadequate contribution to response variance. There will be the items that deal with important concepts of course content
2. There is lack of congruence between what the test measures and what is stressed in a local curriculum
3. Norm-referencing promotes unhealthy competition and is injurious to self-concepts of low scoring students

20.7.3 Teacher Made Test (TMT)

Meaning: TMT are prepared by teacher for local use, gaining knowledge and mainly personality, interest, aptitude of the pupils.

Characteristics

1. The attempt to assess comprehensively to the extent and degree of students progress with reference to specific classroom activities.
2. The teacher is at liberty to conduct the tests any number of times to any class.

Merits

1. They motivate the students.
2. They are simple to use.
3. They provide information for a report on the progress of students.
4. They provide immediate feedback.

Limitations

1. They are often ambiguous and unclear
2. They are either too short or too lengthy
3. They do not cover the entire content
4. They are usually hurriedly conducted

20.7.4 Standardised Tests (ST)

Meaning: Tests which are administered on a very large group by teacher, psychologists, educationists, researchers for determining their reliability, validity and establishing the norms are known as standardised tests. ‘A standardised test is one in which the procedure, apparatus and scoring have been fixed so that precisely the same tests can be given at different times and places’

Characteristics

1. They are based on uniform curriculum
2. They are concerned with whole field of knowledge or ability tested
3. The content is also standardised
4. The administration of the tests is also standardised
5. It is constructed by specialist or experts
6. The validity and reliability of a standardised test is that ensures right from the beginning of its construction

Merits

1. They give us objective and impartial information about an individual
2. They provide information in much less time than provided by any other device
3. These tests measure those aspects of the behavior which otherwise could not be obtained
4. In subjective observation we may over look shy children but these tests discover such also.

‘Check your progress’ - 4

Choose the correct answer from the brackets

- 1) Parlors and Thorn tests are
a) TMT, b) CRT, c) STNRT
- 2) As a teacher you want to know the immediate feedback of your students which test will you use for-this purpose?
a) N R T b) T M T c) ST d) C R T
- 3) Say ‘Yes’ or ‘No’ to the following statements

- a. To know the application level of the pupils of 9th standard in science subject N R T is used
- b. Suresh is in standard 10th and has appeared for state level examination. His scores are compared with these friends in the class and the test Administered is ST.

20.8 Let Us Sum Up

In this Unit we came to know about the variety of tools and techniques of evaluation. Testing or observations are most commonly used techniques in class room situation. We have also learnt the essential characterisation and requirement of sound text and they are validity, reliability, objectivity practicability and comprehensiveness. In this unit different types texts and their characteristics relative merits are discussed.

20.9 Answers to ‘Check Your Progress’

‘Check Your Progress’-1

- 1) Oral Test
- 2) Performance test
- 3) Oral
- 4) Written

‘Check Your Progress’ -2

- 1.a) Play ground
- b) Classroom
- c) In the library In camps excursions etc.
- 2.a) Can be used easily
- b) Can be used in natural and artificial settings
- c) Many situation are available to observe
- d) Less experience is enough

‘Check Your Progress’ - 3

- a) a-3
- b) b-4
- c) c-1
- d) d-2

‘Check Your Progress’ - 4

- a) ST b) TMT c) CRT d) NRT

20.10 Unit-End Exercises

1. Explain the characteristics of Oral, Written and performance tests
2. List out the difference between C R T and N R T
3. What are the merits and limitations of T M T?
4. What is the criterion for the construction of a good test? Explain briefly with examples
5. What is the importance of standardised test?

20.11 References

1. Aggarwal. J.C. : *Essentials of Examination system*
2. Rambha N Patel : *Measurement and Evaluation*
3. Bipin Asthana : *Measurement and Evaluation in Psychology and Education*
4. Dandekar W.N : *Evaluation in Schools*
5. Ahman J. S and Gloek. M. D : *Measuring and Evaluating*

UNIT 21 □ TOOLS OF EVALUATION : AN INTRODUCTION

Structure

- 21.1 Introduction**
- 21.2 Objectives**
- 21.3 Most used Tools - Questions / Test and Items**
 - 21.3.1 Meaning**
 - 21.3.2 Classification**
- 21.4 Most Used Tools - Test papers / Question paper**
 - 21.4.1 Meaning**
 - 21.4.2 A well Balanced Question Paper**
- 21.5 Question Bank**
 - 21.5.1 Objective Based Test Items - Meaning**
 - 21.5.2 Concept and Importance**
 - 21.5.3 Steps of Construction**
- 21.6 Let Us Sum Up**
- 21.7 Answers to ‘Check Your Progress’**
- 21.8 Unit-End Exercises**
- 21.9 References**

21.1 Introduction

Teaching and Testing should go together evaluation should be based on learning outcomes so that teachers have to identify the teaching outcomes and proper test items should be constructed in this unit different tools of evaluation are introduced an idea of Blue print is also given

21.2 Objectives

After studying this Unit you will be able to:

- describe the most used tools - questions / test item
- construct a blue-print for a Unit Test

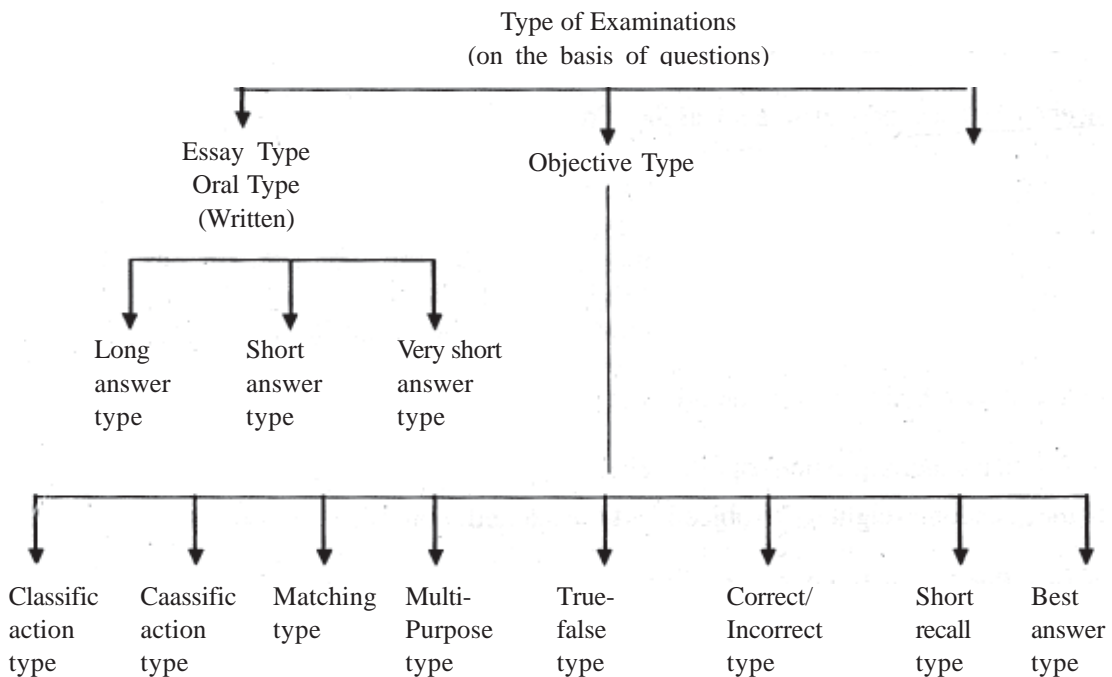
- construct a well balanced question paper
- identify the role of question bank in teaching -learning process

21.3 Most Used Tools–Questions / Test Items

21.3.1 Meaning: Questions/Test items are tools to examine the performance of an individual in cognitive affective and psychomotor domain.

21.3.2 Classification:

Examination can be classified on the basis of type of questions is essay type, objective type and oral type, objective type and oral type. This may be illustrated as under



21.4 Most Used Tools–Test Paper / Question Paper

21.4.1 Meaning: A test / a unit test is a short test given at the end of a teaching unit. A unit test is basically a miniature test. It is different from a full test mainly in regard to the limited content area (Unit) in which it is based questions are of the name type time for the test is about 45 minutes and total marks allotted 25 minutes and total marks allotted 25.

Meaning - Examination

The dictionary of education

1. “ An appraisal of ability, achievement or present status in any respect”
2. The instrument used in making such an appraisal

‘Check Your Progress’ -1

1. How would you come to know about the performance of your pupils after each day’s lesson?

2. What might be the duration of test and an examination?

21.4.2 A well balanced question paper

Concept: The concept of evaluation as the “Process of determining”

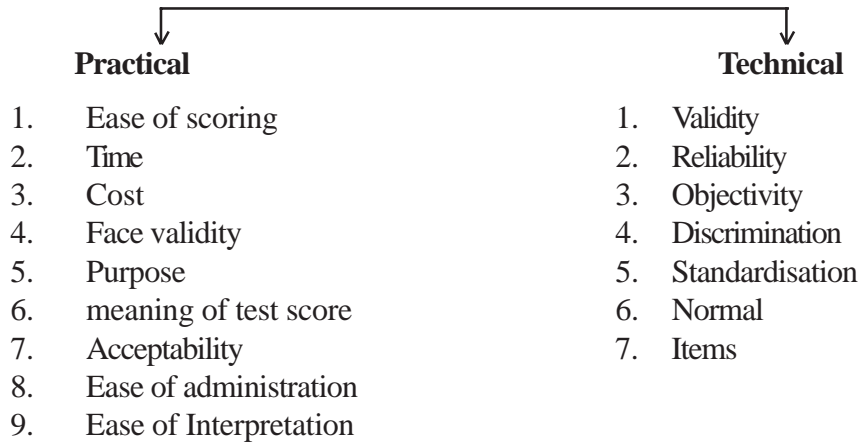
- The extent to which an objective is being achieved.
- The effectiveness of the learning experiences provided in the class room.
- How well the goals of education have been accomplished.

To fulfil the above objective there should be a well balanced question paper. A well balanced question paper is one which gives due weightage to content, types of question, level of the question, weightage to objectives time allotted should also be correct.

Characteristics of a well balanced question paper

The characteristic of a good test can be classified in two categories, viz, 1. Practical Criteria 2. Technical Criteria

Criterion of a good Test



A well balanced question paper should have the following characteristic:

1. Proper weightage to content
2. Proper weightage to objective (cognitive, affective, psycho-motor)
3. Easy, average and difficult question usually 30%, 50% , 20% respectively
4. Proper instruction should be given in writing the answers
5. There should be proper time budgeting
6. A blue -print should be prepared before setting a paper

Steps of construction

If at all we want to make a test an effective instrument of evaluation it has to be structured to a systematic pattern decided in advance - some of the necessary steps for setting up a good and meaningful test are:

- a. Planning the Test paper (Design)
- b. Editing the test paper
- c. Reviewing the test paper

'Check Your Progress' -2

Fill up the blanks

1. A well balanced question pupils should give weightage to.....,, and
2. Evaluation should be based on

A. Design of the Test (Planning)

- a) Selection of objectives and content

- b) Weightage to objective
- c) Weightage to different areas of content
- d) Weightage to different forms of questions
- e) Weightage to difficulty level
- f) Scheme of options
- g) Sections in the question paper

B. Editing the test paper

- a) Selection of test items
- b) Grouping of test items
- c) Instructions to examiners
- d) Sections in the question paper
- e) Preparing a marking scheme and scoring key

C. Reviewing the test paper

- a) Question wise (after the test is given)
- b) Critical evaluation of the test (before the test is given)
- c) Item wise analysis (after the test is given)

The Blue Print

The blueprint is a three- dimensional chart showing the weightage given to objective, content and forms of questions in terms of marks.

1. It helps the content validity of teacher-made-test
2. It describes the scope and emphasis of the test
3. It relates objectives to the content

Who should prepare the Blueprint?

There is nothing wrong about involving students in the development of a blueprint; in fact wherever feasible students' involvement should be encouraged, if for no other reason to make them feel that they have played some role in planning the course. Of course, the major and final responsibility will be that of teacher, who the decision maker is, not the students' input should be considered by the teacher while he is making his decisions and it should be utilised only in an advisory capacity.

When to prepare the Blueprint?

Should the blueprint be prepared before the test is constructed or should it be prepared well in advance? To be of the utmost benefit, it should be prepared well in advance. It would thus assist the teacher in organising his teaching material, serve as a monitoring agent, and help keep the teacher from straying off his instructional track.

The specimens of the weightage-tables and corresponding blueprint are given below:

Design of the unit test

Subject: Algebra

Std. VIII

Unit: Set Theory

Total Marks: 50

Table-1

Objectives	Percentage	Marks
Knowledge	10	5
Understanding	30	15
Application	40	20
Skill	20	10
Total	100	50

Weightage to Objectives:

Table-2

Sub-Units	Percentage	Marks
Concept of set	10	5
Set notation	10	5
Types of sets	10	5
Set Relation	12	6
Subsets	8	4
Set Operations	30	15
Venn Diagrams and examples	20	10
Total	100	50

Weightage to Item Formats:

Table-3

Form of Questions	Percentage	Marks
Easy	30	10
Short answers	30	15
Objective type	50	25
Total	100	50

Weightage to Difficulty Level:

Table-4

Sub-Difficulty Level	Percentage	Marks
Difficulty level	Percentage	Marks
Easy	30	15
Average	50	25
Difficult	20	10
Total	100	50

One can tally the three weightage tables - 1, 2, 3 with the blue print table - 5. The weightage to the difficulty level table - 4 is not to be mentioned in the blueprint, but it should be considered while setting the question paper.

Scheme of Operations

There are two types of options: External options and internal options.

BLUEPRINT

The Blueprint: A Three-Dimensional Chart:

Table-5

Objectives	Knowledge			Understanding			Application			Skill			Total
Content	E	S	O	E	S	O	E	S	O	E	S	O	
Concept of set	1	-	-	-	-	2	-	-	2	-	-	-	5
Set notation	1	-	-		1	-	-	2	1	-	-	-	5
Types of sets	1	-	-	1	1	-	-	2	-	-	-	-1	5
Set relation	1	-	-	-	-	1	1	1	1	-	-	1	6
Subsets	1	-	-	1	1	-	-	1	-	-	-	-	4
Set operations	-	-	-	2	-	4	-	2	4	-	-	3	15
Venn Diagrams and examples	-	-	-	-	-	1	-	2	1	-	2	4	10
Total	5	-	-	4	3	8	1	10	9	-	2	8	
	5			15			20			10			50
<i>E=Essay Type</i>			<i>S=short-answer type</i>			<i>O=Objective type</i>							

‘Check Your Progress’-3

1. Name the chart that gives comprehensive idea about a test or an examination

2. Name the necessary steps in preparing a test paper.

21.5 Question Bank

A question bank contains number of question belonging to different types of questions. The question bank is a planned library of test items pooled through cooperative effort for the use of evaluators, teachers and students. It is an inbuilt feed-back mechanism for improvement of questions. A question bank serves a number of purposes.

Questions from the question bank can be used for the measurement of the pupil’s achievement. Question bank can be for the measurement of the pupils’ achievement. Questions can also be made use for diagnosis of the pupils’ difficulties.

Question banks should be established in various subjects. As for the location of question banks, these can be set up at the DIETS, Teacher Training Schools and Colleges, State Evaluation Units, Boards of Secondary Education, SCERTS and NCERT. Questions for the questions banks, as far as possible, should be prepared by practicing teachers in workshops conducted by experts. Enrichments of questions

21.5.1 Objective Based test items-Meaning

Meaning: Objective tests are a large variety. However, only seven or eight types of objective test are commonly used.

According R. L. Ebel and D. A Frisbie an objective test is “One that can be provided with a simple predetermined test of correct answer so that subjective opinion or judgement in the scoring procedure is eliminated”. Wiersma and S.G. Jurs opines that “Objective items are items that can be objectively scored, items on which persons select a response from a list of options.”

Objective Type Test

Definition: It refers to any written test that requires the examinee to select the correct answer from among one or more of several alternative or supply a word or two and that demands an objective judgement when it is scored.

Objective-centred Test: When questions are framed with reference to the objectives of instruction, the test becomes objective centred or objective-based. This type of test becomes objective-centred or objective-based. This type of test may contain essay type and objective type test items. An essay test may be objective-centred or objective type test. On the other hand, can always be scored objectively, though it may not be objective-centred if it is not planned with reference to the objectives of instruction,

Objective Type Test Item: The most important criterion of an objective type test item is that it can be most objectively scored. The scoring will not vary from examiner to examiner

Classification of Objective Type Item

All objective type test items may be sub-divided into three classes:

1. Supply type or recall type (Short -answer, Completion);
2. Selection type or recognition type (alternate response, matching, multiple-choice);
3. Context-dependent type (pictorial form interpretative).

Merits of Objective Type Test

1. It can be scored objectively and easily. The scoring will not vary from time to time or from examiner to examiner.
2. In this test, a more extensive and representative sampling can be obtained. This reduces (a) the role of luck and (b) cramming of expected questions. As a result, there is greater reliability and better content validity.
3. It possesses economy of time, for it takes less time to answer than an essay test. Comparatively, many test items can be presented to students. It also saves a lot of time of the scorer.
4. It eliminates extraneous (irrelevant) factors such as speed of writing, fluency of expression, literary style, good handwriting, neatness, etc.
5. It creates an incentive for pupils to build up a broad base of knowledge, skills and abilities.

6. It measures the higher mental process of understanding, application, analysis, prediction and interpretation.

Limitations of Objective Type Test

1. Objectives like ability to organise content, ability to present it logically and in a coherent fashion, etc., cannot be evaluated.
2. Guessing is possible. No doubt, the chances of success may be reduced by the inclusion of a large number of items.
3. The construction of adequate objective type test items is difficult. It requires special abilities and is time-consuming.
4. Printing cost is considerably greater than that of an essay type test.

21.5.2 Concept and Importance

Objective test items can be valued without any personal prejudices the pupils have to be very clear in their answer

Importance

1. Can be used for the measurement of the pupils achievement
2. Can be used for the diagnosis of the pupils' difficulties
3. Free from personal prejudices
4. Factors like handwriting, number of papers etc , can be avoided
5. Easy to correct
6. Full justice can be given to the students
7. Questions can be covered comprehensively
8. Can easily be valued through computers and results are obtained very quickly

'Check Your Progress' -4

1. Name the test type which is free from personal prejudices

2. What are the factors that can be avoided while correcting the answers?

21.5.3 Steps of Construction:

A lot of care should be taken while constructing the objective type test. The following factors are to be born in mind by the examiner

- 1) Free from ambiguity
- 2) Very clean in asking questions
- 3) Only one specific answer should be there
- 4) Proper instruction should be given on how they should answer

21.6 Let Us Sum Up

In this Unit we have discussed the most used tools and also criteria of a good test. You have been introduced to prepare a good question paper with the help of a 'Blue Print'.

21.7 Answers to 'Check Your Progress'

'Check Your Progress'-1

- 1) Test / Unit test
- 2) 10 to 45 minutes -test
- 3) 2- 3 hours examination

'Check Your Progress' -2

- 1) Content, types of question, level of question objective
- 2) Learning outcomes / instructional objectives

'Check Your Progress'-3

- 1) Blue Print
- 2) Planning, editing, reviewing (PER)

'Check Your Progress' -4

- 1) Objective type test
- 2) Handwriting, numbers of pages etc.

21.8 Unit-End Exercises

- 1) What are the most used tools of evaluation? Describe them briefly
- 2) Prepare a Blueprint for a unit test
- 3) What is the criterion for balanced question paper?

21.9 References

1. Dandekar W. V - *Evaluation in Schools*, Sri Vidya Prakashana .
2. Srivastva H.S - *Comprehensive Evaluation in Schools*, NCERT, New Delhi 1989
3. Aggarwal J.C - *Essentials of Examination System*, Vikas Publication, New Delhi.
4. Rambhai N Patel- *Educational Evaluation - Theory and practice*

UNIT 22 □ TEST ITEMS, RATING SCALE, CHECK LISTS, AND ANECDOTAL RECORDS: AN INTRODUCTION

Structure

- 22.1 Introduction**
- 22.2 Objectives**
- 22.3. Test Items Salient Features, Relative Merits, Construction Guide lines**
 - 22.3.1 Essay Type Questions**
 - 22.3.2 Short Answer Questions**
 - 22.3.3 Very Short Answer Questions**
 - 22.3.4 Multiple Choice Items**
 - 22.3.5 Completion Type Items**
 - 22.3.6 True False Type Items**
 - 22.3.7 Matching Type Items**
 - 22.3.8 Analogy Type Items**
- 22.4 Rating Scales-Salient Features, Relative Merits, Construction Guide lines.**
 - 22.4.1 Descriptive Rating Scales**
 - 22.4.2 Numerical Rating Scales**
 - 22.4.3 Graphic Rating Scales**
- 22.5 Check Lists-Salient Features, Relative Merits, Construction Guide lines.**
- 22.6 Anecdotal Records-Salient Features, Relative Merits, Construction Guide lines.**
- 22.7 Let Us Sum Up**
- 22.8 Answers to ‘Check Your Progress’**
- 22.9 Unit-End Exercises**
- 22.10 Reference**

22.1 Introduction

Teaching and Testing should always go together. A teacher should be aware of various test item formats, their strengths and weaknesses. In this Unit you are going to learn about different types of tests, rating scales and checklists and anecdotal records.

22.2 Objectives

After studying this Unit you will be able to

construct the following objective type tests:-

- Essay type questions.
- Short answer type questions.
- Very short answer type questions.
- Multiple choice questions.
- Completion Type questions.
- True-False questions.
- Matching type questions.
- Analogy type questions.
- Prepare and use Check lists and Anecdotal Records

22.3 Test Items

22.3.1 Essay Type Questions:

Meaning: Essay tests have a long history that date back to more than four thousand years. In this type the pupils are required to write a long answer. The essay type questions may use the following words signifying the simple to higher mental processes

- a. What, who, when, which, and where
- b. List
- c. Contrast
- d. Discuss
- e. Evaluate
- f. Outline
- g. Compare
- h. Develop
- i. Describe
- j. Explain
- k. Summarise etc.

Merits:

1. Suitable for some aspects of learning.
2. Provoke thought and higher mental processes.
3. Provide qualitative interpretation.

4. Measure originality and initiative.
5. Encourage better and inter-related study.
6. Easy to construct and apply.
7. Cheating, copying minimised.
8. Give examinees freedom to respond with in broad limits.
9. Divergent thinking can be measured.
10. More economical to use.

Limitations

1. They generally stress the lengthy enumeration of memorised facts
2. They have limited content validity
3. There is lack of consistency in judgements even among competent examiners
4. They have 'question to question carry effect'.
5. Scoring depends on the mood of the examiner
6. They are time-consuming both for the examiner and examinee.

Suggestions to Minimise Subjectivity

1. The student should be coached and important distinctions between terms like define, discuss explain, describe should be explained as item to be formed.
2. The students may be coached to write the answers systematically.
3. The question should be pinpointed and precise so that an answer key may be prepared in advance.
4. The expected length of the answer of each question should be indicated on the paper.
5. Normally no weightage should be given to hand writing, spelling and precise language in papers other than languages may be lessened:
6. It is sometimes suggested that a particular questions of all the examiners should be evaluated at one time. Then the second question of all the examiners and so on.

22.3.2 Short Answer Type Questions

Salient features: In simple language it may be stated that short-answer type test in between an essay type test and an objective test. Short answer items require the examinee

to respond to the item with a word, short phrase, number or a symbol. Short answer items are considered objective items in that the correct response can be secured objectively. That is preferably there is a single correct answer so that equally important scores would agree on the correctness of a response.

Merits:

1. A relatively large sample of the content can be covered.
2. Easy to construct.
3. It provides little opportunity for guessing.
4. Useful in evaluating spelling and knowledge of a foreign language.
5. There is very little scope for the influence of handwriting and spelling.
6. Questions will not have irrelevant clues to possible answers.

Limitations:

1. Not suitable for measuring complex learning outcomes.
2. Not suitable for judging the power or analysing and reasoning of the student.
3. Impossible to test the synthesis, interpretation, ability of the students.
4. It is limited to questions that can be answered with a word, phrases, symbol or number only.

22.3.3 Very Short Answer

Salient features: In this type of questions the students are required to supply a factor.

A specific answer ex:

1. Fill of the blanks
2. Matching type
3. True or false etc.,

Merits:

1. There can be wide coverage of syllabus.
2. Easy to correct.
3. Purely objective.
4. In the content

Demerits:

1. Language ability / competency cannot be tested
2. Guessing is possible
3. Encourages copying

'Check Your Progress' -1**Fill in the blanks**

1. To test the organisation capacity of the studentstype question are suitable.
2. There is wide coverage of the content intype of tests.
3. In very short answer type questions there is scope forand.....

22.3.4 Multiple Choice Items

Meaning: A multiple choice item consists of a problem and a list of suggested solutions. The problems may be stated on a direct questions or an incomplete statement and is called the stem of the items. The text of suggested solution may include words, numbers, symbols or phrases and are called alternatives / choices/options. The pupils are requested to read the stem and the list of alternatives and to select the one correct or best alternative.

Forms of Multiple Type Test

1. The correct answer form
2. The best answer form
3. The Multiple Response form
4. The incomplete statement Form
5. The Substitution form
6. The combined responses form

Merits:

1. Objective in scoring
2. They reduce the effect of guessing
3. They can be easily adopted for machine scoring
4. A substantial amount of subject matter can be tested.

Limitations:

1. They do not permit the examiner to express their views.
2. They cannot measure attitudes or motor skills
3. They cannot evaluate the ability to organise and present ideas
4. They require more time to construct.

Guide Lines To Construct Good Multiple Choice Questions:-

1. Be sure the stem of the items clearly formulates a problem.
2. Use the negative sparingly in the stem of an item.
3. There should be only one correct or best answer in every item.
4. Questions and sentences should be kept as short as possible.

22.3.5 Completion Type Questions

Meaning: Here an incomplete statement and the pupil is required to complete it.

Ex: There is more perspiration in theseason.

Merits:

1. Easy to correct
2. Easy to answer
3. More syllabus can be covered.
4. High objectivity can be brought in

Demerits:

1. Copying is encouraged.
2. Languages ability cannot be tested.
3. Logical thinking or organisation capacity of the pupil cannot be tested.
4. Not possible to test affective / psychomotor abilities of the pupil.

Guidelines to construct:

1. There should be only one specific answer.
2. The incomplete statement should not be doubtful or ambiguous.
3. Items should be taken from the curriculum.
4. Proper space should be given for response.

22.3.6 True -False Type Questions

Meaning: Here the pupil is presented with a declarative statement and the pupil has to identify whether it is “true or false”.

Merits:

1. They are good for young children who have poor reading habits.
2. They can be scored quickly, reliably and objectively
3. They are adaptable to most areas.
4. This type of item is a time saver for it allows for frequent testing.

Limitations:

1. There is chance for guessing the answer.
2. They lend themselves most easily to cheating.
3. They are susceptible to ambiguity and misinterpretation.
4. They tend to be less discriminating and create clusters.

Guidelines for Constructing True / False Items

1. To use simple, clear language to avoid ambiguity.
2. To avoid tricky statements.
3. To avoid lifting statements verbatim from the text.
4. Double negative statement should be avoided.

22.3.7 Matching Type Questions:

The matching test consists of two columns. One column consists of the questions or problems to be answered and the other column consists of answers. The examinee is required to make some sort of association between each premise response. He pairs the corresponding elements and records his answers.

Merits:

1. Many questions can be asked in a limited period of testing time.
2. They can be constructed relatively easily and quickly.
3. A great deal of space is saved and the pupil usually has less reading to do.
4. Can be scored easily.

Limitations:

1. Items are likely to include irrelevant clues to the correct answer.
2. Generally they emphasise rote memorisation.
3. They are largely limited to learning outcomes in the knowledge domain.
4. Scoring is relatively easier.

Writing good True - False items

1. To keep each list relatively short
2. Each matching test should consist of homogeneous items;
3. To avoid equal number of premises and responses
4. To arrange the answers in some systematic fashion
5. To avoid giving extraneous or irrelevant clues.

22.3.8 Analogy Type Questions:

Meaning: In this type the pupil is required to deduce the relationship that exists between the first “two parts of the item and then apply it to the third and fourth parts. Normally the third part is given and the missing fourth part is selected from the list of options on the basis of the relationship existing between the first two parts.

Ex: The Himalayas : India : : The Alps : :

Merits:

1. They help measure students’ capacity for interpretation and discrimination.
2. They can be subjectively scored by hand as well as by machines.
3. The students can understand items of this type without any extra coaching.
4. They are not so much influenced by guessing.

Limitations:

1. Construction of the item is not very easy.
2. They consume more time.
3. It tests only knowledge level of the students.

Guidelines for Construction:

1. Perfect items should be given and there should not be room for ambiguity.
2. Items should be useful and reliable.

'Check Your Progress' -2

Choose the correct answer

1. Copying can be avoided in the following type of test
 - a) Essay type
 - b) Short answer type
2. The examiner is not carried away by the handwriting of the students in
 - a) Short answer
 - b) Essay type answer.

22.4 Rating Scales-Salient Features, Relative Merits, Construction Guide lines.

Rating scales are very popular and are useful in testing and in applied psychology as well as in basic research. They can be employed in evaluating individuals, their reactions and products. They are being increasingly used in large industrial, mercantile and financial organizations and in recommending promotions, transfers and wage increases. In education too, they are being used to evaluate personnel.

Rating method began with Psychophysics, particularly with the work of FECHNER. GALTON published the first Rating Scale in connection with his esquire into Mental Imagery. Galton distinguished between various strengths of imagery such as highest, first, sub-octile, first quartile, last octile, etc. in 1906-1907, PEARSON constructed his rating scale for judging intelligence. He took a seven category judgement mentally defective, slow-dull, slow, slow-intelligence, fairly intelligent, distinctly capable and very able. Several other rating scales were prepared later on .

Types of Rating Scales

These are five broad categories of rating scales. They are: 1. Numerical, 2. Graphic 3. Standard 4. Cumulative Points and 5. Forced Choice. In almost all of these scales, assignment of a category evaluation is done by inspection. This may be either along an unbroken continuum or in ordered categories along with a continuum. The operation in each of these types is, however, quite distinct. We shall describe the nature, limitations and construction of each of these scales in brief.

22.4.1 Descriptive Graphic Rating Scales

This type of scale is generally the most desirable type of scale to use. Such specific descriptions define a particular dimension

22.4.2 Numerical Rating Scales

In numerical scales, the observer is the one who evaluates and assigns a particular number to a particular stimulus. For example, following numbers may be allotted while evaluating feminine beauty.

1. Most beautiful
2. Very beautiful
3. Beautiful
4. Average
5. Ugly
6. Very ugly
7. Ugliest

Or else numbers allotted may be - 3, -2, -1, 0, 1, 2, and 3. They may also be in alphabets as A, B, C, D, E, F, and G.

Suggestions for Construction

1. These scales have a bipolar tendency; they have a direction in two opposite extremes. A zero value is generally taken at the middle, minus (-) values below it indicating negative direction, and plus (+) values above, it, indicating positive direction. Since such a way is not quite suitable for persons having little or negligible knowledge of algebra, use of negative numbers is not recommended. Alphabetical or serial numbers may be used instead.
2. Subjects generally avoid terminal categories and shift judgements towards the middle of the range. This leads to shortening of the range. Therefore, while constructing rating scale, the investigator should leave room for expansion beyond these categories.

Evaluation

1. The construction and application of numerical scales is easy. The handling of results is also very convenient.
2. If the rater uses assignment honestly and sincerely, then evaluation of a very high order is possible. If adequate numbers of categories are employed, these scales can be used in a large number of situations.
3. These scales are subject to more bias and errors than other scales.

22.4.3 Graphic Rating Scales

These scales are very popular and are very widely used. Boyce used some sort of a Graphic Scales before 1915. But it was truly developed later on by Scott Company. In these scales a four five inches long straight line is given and under these some descriptive adjectives or phrases are given. The use of the scale is given in directions, such as “These adjectives represent your judgement. Judge every trait independently, so that when you judge on trait, disregard other traits. If a person is exceptional in your opinion you need not judge him high in every trait, because in spite of being exceptional, he may not be up to the mark in every trait” devised by American Council on Education. An example is given below.

In social conversation how have you been? 1. Talkative 2. An Easy Talker, 3. Talked When Necessary, 4. Preferred listening, 5 Refrained from Talking (from Lind’s Personal Inventory).

Suggestions for Construction

1. The good end may be placed first and bad end in the last, because raters generally think good qualities first.
2. On an average, 5 lines may be taken which are not very short or very long. In long lines continuum is disrupted and rates tend to cluster their marks in the middle. In shorter lines, works are mixed and so confused.
3. Space amidst adjectives or phrases need not be equal. There may be more space left in the middle categories than in the extreme ones to counteract the tendency of bunching ratings in the middle.
4. If traits are mentioned in a bipolar manner, most favourable in the one end and most unfavourable in the other, the neutral cue may not necessarily be given in the middle.
5. One trait should be completely rated before going to the next.

Evaluation

1. Construction and administration of graphic rating scales is very simple.
2. The rater need not bother with numbers. Descriptions are given and so scale can be quickly filled out.
3. A comparable rating can be done without bothering about all the ratings.
4. Comparable rating can be done without bothering about all the ratings.

5. The discrimination range or fineness may be changed whenever necessary say from one to five or one to fifty.

‘Check Your Progress’ -3

1. What are the types of Rating Scales?

2. What are the main characteristics of the three Rating scales?

22.5 Check Lists-Salient Features, Relative Merits, Construction Guide lines

A check list consists of listing of steps, activities or behaviour which the observer records when an incident occurs. It is similar in appearance and use to a rating scale and is classified by some as a type of rating scale. A check list enables the observer to note only whether or not a trait or characteristic is present. It does not permit the observer to rate the quality of a particular behaviour or its frequency of occurrence or the extent to which a particular characteristic is present. When such information is desired, the check list is definitely inappropriate.

Advantages of Check Lists

1. They are adaptable to most subject-matter areas.
2. They are useful in evaluating those learning activities that involve a product, process and some aspects of personal-social adjustment.
3. They are most useful for evaluating those processes that can be sub-divided into a series of clear, distinct, separate actions.
4. When properly prepared, they constrain the observer to direct his attention to clearly specified traits or characteristics.
5. They allow inter-individual comparison to be made on a common set of trails or characteristics.

6. They provide a simple method to record observations.
7. They objectively evaluate traits or characteristics.

A Specimen

Directions: Listed below are series of characteristics related to health practices. Check those characteristics which are applicable to students.

Characteristics to be Observe	Roll Numbers of the Pupils								
	1	2	3	4	5	6	7	8	Etc
1. Takes a balanced diet									
2. Washes before breakfast									
3. Brushes teeth after eating									
4. Drinks plenty of water at time of eating									
5. Brushes teeth before going to bed									

Here is an example of a check list for constructing T/F items

1. Expresses each item in clear, simple language;
2. Avoids lifting statements verbatim from the text;
3. Avoids negative statements wherever possible;
4. Makes sure that each item is clearly true or false;
5. Review the items independently.

A Check list should not be used if a more discriminating procedure can provide a valid appraisal; Example:

1. Adds two digit numbers;
2. Subtracts two digit numbers;
3. Multiplies decimals.

These abilities may be evaluated with greater discrimination and objectivity through the use of written problems or a simple test

While Using Check Lists

1. Use check list only when you are interested in ascertaining whether a particular trait or characteristic is present or absent;

2. Clearly specify the traits or characteristic to be observed;
3. Observe only one child at a time and confine your observations to the points specified on the check list;
4. Have a separate check list for each child. Individual observations can be recorded on a master check list;
5. The observer must be trained to observe behaviour. To make a valid judgement, he should omit recording those behaviours for which he has insufficient information.

22.6 Anecdotal Records-Salient Features, Relative Merits, Construction Guide lines

These are records of specific incidents, factual description of important and meaningful events or behaviour of students on informal occasions. Each event or behaviour is described shortly after it occurs.

Anecdotal records should possess certain characteristics:

1. They should contain a factual description of what happened, when it happened and under what circumstances the behaviour occurred.
2. The interpretation and recommended action should be noted separately from the description.
3. Each anecdotal record should contain a record of a single incident.
4. The incident recorded should be one that is considered to be significant to the pupil's growth and development.

Anecdotes	December 10, 10.30 am Recess
1. Jagadish is seen in the Library, sitting in- a corner, solving riders in Geometry.	December 15, 1.15 pm Geometry Period
2. Jagadish is found to be the only boy responding to the teacher's questions on solving a rider.	December 21, 4.45am Language Period
3. Jagadish was caught reading a book "Fun in Geometry" during the language period and was asked to leave the classroom.	
Interpretation :	Jagadish is very much interested in Geometry .
Recommendation:	Jagadish should be encouraged to do more in Mathematics and also not to neglect languages.

Advantages of Anecdotal Records

1. If properly used, they provide a factual record of an observation of a single, significant incident in the pupil's behaviour.
2. They record critical incidents of spontaneous behaviour (in a natural setting)
3. They provide the teacher with objective descriptions.
4. They are very good for young children who are unable to use pencil-and paper tests.
5. They direct the teachers' attention to a single pupil.
6. They provide for a cumulative record of growth and development.
7. They can be used by the counsellor as a source of information for giving guidance.
8. They provide more complete descriptions of behaviour better suited to understanding and guiding pupils than the other observational tools available.
9. They can be used as a supplement to quantities data. This leads to a better understanding of a pupil's behaviour.

Limitations of Anecdotal Records

1. They tend to be less reliable than other observational tools as they tend to be less formal and systematic.
2. They are time-consuming to write.
3. It is difficult for the observer to maintain objectivity when he records the incident observed.
4. When incidents are noted and read out of context, they may lose their meaning.
5. The observers tend to record only undesirable incidents and neglect the positive incidents.
6. They present only a verbal description of the incident. They do not reveal causes.

Making Anecdotal Records Effective

1. Restrict observation to those aspects of behaviour which cannot be evaluated by other means.
2. Concentrate on only one or two behaviours.
3. Observation should be selective.

4. An observational blueprint or guide should be prepared in advance.
5. Records should be complete.
6. They should be kept by all teachers and not only by the child's classroom teacher.

'Check Your Progress' -4

1. What are the advantages of Check Lists?

2. What should a teacher do in an anecdotal record?

22.7 Let Us Sum Up

Education is not only concerned with the acquisition of knowledge but also is concerned with the development of desired attitudes interest, skills and various personal and social qualities. In this chapter you have studied about types of questions available and then relative merits and construction guidelines. For example: there are question types like essay type, short answers, and objectives type questions etc., In this chapter we have learnt about the constructions of multiple of choice true-false etc. We have also learnt about rating scales check list anecdotal records.

22.8 Answers to 'Check Your Progress'

'Check Your Progress' -1

1. Essay Type
2. Short / Very short answer type
3. Copying / guessing

‘Check Your Progress’ -2

1. a
2. a

‘Check Your Progress’ -3

1. Descriptive Rating scale, Numerical Rating Scale and Graphical Rating Scale
2. a) Numerical Rating Scale indicates the extent to which a characteristic or trait is present
b) The Graphic Rating Scale assigns some value to specific traits
c) Descriptive Rating Scale expresses the trait objectively in a clear manner

‘Check Your Progress’-4

1. Advantages of check lists:
 - a) They are adaptable to most subject-matter areas
 - b) They provide a simple method to record observations.
 - c) They objectively evaluate traits or characteristics.
2. These are records of specific incidents, factual description of important and meaningful events or behaviour of students on in formal occasions.

22.9 Unit-End Exercises

1. What are the merits and limitations of essay type questions?
2. Construct ten multiple choice questions on a topic of your choice.
3. Explain different types of rating scales.
4. Mention the merits and limitations of check lists and anecdotal records.

22.10 References

1. N. Patel and B Rambhai - *Educational Evaluation*
2. Bipin Asthana - *Measurement and Evaluation in Psychology and Education*
3. Aggarwal. J. C. *Essentials of Examination System*

UNIT 23 □ CLASSIFICATION AND GRAPHICAL REPRESENTATION OF TEST DATA

Structure

- 23.1 Introduction**
- 23.2 Objectives**
- 23.3 Preparing Frequency Distribution Table**
- 23.4 Importance of Graphical Representation of Scores**
- 23.5 Types of Graphical Representation**
 - 23.5.1 Frequency Polygon Construction**
 - 23.5.2 Histogram - Construction**
 - 23.5.3 Pie Diagram- Construction**
- 23.6 Let Us Sum Up**
- 23.7 Answers to ‘Check Your Progress’**
- 23.8 Unit-End Exercises**
- 23.9 References**

23.1 Introduction

We collect data on various things in order to draw certain generalizations. In Education we make use of data for various purposes for example to improve the examination system we will depend on the Test data. The data is the quantity for qualitative assessment. Any research in education is meaningless without the data of various kinds and its analysis.

The data is of two kinds

1. The data obtained by measurement is called as metric data. This is continuous series.
2. The data obtained by counting is called enumeration of data. This is a discrete series.

The branch of Mathematics that deals with metric data in relation to enumeration data is known as Statistics, the knowledge in the process of teaching and learning.

23.2 Objectives

After studying this Unit you will be able to:

1. Prepare frequency distribution table when the raw scores are given
2. List the advantages of graphical representation of data
3. Represent the data in different types of graphs
4. Prepare the frequency polygons for the given data
5. Prepare histogram for the given data
6. Prepare pie diagram (circle graph) for the given data

23.3 Preparing Frequency Distribution Table

Let us consider that you have conducted a test for VIII class in any subject, the marks obtained by 25 students are as given below for the maximum marks of 20. The data or measure is known as Raw Data. It need not be in a systematic form.

5	12	8	14	10
6	7	9	10	9
10	8	10	12	11
9	13	12	9	13
8	15	11	8	12

The steps to be followed in preparing the frequency distribution table for the scores given above

Step-I Identify the highest score in the distribution

Step-2 Identify the least score in the distribution

Step-3 Find the range of the scores

Range = Highest score -least score

Step-4 Divide the range by the size of the class interval (you have to decide the size of the class interval by taking into account the range. preferably our odd number, odd number only for convenience)

Step -5 Write the step intervals keeping in mind the size of the class intervals the highest score must come in the first step interval if you write from the highest to least and the least score must come in the last step interval

Step -6 After writing the step intervals (Regular) mark the tallies against each class interval i.e. how many scores occur in a particular class interval

Step -7 Convert the tallies into numerical number called as frequency (f)

Step -8 Frequency distribution table can be written either from the highest to least or from least to highest both are correct but the convention is to write from the highest to least

Illustration for the raw scores given above

Step-1 Maximum Score = 15
(Highest)

Step-2 Minimum Score = 5
(Least)

Step-3 Range = 15-5 = 10

Range divided by the size of the class interval gives the number of step intervals (let the size be '3' in this case)

$\frac{10}{3} = 3.3$ (make it whole number)

3 = 4 step intervals

Step -4

Class Interval	Tallies	Frequency
(C I)		
13-15		4
10-12	 	10
7-9	 	9
4-6		2
		<hr/>
		25

Another way just to help you to understand the frequency distribution

Step -1. Write the scores from the highest to least (all the twenty five)

15	9
14	9
13	9

13 9
 12 8
 12 8
 12 8
 12 8
 11 7
 11 6
 10 5
 10
 10
 10

Step 2. Make the table short by writing the frequency (number of times the score has occurred against each score the score has occurred) against each score.

15 ————— 1 }
 14 ————— 1 }
 13 ————— 2 }

 12 ————— 4 }
 11 ————— 2 }
 10 ————— 4 }

 9 ————— 4 }
 8 ————— 4 }
 7 ————— 1 }

 6 ————— 1 }
 5 ————— 1 }

Step 3. Make three scores as one step interval and write the total frequency of three scores against class interval

Class interval	Frequency
13-15	4
10-12	10
7-9	9
4-6	2
N=	25

23.4 Importance of Graphical Representation of Scores

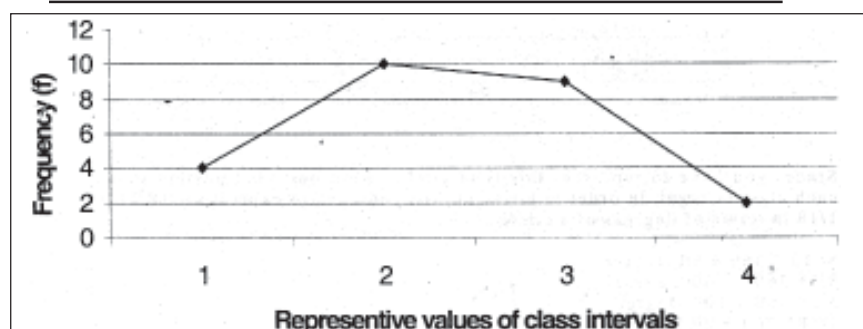
1. Graphs are the pictorial representation of data. Pictures can be made more vivid and Eye catching by appealing columns
2. Graphs easily draw the attention of the reader (observer)
3. Graphs are helpful to summarise the data (information)
4. Graphs are helpful to convey the information more precisely and quickly
5. Graphs are helpful to compare the performance of one group with the other.
6. Graphs are helpful to know the nature of group (Whether Normal or skewed group)
7. Graphs are helpful to draw certain generalizations or conclusions
8. Graphs (Pictures) help even the illiterate persons to understand the information
9. Graphs are helpful to analyse the data in different ways
10. Graphs (Frequency Polygon) are helpful to know the type of relationship that is existing between two variables

23.5 Types of Graphical Representation

23.5.1 Frequency Polygon Constructions

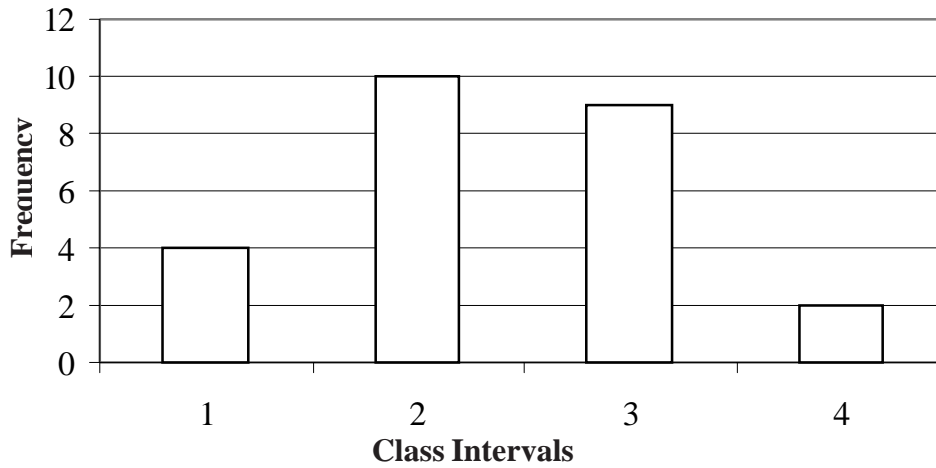
Frequency distribution table

Class interval	Frequency
13-15	4
10-12	10
7-9	9
4-6	2



(mid points of class intervals)

23.5.2 Histogram (Bar or Column Diagram) for the above table



23.5.3 Pie diagram

Frequency distribution table

Class interval	Frequency
13-15	04
10-12	10
07-09	05
04-06	01
N =	18

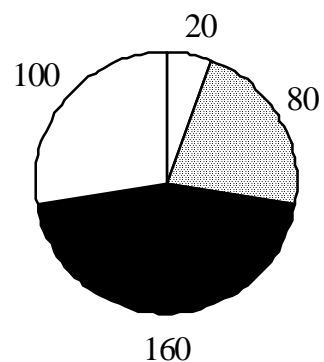
Since you have to represent this in circle. Find out what portion is odd each class interval. In order to arrive at this, you have to express 4/18, 8/18 1/18 in terms of degrees of a circle.

$$8/18 * 360 = 80 \text{ Degree}$$

$$8/3 * 360 = 160 \text{ Degree}$$

$$5/18 * 360 = 100 \text{ Degree}$$

$$1/18 * 360 = 20 \text{ Degree}$$



‘Check Your Progress’-1

1. Fill up the blanks with appropriate words

1. The data obtained by measurement is called as data
2. The data obtained by counting is called as data
3. The frequency distribution table can be written fromto

Answer the following questions,

1. What do you mean by raw scores?

2. What are the advantages of graphical representation of test data?

3. What is range?

23.6 Let Us Sum Up

1. Frequency distribution table can be prepared for the raw scores obtained by scoring a test.
2. There are many advantages of representing the data in different types of graphs.
3. The data is classified to know more about the performance of a group.
4. The data can be represented graphically they are
 - a) Frequency Polygon
 - b) Histogram
 - c) Bar Graph or Column graph
 - d) Pie Diagram or Circle Graph

23.7 Answers to ‘Check Your Progress’

‘Check Your Progress’-1

1.

- 1) metric
 - 2) enumeration
 - 3) lowest, highest
2. The data or measurements taken from a group of individuals.
3. Refer section 23.4
4. Range is the difference between the highest and the lowest score

23.8 Unit-End Exercises

1. Collect the test marks of 50 students in any subject and prepare the frequency distribution tables with varied class interval.
2. Collect the marks obtained by one hundred. X standard students in Mathematics and prepare the frequency distribution table.
3. Prepare the frequency polygon for the item 2 under 23.8 and interpret the nature of the group.
4. Show the progress of your institution in any subject with the help of histogram or frequency polygon.

23.9 References

1. Dandekar .W. N - *Evaluation in Schools*
2. Henry Garrett - *Statistics in Education and Psychology*
3. Guilford J. P - *Fundamental Statistics in Psychology & Education*

UNIT 24 □ PROCESSING OF TEST DATA

Structure

- 24.1 Introduction**
- 24.2 Objectives**
- 24.3 Measures of Central Tendency**
 - 24.3.1 Mean - Meaning, Calculation and Uses**
 - 24.3.2 Median - Meaning, Calculation and Uses**
 - 24.3.3 Mode - Meaning, Calculation and Uses**
 - 24.3.4 Measures of variability Meaning, Types and Uses**
- 24.4 Correlation**
 - 24.4.1 Meaning and uses**
 - 24.4.2 Calculation of Co-efficient - Rank Difference Method**
- 24.5 Let Us Sum Up**
- 24.6 Answers to ‘Check Your Progress’**
- 24.7 Unit-End Exercises**
- 24.8 References**

24.1 Introduction

The test data is to be processed to understand more about the performance of the group. The processing of data reveals many interesting things and helps the teacher to improve the system and also to take up the remedial programme to overcome the problems of the learners in learning.

The data processing helps the teacher to arrive at certain generalisations. What is the general ability of the group? What is the relevant programme according to the abilities of the learners? Where the majority of the group falls? How many are the exceptional learners? How many need extra guidance? Whether the group is homogeneous or heterogeneous etc All these questions can be answered appropriately, if the test data analysed by using various statistical techniques.

24.2 Objectives

After studying this Unit you will be able to:

- define central tendency
- define mean, median and mode
- calculate mean, median and mode from the ungrouped and grouped data
- define the measures of variability
- list the uses of variability
- define correlation
- define the co-efficient of correlation
- calculate the co-efficient of correlation by rank difference method
- list the uses of co-efficient of correlation

24.3 Measures of Central Tendency

Central Tendency it is a point in the distribution of scores, where the majority of the scores tend to fall. The most common measures of central tendency are the mean, the median and the mode. These are also called as the representative values of a group.

24.3.1 Mean - Meaning, Calculation and Uses

Mean is the average of test scores

Or

Mean is the average of any measurement about the performance of a group

Mean is obtained by adding all the given scores and dividing the sum by the number of scores

Ex: The scores are 5, 6, 4, 5, 10, 6.

The sum of the scores $5+6+4+5+10+6 = 36$

Number of scores = 6

The average or mean = $36/6 = 6$

In general $X_1, X_2, X_3, X_4, \dots, X_n$ are the scores

$$\text{Mean} = \frac{\sum f.x}{N}$$

When the grouped data is given ie. Frequency distribution table

How to find the mean Method I

Class interval	F	(X) Mid Point of the Class interval	f.x
80-84	2	82	164
75-79	3	77	231
70-74	5	72	360
65-69	7	67	469
60-64	8	62	496
55-59	10	57	570
50-54	12	52	624
45-49	8	47	376
40-44	5	42	210
35-39	3	37	111
			3611
N=63			

$$\begin{aligned}
 \text{Mean} &= \frac{\sum f.x}{N} \\
 &= \frac{3611}{63} \\
 &= 57.3
 \end{aligned}$$

Method II (This is called as Deviation Method)

Class interval	F	(X)	f.x
80-84	2	+4	+8
75-79	3	+3	+9
70-74	5	+2	+10
65-69	7	+1	+7
60-64	8	0	0
55-59	10	-1	-10
50-54	12	-2	-24
45-49	8	-3	-24
40-44	5	-4	-20
35-39	3	-5	-15
N = 63			

$$\sum fx = -59$$

$$\begin{aligned} \text{Mean} &= \text{AM} + \left(\frac{\sum fx}{N} \right) 1 \\ &= 62 + (-59/63)5 \\ &= 62 + (-295/63) \\ &= 62 - (295/ 63) \\ &= 62-4.68 \\ &= 57.32 \end{aligned}$$

AM= 62 It is the midpoint of the class interval where mean is assumed 1=5 size of the class interval N= Sum of the frequencies

Note: You can assume the mean to lie in any class interval but we take middle class interval generally you have to be careful while marking deviations from the assumed mean class interval + 1,+2 +3+4 ... towards the upper (increases) end of the scale, -1, -2, -3, -4, -5 towards the lower end (decreases) of the scale.

Uses

1. When the distribution is normal
2. When the most stable measure of Central Tendency is desired
3. Mean is used in further statistical calculations like Average Deviation Standard Deviation etc.
4. Mean is used to draw generalisations about the performance of a group
5. When we are interested to compare the performance of one group with another.

24.3.2 Median - Meaning, Calculation and Uses

1. It is the mid score in the distribution of scores, when the scores are arranged either in the increasing or decreasing order
2. It is a point in the distribution of scores above and below of which 50% of the scores lies. It divides the scale into two equal parts
3. It is also called as 50th percentile

Calculation:

1. Ungrouped data: let us consider 3,5,2,4,4,6,5,7,3 are the scores ,you have to arrange 2,2,3,3,④, 5,5,6 in the order 4 is the median

Suppose the scores are even 2,2,3,(3,4) 5,5,6

The average of the middle scores are taken is $\frac{3+4}{2} = 3.5$ is the median

In general $N + \frac{1}{2}$ gives the median

Where N is the number of scores arranged in the order (from highest to least or from least to highest)

2. When the grouped data is given

Median: When the frequency distributions table is given

Calculation:

Class Interval	F
70-72	2
67-69	3
64-66	2
61-63	4
58-60	5
	4
fm	3
52-54	3
49-51	4
46-48	5
F	
43-45	2
40-42	2
N=	36

Steps

1) Divide N by 2 $\frac{36}{2}$

2) From the lower end of the scale add the frequencies is cumulative frequency and identify the class interval where $N/2$ lies,

$$\text{Median} = L + \left(\frac{N/2 - F}{fm} \right)^1$$

I = The exact lower limit of the class interval where $N/2$ lies = 54.5

f = Sum of the frequencies, below the Class interval where $N/2$ lies
= 16

fm = The frequency of class interval where $N/2$ lies = 4

I = Size of the class interval = 3

Substitute the values in the formula given above

$$= 54.5 + (0/4)3$$

$$= 54.5 \text{ is the median}$$

$$= 54.5 + \left(\frac{16-16}{4} \right) 3$$

Uses

1. When the distribution is skew, median is the appropriate measure of central tendency
2. When we are interested to know the 50th percentile

24.3.3 Mode - Meaning, Calculation and Uses

It is the most frequently occurring score in the distribution for

Ex:-

5, 6, 4, 6, 7, 4, 3, 6

The score that has occurred more number of times is 6

6 is 'Empirical' mode. This is also called as crude mode when the frequency distribution table is given. The formula used to find the Mode = $3X$, Median = $2X$ Mean

Uses

1. It is a quick and rough measure of Central Tendency when the data is scant.
2. It is a typical value of a group (The value most commonly found).
3. When the data is scant.

24.3.4 Measures of variability Meaning, Types and Uses

When we are comparing the performance of one group with another, we have to consider not only the mean and the number but also the dispersion of scores.

Let us consider the following:

Example: The Marks obtained by the two groups are as follows find the average

GA	GB
90	54
80	53
70	52
60	51
50	50
40	49
30	48
20	47
10	46
<hr/>	<hr/>
450	450

The average of group A = $450 / 9 = 50$

The average of group B = $450 / 9 = 50$

Since the average of group A is equal to the average of group B Can we say the Group A is equal to B ? No, because look at the dispersion of scores or the spread of scores Group A is widely distributed where as Group B is closely distributed because the range of GA = $90 - 10 = 80$ and the range of GB = $54 - 46 = 8$

Hence the measures of variability are important

There are four measure of variability, They are:

1. Range
2. Quartile deviation
3. Average deviation
4. Standard deviation

Range: It is the difference between the highest and the least scores in the distribution.

Uses

1. When we are interested to know the total spread of the scores.
2. When the data are too scant and scattered widely.
3. Range is the most quick and rough measure of variability.

Quartile Deviation: It is a semi-inter quartile range

Or

It is half of the scale distance between 75th percentile and 25th percentile

Uses

1. When the median is the measure of central tendency.
2. When there are extreme scores, which would influence the standard deviation disproportionately.
3. When the concentration of scores around the median is of primary interest.

Average deviation: It is the average of deviations of scores from the mean of the scores Let us consider the following scores.

Scores(x)	Deviation of scores from the mean (x)	
5	5-5= 0	
4	5-4= 1	
5	5-5= 0	Add the deviations without taking into account signs
6	5-6= -1	
5	5-5= 0	
4	5-4= 1	
6	5-6= -1	
Sum=35	x=4	

Total =35

Average =35/7=5

Signs: The sum of deviations =4

Average or mean deviation = $\frac{\sum x}{N} = 4/7 =/0.57$

Uses

1. When we are interested to know the deviations of all the scores from the mean.
2. When these are extreme deviations which would influence standard deviation unduly.

Standard Deviation

X	M-X=x	x²
5	6-5= 1	1
7	6-7= -1	1
6	6-8= -2	4
6	6-6= 0	0
5	6-5= 1	1
7	6-7= -1	1
4	6-4= 2	4
Sum=42		$\sum x^2=12$

$$\text{Average} = 42/7 = 6$$

$$\text{S.D} = \sqrt{\frac{\sum x^2}{N}}$$

It is defined as the square root of the average of the sum of the squares of deviations from the mean of the scores

Uses of the Standard Deviation

1. When the statistics of greatest stability is wanted.
2. When there are extreme deviations which would exercise a proportionately greater effect on the variability.
3. In further statistical calculations.

24.4 Correlation

It is the relationship existing between two variables

24.4.1 Meaning and Uses

It is an index which tells us the degree of relationship between two sets of scores either positively or negatively Characteristics of the co-efficient of correlation are: It possesses both magnitude & direction. Limits: It always ranges from -1..... to + 1

24.4.2 Calculation of Co-efficient of correlation by Rank Difference Method

Ranks

Pupils	Marks in	Marks in	Rm	Rs	Difference of Rank		d ²
	maths	science	maths	science	Rm	Rs	
1	80	85	3	1	2		4
2	75	80	6	3	3		9
3	62	68	10	10	0		0
4	65	70	8	8	0		0
5	82	82	2	2	0		0
6	85	79	1	4	3		9
7	64	75	9	6	3		9
8	79	69	4	9	5		25
9	78	76	5	5	0		0
10	70	72	7	7	0		0

$$\sum d^2 = 56$$

$$= 1 - \frac{6 \sum d^2}{N(N^2 - 1)}$$

$$= 1 - \frac{6 \sum 56}{10(100 - 1)}$$

$$= 1 - \frac{6 \sum 56}{10 \times 99}$$

$$= 1 - 0.3$$

$$= 1 - \frac{56}{165}$$

$$= 0.7$$

Positive high correlation

When there are repeated scores in the data how to give ranks

Pupils	Marks in Eng	Marks in maths	R_E	R_M	$d = R_E - R_M$	d^2
1	70(5)	75(3)	6	4	2	4
2	68	70	8	7	1	1
3	80	75(4)	3	4	1	1
4	82	80	2	2	0	0
5	70(6)	75(5)	6	4	2	4
6	85	69	1	8	7	49
7	70	82	6	1	5	25
8	65	68	9	9	0	0
9	75	72	4	6	2	4

$\sum d^2 = 88$

In Eng-Add 5+6+7=18 and divide by 3

$$=18/3=6$$

Ranks in Maths- Add 3+4+5=12 and divide by 3

$$=12/3=4 \quad \frac{11}{15}$$

$$= 0.3$$

$$= 1 - \frac{6 \sum d^2}{N(N^2 - 1)}$$

$$= 1 - \frac{6 \times 88}{9(81 - 1)}$$

$$= 1 - \frac{11}{15}$$

$$= 1 - 11/15$$

$$= 1 - 0.7$$

$$= 0.3$$

Positive low correlation

Interpretation of index

± 0.1 to ± 0.3	Positive or Negative low correlation
± 0.4 to 0.6	Positive or Negative Moderate correlation
± 0.7 to 0.9	Positive or Negative High correlation

Uses of Co-efficient of Correlation

1. To find out the reliability and validity of evaluation tools.
2. When two examiners value the answer scripts, to find out the objectivity in their scoring.
3. To find out the relationship between any two school subjects.
4. To find out the relationship between internal assessment and external assessment in an examination.
5. To find out the relationship between any two variables of a group.
6. To know the truthfulness of certain statements made by the people for Ex: The intelligence of a person is depending upon the size of the head.
7. To improve the test items

24.5 Let Us Sum Up

1. You have learnt about the measures of Central Tendency. They are Mean, Median, Mode their meaning, calculation and uses.
2. You have learnt about the measures of Variability, They are Range, Quartile Deviation. Average Deviation and Standard Deviation their meaning and uses.
3. You have learnt about Correlation its meaning, characteristics, limits its calculation by rank difference Method and the uses of Co-efficient of Correlation.

24.6 Answers to ‘Check Your Progress’

‘Check Your Progress’ - 1

1. Central Tendency is a point in the distribution of scores, where the majority of the scores tend to fall.
2. Mean is used

- When the distribution is normal.
 - When the most suitable measure of Central Tendency is designed.
 - Mean is used in further statistical and standard Deviation etc.
 - Mean is used to draw generalisations about the performance of a group.
 - When we are interested to compare the performance of one group with another.
3. Mode is a quick and rough measure of Central Tendency when the Data is scant
 4. The measures of Variability are - Average Deviation, Quartile Deviation and standard Deviation.
 5. Range is the most quick and rough measure of variability.
 6. It is the square root for the average of the sum of deviations from the mean of the scores.
 7. It is half of the scale distance between the 75th score and 25th score when the scores are arranged from highest to lowest.
 8. It is an index which tells us the degree of relationship between two sets of scores either positively or negatively.
 9. The limit of Co-efficient of Correlation is from -1 through 0 to + 1.
 10. Print from page 77 uses of Co-efficient of Correlation>

‘Check Your Progress’ - 1

1. Define Central Tendency

2. What are the uses of Mean?

3. What are the measures of Variability?

4. Which is the most quick and rough measure of Variability?

5. Define Standard Deviation.

6. Define Quartile Deviation.

7. Define Correlation.

8. What are the limits of Co-efficient of Correlation?

9. What are the uses of Correlation?

10. What are the uses of Correlation?

24.7 Unit-End Exercises

1. Prepare a frequency distribution table for the marks obtained in any subject that you are teaching
2. Calculate the mean, the median and the mode for the frequency distribution table that you have prepared for the raw scores
3. Construct the frequency polygon and the Histogram for the frequency distribution table and interpret the nature of the group
4. Write the advantage of graphical representation of test data (frequency distribution table)
5. Write the uses of co-efficient of correlation
6. Take any two types of measurement about a group and find the type of relationship existing between them
7. Collect the marks obtained by VIII or IX standard students in any two school subjects and find the relationship between them
8. Find the relationship between the hours of work at home and the academic achievement of a given class

24.8 References

1. Dandekar. W.N. : *Evaluation in Schools*
2. Henry Garrett : *Statistics in Psychology and Education*
3. Guilford J.P. : *Statistics in Psychology and Education*