CHAPTER-III

RESEARCH METHODOLOGY

3.1. RESEARCH, CHARACTERISTICS OF RESEARCH, TYPES OF RESEARCH:

1. Research:
Research is an objective study which has logical analysis by means of controlled observations of the sample which is recorded in a form of data. The research observations can be further developed as a generalised statement, principles or theories.

2. Characteristics of research:
- A research conducted should suggest the solution for the problem in hand.
- A generalised statement or principle or theory which is obtained through the research should be helpful for understanding the causes behind the occurrence of the problem.
- A research is truly based on the actual evidence or factual observation.
- The observations and interpretation explained in the research work should be accurate and clear.
- Primary source of data or existing data in a form of events or issue can be used for formation of new data in research.
- Research should be done in a systematic manner.
- Research should be done under the guidance of the subject expert or the expert from that field.
- The researcher should standardize the research tools before collection of data.
- A researcher needs to validate his/her research procedures and the result before concluding them.
- The personal biased statement should be avoided by the researcher.
- Research should be conducted on solving the unsolved problems.
- Accurate recording of the data should be done by the researcher.
- Research work may have some limitations hence it may be criticized.

3. Types of research work:
There are 3 types of researches namely, Fundamental research, Applied research and Action research.

I. **Fundamental research:**
   - Fundamental research is a basic research in which a researcher try’s to understand the basic components of the knowledge.
   - The main aim of fundamental research is to evaluate and understand the fundamental process which is involved in learning.
   - Application based theory or principle can be developed by using the existing knowledge through fundamental research.
   - The result obtained through research work may not have practical values.
   - The research involves critical thinking of the components.
   - The fundamental research is less concern about the application of findings.

II. **Applied research:**
   - Applied research is conducted on the practical issues faced during the developing of the knowledge.
   - The conditions which are examined in this type of research are related to actual problems.
   - The research tool used by the researcher while conducting the applied research can be used by the teachers and school management after its effectiveness is validated.
   - The applied research result has direct impact on educational practices and procedures which is under consideration.
   - In applied research, development of the new theory or principles or statement is the secondary form of research work.

III. **Action research:**
   - Action research is a decision-oriented research work.
   - The research work involved in action research is based on the real problems faced by the teachers, students and school administration.
   - The action research applies the scientific thinking to resolve all the day to day problems faced during teaching learning session.
   - The result obtained and the interpretations based on the findings are applicable only to the sample which is under examined.
The decision or the solutions obtained through the action research are applicable only for the researcher and the sample selected for research work.

- It can act as guidance or suggestions for other teachers, who are facing the same problem.
- The action research is a systematic problem solving research work.
- Both quantitative and qualitative methods for measuring the data can be used.
- The bonding between the teacher and student develops stronger due to intensive interactions.

3.2. EDUCATIONAL RESEARCH, NEED FOR EDUCATIONAL RESEARCH, PURPOSE OF EDUCATIONAL RESEARCH, SCOPE OF EDUCATIONAL RESEARCH AND STEPS IN EDUCATIONAL RESEARCH:

1. Educational research:
   - Educational research are the systematic approach of improving the efficacy of various process involved in educational field.
   - Educational research aims for better understanding, explanation of various events which have direct or indirect control over human behaviour.
   - To generate the concepts or theory based on the existing knowledge or processes or practices is the major utility of the educational research.
   - Through suggestion of various skills, it helps to improve efficacy of the process.

2. Need of Educational research:
   - There are various problems faced by teachers, students and school management which affect the teaching-learning process.
   - By means of educational research, the researcher try’s to find the factors which are associate with the problem.
   - This helps in clarifying the method which is in use and creating a new one by re-evaluating the old one.

3. Purpose of Educational research:
➢ To resolve the basic problem faced during routine learning sessions.
➢ Development of principles or the models of learning which can be used by the teachers.
➢ By critical thinking with an aid of scientific approach the unanswered questions related in educational field can be solved with the result of appropriate findings.
➢ New application of learning theories can be discovered.

4. **Scope of Educational research:**
The scope of educational research is a broader aspect. Educational research helps in all the areas of learning such as psychological, philosophical and sociological.

1) **Educational research in Psychology:**
Understanding of the children’s behaviour and their learning styles and also the classroom handling strategies are the backbone of educational research in Psychology field.

2) **Educational research in Philosophy:**
Educational research in Philosophy teaches how to implement the various philosophical values on the students while developing a new theory or a concept.

3) **Educational research in Sociology:**
The role of teacher while inculcating the social values and changes on the mind of the student along with the ethical values of modernisation is explained by educational research in Sociology.

4) **Educational research in School management and Administration:**
Educational research in school management and administration helps in tackling the problem faced by the educational institutions with respect to the discipline of the students. Also the suggestions for enhancing the school progress are discussed in educational research.

5) **Educational research on different types of Educational systems:**
A brief understanding of various educational systems in India along with their educational policies is included in this type of educational research.
6) **Educational research in Guidance and Counselling:**

The impact of school and home environment on the student are studied under educational research which deals with guidance and counselling. How to make children social and how to make them learn about the adjustment is taught in this type of guidance and counselling.

7) **Educational research on Educational technology:**

Educational research on educational technology deals about various innovative methods for teaching-learning process which can make learning sessions interactive.

8) **Educational research on Special education:**

The learning problems faced by physically handicapped students are discussed in educational research which deals about special education.

5. **Steps in Educational research:**

The steps in educational research are interlinked to each other. The following are the steps involved in conducting any educational research:

- **Step 1**: To decide research problem.
- **Step 2**: To formulate the hypothesis and objectives based on the research problem.
- **Step 3**: Selection of research method which includes selection of research tool, sample size, sample area and duration.
- **Step 4**: Collection of data as per the designed procedure.
- **Step 5**: Appropriate analysis and interpretation of the data.
- **Step 6**: Drawing the result based on the analysed and interpreted data.

It is necessary for a researcher to follow each step accurately to obtained measurable result. The researcher can recommend various thoughts, ideas for improving the efficacy of the learning method.

3.3. **POPULATION (RESEARCH SAMPLE), TYPES OF POPULATION, NEED OF POPULATION AND CHARACTERISTIC OF GOOD SAMPLE:**

1. **Population (Research Sample):**
A population for a research is a set of individuals which are under observation having the one of the common characteristic which is selected for evaluation by the researcher when compared with other group of individuals.

2. **Types of Population:**
Depended upon the requirement of the research for obtaining accurate and unbiased result, the researcher can select any one set of the population enlisted below:

   I. **Finite Population:**
   A population which contains a countable number of individuals or objects or units.

   II. **Existence Population:**
   Existence population is a population which are existing and real, it means concrete in nature.

   III. **Hypothetical Population:**
   When a population is selected to just fill the numbers of count is termed to be hypothetical population.

3. **Need of Population (Research Sample):**
A representation of the population which is selected by a researcher for his/her research work is called a sample. The need of the selection of sample is for following reasons:

   - Sample helps in defining the population which helps in evaluation of the objective and hypothesis formulate by researcher for his/her research work.
   - Adequate sample helps to remove the unbiased responses, which helps researcher to drive accurate results and conclusions.

4. **Characteristic of good sample:**

   - The selected sample should represent the population appropriately.
   - The sample selected for research should satisfy the research objective.
   - Sample should reflect the entire characteristic under the examination.
   - Sample should be flexible in nature.
   - To acquire precision in observation, the researcher should select the large sample.
   - The responses obtained from the sample should be unbiased; hence they should be given training for the understanding of the research procedure.
3.4. HYPOTHESIS, SOURCES OF HYPOTHESIS, CHARACTERISTICS OF A HYPOTHESIS AND TYPES OF HYPOTHESIS:

1. **Hypothesis:**
   - Hypothesis is predictable generalised statements which are selected for evaluation and measurement of the problem in hand.
   - Hypothesis guides the researcher for finding the tentative answers for the questions of “Why” and “How”.
   - Hypothesis is the statements which are based on researcher imaginative idea or guess.
   - Hypothesis becomes the basis for action or investigation of the work.
   - Hypothesis is the conjunctural statement for validating the relationship among two or more variables or the differences in selection of two or more groups.
   - Hypothesis is not an unmotivated or un-directional statement.
   - Hypothesis is designed in such a manner that it helps in finding answers for a question.
   - Hypothesis helps in formation of the data which can be observed and evaluated.
   - Hypothesis is never proved by the researcher, it is a statement which is rejected or accepted.
   - Hypothesis generates conclusive statement.

2. **Sources for Hypothesis:**

   There are various conditions, events and objects which act as a source of hypothesis for researcher.

   1) **Researcher ’s environment:**
      a. The environment includes the places where the researcher has major interaction.
      b. The workplace, the area where researcher resides and the socio-economic status includes the researcher’s environment.
2) **Researcher’s culture:**
   a. Researcher’s culture deals about the behaviour of the researcher.
   b. The researcher thoughts, its manner of perception over the outlook of the knowledge helps in developing the statement.
   c. If a researcher is optimistic, he/she will always formulate the statements which are related positively.

3) **Popular Beliefs and Practices:**
   a. There are various generalise statement which forms the beliefs.
   b. Hypothesis helps in the validation and re-ability of those statements which are related to the society welfare.

4) **Assumptions:**
   a. Hypothesis helps in comparisons of the impletion of the policies or laws and its success level.
   b. The obstacles can be taken into consideration for the analysis of the effectiveness of the policy.

5) **New innovations:**
   b. It emphasis on the various resources for the exploration of knowledge.
   c. It helps in understanding of effectiveness.

6) **Theories:**
   a. Hypothesis helps in assessment of various learning theories by formulating the major assumptions and related factors.
   b. A comparison of theories can be done by designing the theories based on hypotheses.

7) **Researcher’s experiences:**
   a. Researcher’s has numerous experiences related to the problem in hand.
   b. This experience helps in designing of the hypothesis which can be realistic and measurable.
c. They are based on the factual analysis of the factors and the causes.

d. Researcher experiences helps in designing of the precision in views.

3. **Characteristics of a Hypothesis:**
   - A hypothesis should be clear and precise.
   - A hypothesis should be conceptual.
   - The terms used for designing the hypothesis should be accurate.
   - They should be easily verifiable and measurable.
   - The formulated hypothesis should be linked to more than two variables or groups.
   - It should be concise in nature.
   - The hypothesis which is designed should have limited scope for research.
   - The hypothesis drawn should be based on the known facts or principles.
   - Hypothesis should be specific.
   - It should not be a generalised statement.
   - A researcher should determine the conditions which are used for forming hypothesis.
   - A hypothesis should not be designed by using emotional language or statement.
   - Non ethical issues cannot be termed as hypothesis.
   - The basic formulation of hypothesis is the standardized theories.
   - The hypothesis statement should be based on the real facts or events.
   - A hypothesis should not be non-scientifically investigation.
   - The framed hypothesis should be based on the all factors related to the problem.
   - The facts under investigation are the major basis of the design of a hypothesis.

4. **Types of Hypothesis:**
   There are four types of hypothesis namely; Research hypothesis, directional hypothesis, non-directional hypothesis and null hypothesis.
I. **Research hypothesis:**
- Research hypothesis is a scientific hypothesis.
- It is a positive statement which explains the research outcomes with the assumption explanation of the variable.
- Research hypotheses are found in quantitative research.
- They are drawn on the basis of the introduction and review of literature.

II. **Directional Hypothesis:**
- Directional hypothesis are the statistical hypothesis which can be tested.
- Directional hypothesis helps in understanding the variables and the differences of the variables.
- This hypothesis helps in study of the expected statement to be derived.
- The directional; hypothesis can be measured by using one tailed test of significance as a statistical tool.
- The statement designed as a hypothesis can be stated as directional only when the researcher has the complete confidence on the statement that there will be quantitative relationship between two variables which can form a directed statement for the research procedure.

III. **Non-directional hypothesis:**
When a hypothetical statement do not shows the nature of relationship between two variables or two differences between two or more groups is termed as non-directional hypothesis.

IV. **Null hypothesis:**
- Null hypothesis is represented as $H_0$
- It is a statistical method of interpretation of the conclusions.
- The characteristics of the population are evaluated.
- The observed relationships or differences are the based on the sampling techniques.
3.5. VARIABLES AND TYPES OF VARIABLES:

1. Variables:
   a. Variables are the conditions or characteristics that the researcher has considered for analysis and interpretation of the data.
   b. These variables can be manipulated or controlled or observed by the researcher according to the requirement.

2. Types of Variables:
   There are four types of variables used in a research work namely independent variable, dependent variable, extraneous variable and intervening variable.

   I. Independent variable:
      - Independent variable is the conditions or characteristics which the researcher can manipulate or control according to the need of the objective and hypothesis.
      - The independent variable can be any new learning method of teaching technology of new curriculum.
      - There are 2 types of independent variables:
         a. Treatment variable:
            Treatment variable are those conditions which researcher manipulates for evaluating the impact of variable on the selected subjects or sample.
         b. Attribute variable:
            The variable such as age, socio-economic status and gender of the selected sample which cannot be manipulated or modified by the researcher are considered as attribute variable.

   II. Dependent variable:
      - The dependent variables are those conditions or characteristics which have impact on the result to be obtained.
      - They are measured to evaluate the effectiveness of the variable on the problem in the hand.
      - They are considered as criterion variable or outcome variable.
      - It has measureable impact on the subject or the sample and their responses on the interpretation of data.
III. Extraneous variable:
They are the external factors which act as variables which interfere with the experimental outcome and its influence on the analysis.

IV. Intervening variable:
- The variables which acts as an intermediate variable between the independent and the dependent variable for the researcher.
- There are two types of intervening variables:
  a. Mediator variable:
  They are that type of variable which will influence the independent variable first and then influences the dependent variable.
  b. Moderator variable:
  - They are that type of variable which will show the direct relationship with a particular portion of the sample.
  - The moderator variable has the direct impact on the independent variable and the dependent variable which a researcher has considered.
  - Moderator variables can be selected in such a manner that it gets manipulated or measured by the researcher.
  - The researcher can modify the relationship by manipulation of the observed phenomenon.
  - The independent variable can be changed as per the requirement of the research outcome.

3.6. DATA, TYPES OF DATA AND CHARACTERISTIC OF GOOD DATA:

1. Data: Any information which can be statistically analysed into either quantitative (Statistical information which deals about the variables and dimension) or Qualitative (statistical information which deals about the description of the Observed concept) is termed as data.

2. Types of Data: Data is classified into primary and secondary data:
   a. Primary data:
      The quantitative or qualitative information which is gathered newly, and which will specify the statement of problem precisely.
b. Secondary data:
The observational and interpreted data obtained after analysing the documented primary data is termed as secondary data.

3. Characteristics of good data:
The characteristics of good data are determined by following factors:

I. **Validity:**
It measures the utility of the proposed statement of the problem with concern to hypothesis and objective.

II. **Reliability:**
It measures the accuracy of the data obtained after the data collection.

III. **Objectivity:**
It removes personal judgement and views over the expected result.

3.7. **SAMPLING METHODS:**
There are two major types of sampling methods namely non-probability sampling and probability sampling:

1. **Non-probability sampling:**
   - In non-probability sampling methods, the sample in a form of unit is selected by researcher as per his/her needs.
   - The selection of sample is based on the situations or events which a researcher has considered while designing the research objective and hypothesis.

   a) **Advantages of non-probability sampling:**
   - Non-probability sampling does not require sampling frame.
   - The responses obtain for data analysis are faster in non-probability sampling
   - The researchers do not require investing more amount of cost for conduction of task.
   - The sample size in non-probability sampling is decided as per the requirement.

   b) **Limitations of non-probability sampling:**
The confidence limit of analysis is lesser in the obtaining of data from the samples.

The sampling technique affects the variance within a group and also between the groups.

Sampling errors of non-probability sampling technique cannot be determined.

Since the researcher uses uncontrolled factors for forming sampling, hence there is no statistical method for determine the margin to measure sampling error.

Sometimes non-probability sampling techniques do not cover the adequate amount of the population which is required for the evaluation.

Selection of sampling by the researcher may be biased in nature.

c) Types of non-probability sampling:
There are 3 major types of non-probability sampling namely, Quota sample, Incidental sample and Snowball sample.

I. Quota sample:
- Quota sample are the judgement samples.
- In a quota sampling, the researcher is given the freedom to fill the sample from any strata.
- The selection of sample is truly based on the researchers approach over selection.

II. Volunteer sample:
In volunteer sampling method, the individual which is available and ready to co-operate with researcher for comparing the data analysis through providing the necessary information required for research evaluation.

III. Snowball sample:
- The researcher selects few of individuals from the population under examination and then identifies the other individuals who have same interest or same characteristic.
- The other individual selected is identified from those few individuals who are selected by researcher.
2. **Probability sampling:**

- In probability sampling, the population selected by the researcher is specific and appropriate based upon the requirements of research work.
- Probability sampling is also known as random sampling technique.
- In probability sampling method, the selection of a group of individuals is based on the formulated objectives and hypothesis.
- There is a balance in a selection of the experimental and control group selected for the research work.

**a) Characteristics of probability sampling:**

The following are the characteristics of the probability sampling described by Good in 1966.

- The probability sampling includes the known variables for determining the effectiveness on other.
- The appropriate sets of probabilities are used in analysis of the sample which is selected.
- The process of probability sampling is automatic.
- The selection of sample is completed in one or two steps.
- The conditions selected for determining the probabilities are suitable for the hypothesis and objectives taken under consideration by the researcher for his/her research work.

**b) Advantages of probability sampling:**

- Probability sampling gives the accurate results.
- It helps the researcher to know the exact size of the population required for the research.
- The chances of selection of each unit of the population can be specified by the researcher.
- The researcher helps to estimate the magnitude of error caused due to the probability sampling technique.

**c) Limitations of probability sampling:**

- The probability sampling technique may not able to complete the systematic analysis of the objectives and hypothesis of the research work.
In probability sampling technique certain sets of the sampling frame is examined.
Due to analysis of only specific information, the each sampling unit data is ignored.
In small population, there are higher chances of the sampling error.
The sample drawn from the population may be questionable and controversial.

d) **Types of probability sampling:**
There are various types of probability sampling technique which are widely used are enlisted below:

I. **Simple random sampling technique:**
   - In simple random sampling technique the unit of population under observation is given an equal chance of being selected.
   - Careful controlled conditions are formed to ensure that each sample selected from the population has an equal chance.
   - There are various method used for drawing the sample from population:
     a. **Lottery method:**
        The researcher uses a set of N-tickets, for selection of the population. 1 to N numbers is written on tickets and then the tickets are asked to be drawn one by one.
     b. **Use of random table:**
        The researcher reads any number from the random table and selects one by one sample as per need of sample size.

II. **Stratified random sampling:**
   - The researcher divides the population into different strata in stratified random sampling technique.
   - The formed strata are on the basis on different characteristic such as age, sex, grade and economic conditions.
   - The researcher ensures that the group of sample formed represents the proportionate to individuals.
   - For allocation of sample size through strata is done by the percentage method.
III. Systematic sampling:
- The researcher can accurately list the population by use of systematic sampling method.
- The units of the population are listed in an alphabetical order primary at the formation of sample.

IV. Cluster sampling:
- The researcher in cluster sampling includes the population in infinite manner.
- This type of sampling is called as area sampling.
- List of all units of population are not available for the researcher in cluster sampling.
- In cluster sampling, it is necessary that the researcher needs to study the sample as a group.

V. Multistage sampling:
- Multistage sampling is conducted for a large scale surveys.
- There are certain stages which researcher has to follow while selection of the sample is done in 2 to 4 stages.
- Due to unequal size of sample, sample is found to be biased.

3.8. TYPES OF DATA COLLECTION:
The following are the types of data collection:

1) Interview:
- This type of data collection studies psychological attributes of the individual.
- It can be conducted by face to face or telephonic.

2) Questionnaire and survey:
- This type of data collection explores the variability in the responses which helps in the development of the individual which in turn helps the society, which can be counted in socio-psychological attributes.
- It can be performed by using pencil-paper method or using electronic media.

3) Observations:
This type of data collection analyses the specific variable which is under consideration.
This helps to understand the utility of the designed model or programme.

4) **Focus group:**
- This type of data collection can be implemented on the small group which focuses on particular issue.
- It can be conducted on children and employees of the company.

5) **Ethnographies, Oral history and case studies:**
- This type of data collection gives a broad view of socio-cultural aspect.
- It can be performed by categorising the data.

6) **Documents and records:**
- This type of data collection includes the verification of collected data in a form of documents and records.
- This can be done by utilising paper documented, audio visual tapes.

3.9. **SURVEY METHOD, TYPES OF SURVEYS, METHODS OF SURVEY, ADVANTAGES OF SURVEY, DISADVANTAGES OF SURVEY AND STEPS USED IN CONDUCTION OF SURVEY.**

1. **Survey method:**
- It is basically a collection of data from the selected population at a particular time.
- It studies about educational, psychological and sociological variables. The sample size can be large or small but it should be chosen as per the need of the objective of research.
- The important factor of this method is that a researcher gets variation in responses.
- It can be broad or narrow depending upon the quantitative assessment.

2. **Types of survey method:**
These are various types of surveys; they are conducted on the basis of the requirement and fulfilment of the objective behind the research is conducted.

a) **Public opinion survey:**
It is a sample survey where sub-groups are formed which determines the socio-economic issues.

b) School survey:  
   It is an assessment of the resources used by the management and also provides guidelines for further development.

c) Community survey:  
   It represents the problems faced by the society and the progress report for its implemented solutions.

d) Developmental survey:  
   This type of survey is mostly used in academics as it access the effectively of the curriculum and its method used.

e) Follow-up studies:  
   It is evaluation of the variables considered as the attribute for analysis.

f) Job analysis:  
   It assesses the strength as well as the weakness of the team or an individual or a company as whole.

g) Documentary analysis:  
   It is mostly deals with analysis of historical research by using the documents.

3. Methods of surveys:  
   There are basic methods of survey, which are design on the requirements of the resource, costing and its utility.

a) Pencil-Paper questionnaire:  
   ➢ In this type of survey, the researcher personally interacts with the participant.  
   ➢ The researcher prepares the questionnaire and asks the participant to respond them.

b) Face to face interview:  
   ➢ The researcher has his personal interaction with the participant by asking him/her certain set of questions.  
   ➢ The researcher interprets its own observations which may be biased.

c) Telephonic interview:  
   The researcher evaluates the various variables by a telephonic
conversation with the participant.

d) Self-administered mailed questionnaire:

The researcher uses electronic media or social networking sites for analysis of the proposed questions.

4. **Advantages of survey method.**
   
a) Various responses can be obtained.
   
b) It can be analysed in a short period of time.
   
c) Generalised statement is obtained by the analysis as specific sample is used.

5. **Disadvantages of survey method.**
   
a. It may be costly.
   
b. It lacks validity.
   
c. Complex behaviours cannot be assess.

To overcome the weakness of survey research, the researcher should use standardised tool for references. Also to improve the validity the researcher should verify the design tool with the experts of concern subject.

6. **Steps used in conduction of a survey:**

   The problem to be examined is decided.
   
   Identify and develops research questions.
   
   Selection of sample size.
   
   Constructing the questionnaire as per the proposed objective.
   
   Pre-testing of questionnaire by validation with subject expert and pilot survey.
   
   Preparing the covering letter for the permission for conducting the survey at the selected place.
   
   Collection of data.
   
   Drawing out observation and interpretation of responses and non-responses.
3.10. CRITERIA OF A GOOD SAMPLING:
A good tool should contain following 3 criteria’s namely: Validity, Reliability and Objectivity:

1. **Validity:**
   - The validity of the tool helps to understand the function of the tool in order to achieve the stated aims of research.
   - There are 5 different categories of validity:
     a. **Content validity:**
        It analyses the content so that it can be effectively represent the behaviour domain of the sample.
     b. **Criterion related validity:**
        Evaluation of the one or more criteria which are constructed as per the interest of the researcher.
     c. **Content validity:**
        The researcher measures the operational limits used for evaluation of objectives and hypothesis.
     d. **Face validity:**
        Validation of the terms which are in forms of operational.
     e. **Factorial validity:**
        The evaluation of the factors which determines the impact over the research work.

2. **Reliability:**
   The reliability determines the accuracy of the tool with respect to the frequency obtaining of the result.

3. **Objectivity:**
A good objective tool eliminates the sample responses which are the biased opinions.

3.11 DESIGN OF RESEARCH TOOL:
Design of research tool consists of types of tools and steps of developing research tool:

1. **Types of tools:**
   There are 4 types of tools:
   
   A) **Performance assessment test:**
   The test in which a person’s performance can be assessed.
   **Example:** Achievement test.
   
   B) **Attributes assessment test:**
   It is a type of tool which determines the individual behaviour with respect to the determine condition.
   **Example:** Personality tool.
   
   C) **Response assessment test:**
   It is a type of tool which analyse various types of responses obtained which determines psychometric analysis.
   
   D) **Mastery test:**
   It is a type of test which analyse the data which assess the intellectual command over its academic profiling with its professionalism.

2. **Steps of developing a tool:**
   
   Researcher to construct the tool by considering its conceptual definition.

   Selection of the type of tool researcher need to develop (Rating scale /checklist/questionnaire/achievement test).

   Categorising the items or the variables to be analysed.

   Referring the standardised tool and research papers.
Evaluating it with subject expert in determining the reliability of the content of tools

Conducting pilot reading.

Calculating the norms of the scores obtained on the tool.

3.12. QUESTIONNAIRE, TYPES OF QUESTIONNAIRE, MODES OF QUESTIONNAIRE ADMINISTRATION, RULES OF PREPARATION OF QUESTIONNAIRE, ADVANTAGES OF QUESTIONNAIRE AND LIMITATIONS OF QUESTIONNAIRE:

1. **Questionnaire:**
   Questionnaire is a research tool which has a set of questions which are design for factual information by gathering information from respondents.

2. **Types of questionnaire:**
   There are 2 types of questionnaire, structured questionnaire and non-structured questionnaire.
   
   a. **Structured questionnaire:**
      It has concrete set of questions which are used for having accurate communication and response.
   
   b. **Non-structured questionnaire:**
      It is basically interview type, where the researcher can arrange the subject matter as per its desire.

3. **Modes of questionnaire administration:**
   There are 4 main modes of questionnaire administration, which depends upon the need and scope of the studies.

   a) **Face to face questionnaire:**
      The researcher utilises facial expression as its mode of designing objectivity.
   
   b) **Paper and pencil questionnaire:**
The researcher analyse the responses by designing the questionnaire as per likert scale method.

c) **Computerised questionnaire:**
The researcher evaluate responses by using electronic media and social networking site.

4. **Rules of preparation of questionnaire :**
   - The questions should be written with a positive statement.
   - Use of correct spelling along with accurate grammar and punctuation.
   - One should avoid more variables in one question.

While constructing questionnaire the researcher should consider open-ended and closed–ended question.

**Open-ended question** are those question where a participant express its own views over it, whereas in **Closed-ended question** the participant are given the options as its responses from which one has to select one from it.

5. **Advantages of questionnaire:**
   a) It helps the researcher in executing its idea over the project.
   b) It helps in collecting information from large population.
   c) It reduces the expenses.

6. **Limitation of questionnaire:**
   a) Sometimes respondent gives incomplete answer which makes researcher to analyse it difficultly.
   b) Due to lack of interest, participant may not reveal correct answers.in some cases,
   c) Due to lack of confusion about actual meaning the participant responds to wrong answer.

3.13. **HOW RESEARCHER DESIGN HER QUESTIONNAIRE:**
According to the statement of problem, researcher has chosen Emotion and Motivation as its variable while designing the questionnaire.

- In case of **emotion**, following factors are consider:
  1. Fear.
  2. Arousal.
  3. Appraisal
  4. Facial expression

For **fear**, researcher has considered **Le Doux’s Model of Emotion**, which deals about 2 neurological pathways (short and long) whereas in **arousal**, **schater and singer** theory is used.

- In case of **motivation**, following 6 factors are consider:
  1. Self-efficacy
  2. Active learning strategies
  3. Learning values
  4. Performance goal
  5. Achievement goal
  6. Learning environment stimulation

1. **The researcher have used following standardised tool:**
   1. Study involvement inventory by Dr.AshaBhatnagar.
   2. Questionnaire to measure student’s motivation towards science learning by Hsiao-Lin Tuan,Chi-Chin Chin and Shyang-HorngShieh.
   3. Emotional maturity scale by Dr.Yashvir Singh and Dr.Mahesh Bharagava.

2. **The design questionnaire where evaluated by the researcher from the following subject experts:**
   1. Dr.MadhavGavai
   2. Dr.UshaRao
   3. Dr.ChetanChavan
   4. Dr.B.A.Patel
3.14. PROCEDURE FOLLOWED DURING DATA COLLECTION:

Researcher selected the variables and its factors to be consider while formulating data

Selection of standardised tool for data collection

Designing the self-made questionnaire under the guidance of guide

Evaluating the questionnaire from the subject expert.

Selecting the colleges and approaching to the principals for the permission for conducting research in their esteemed institute

The selection of participants

Finalising date and time for conducting the research

Circulating questionnaire to the participants and collecting it from them.

3.15. STATISTICAL TOOL: MEAN, MEDIAN, MODE AND T-TEST:

1. Mean:
   - It is arithmetic average.
   - It includes summation of all the observations or scores included in the sample.
   - There are 3 types of mean:
     a. Arithmetic mean:
        It is obtained by addition of all the values and then divided it with the number of items involved in it.
     b. Geometric mean:
It includes all the positive numbers.

c. Harmonic mean:

It is average of all the units.

- **Advantages:**
  
a. There is always one answer obtained as a result.
  
b. It helps in comparing the values of the data.

- **Disadvantages:**
  
  a. It affects the extreme values of the data analysis.
  
  b. It involves complicated calculations.

2. Median:

- It is the mid-point of the data arranged either in ascending order or descending order.

- There are 2 different methods for calculating median; Median for grouped data and Median for ungrouped data.

  a. **Advantages:**

     - It does not affect outlier values.
     - It helps in comparing data.

  b. **Disadvantages:**

     It takes long duration for calculating mean.

3. Mode:

- It is frequently recurring data.

  - **Advantages:**

     a. It is a simple method of calculation of measure of central tendency.
     
     b. It can be located graphically.
     
     c. It has no effect on large or small values.
     
     d. It gives qualitative data.

  - **Disadvantages:**

     a. It gives more than one answer.
     
     b. It cannot be used for accurate interpretation of data.

4. T-Test:

  - T-test value is obtained by accessing means of two groups.
  
  - It is widely used when a researcher wants to compare the means of 2
groups or 2 variables.

- The responses in T-test are independent.
- It is an ordinal measurement.
- T-value distribution is calculated from negative value to infinity.
- The T-value distribution is specific.
- It is always symmetrical.
- It accurately represents the sample and population.

- **Advantages:**
  a. It helps in finding the appropriate differences among the groups.
  b. It gives accurate analysis of the effectiveness of the treatment to either the groups or variables.
  c. The mean of population can be easily calculated.
  d. It can be applied to large sample size.
  e. It gives measurable data analysis.