CHAPTER III
PLAN AND PROCEDURE

III. PLAN AND PROCEDURE

- Introduction
- Need for research design
- Methodology used for the study
- Experimental Design
- Sample
- Tools used for the study
- Data Collection
- Analysis of the Data
- Formula used in dissertation

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INTRODUCTION

The methodologies of educational research are based, in most instances, on research methods in the behavioral and social sciences, relying most heavily on psychology, sociology and anthropology. Because research in these fields emphasizes logical positivism, which uses experimental and quantitative research methods, most educational research also utilizes these methodologies. Still some research concerns may be addressed more appropriately with a phenomenological or qualitative research approach derived from the humanities, particularly History and Philosophy, or with qualitative methods from the social sciences.

Research can be divided in to two broad categories: quantitative research and qualitative research.

Meaning of research:

Research = Re + Search

" Systematic, controlled, empirical and critical investigation of hypothetical propositions about the presumed relations among natural phenomenon."

" The manipulation of generalizing, extending, correcting or verifying knowledge. . ."

-Encyclopedia of social sciences

Research may be defined as the systematic method of discovering new facts or verifying old facts, their sequences, interrelationships, causal explanations and the natural laws which govern them."

-Young P V

It is systematic and objective analysis and recording of controlled observation that may lead to the development of generalizations, principles and theories, resulting in prediction and possible control of events.

Educational research

In day to day life much more problems came in picture in the area of science and education.

In order to achieve the target or fulfill the objectives problem should be analyzed and it is necessary to choose a solution. The aim of educational research is related to the laws, methods and principles.

" Educational research aims to made contributions towards the solution of problems in the field of education by the scientific, philosophical method."

Research methodology

Present research is experimental research and different research methods are there for educational research. Educational research methods are divided on the basis of research objectives, data collection.

Educational research methods are divided in following three types

1. Historical research
2. Descriptive research
3. Experimental research

The main objective of historical research is to know the solution of present problems or issues with reference to past issues.

The objective of descriptive research is to know the current situation. Experimental research is related with future and to check the relation between two variables.

Experimental research

Experimental research provides a systematic and logical method for answering the question, " If this is done under carefully controlled conditions, what will happen?" Experimenters manipulate certain stimuli, treatments, or environmental conditions and observe how the condition or behavior of the subject is changed. Their manipulation is deliberate and systematic. They must be aware of other factors that could influence the outcome and remove or control them so that they can establish a logical association between manipulated factors and observed effects.

Experimentation provides a method of hypothesis testing. After experimenters define a problem, they propose a tentative answer or hypothesis. They test the hypothesis and confirm or refute it in the light of the controlled variable relationship that they have observed. It is important to note that the confirmation or rejection of the hypothesis is stated in terms of probability rather than certainty.

Experimentation provides a method of the science laboratory where elements manipulated and effects observed can be controlled. It is most

sophisticated, exacting and powerful method for discovering and developing an organized body of knowledge.

Although the experimental method finds it's greatest utility in the laboratory, it has been effectively applied in non-laboratory settings such as the classroom, where significant factors or variables can be controlled to some degree. The immediate purpose of experimentation is to predict events in the experimental setting. The ultimate purpose is to generalize the variable relationships so that they may be applied outside the laboratory to a wider population of interest.

Variables

Variables are the conditions or characteristics that the experimenter manipulates, controls or observes.

Independent and dependent variables

The independent variables are the conditions or characteristics that the experimenter manipulates or controls in his or her attempt to ascertain their relationship to observed phenomena. The dependent variables are the conditions or characteristics that appear, disappear, or change as the experimenter introduces, removes, or changes independent variables.

EXPERIMENTAL DESIGN

Experimental Design is the blueprint of the procedures that enable the researcher to test hypotheses by reaching valid conclusions about relationships between independent and dependent variables. Selection of a particular design is based on the purposes of the experiment, the type of

variables to be manipulated, and the conditions or limiting factors under which it is conducted.

Three categories are presented here:

1.Pre experimental design is the least effective, for it provides either no control group or no way of equating the groups that are used.

2.True experimental design employs randomization to provide for control of the equivalence of groups and exposure to treatment.

3.Quasi experimental design provides a less satisfactory degree of control, used only when randomization is not feasible.

Pre experimental designs

1.The one shot case study

X O

2.The one group, pretest-posttest design

O_1 X O_2

O_1 - Pretest O_2- Posttest

3.The static group comparison design

X O

C O

2.True experimental designs

1.The post-test only, equivalent groups design

R X O_1

R C O_2

2.The pretest post test equivalent groups design

R	O_1	X	O_2
R	O_3	C	O_4

O_1O_3 = Pretests

O_2O_4 = Posttests

This design is similar to the previously described design, except that pretests are administered before the application of the experimental and control treatments and posttests at the end of the treatment period. Pretests scores can be used in analysis of covariance to statistically control for any differences between the groups at the beginning of the study. This is a strong design, but there may be a possibility of the influence of the interaction effect of testing with the experimental variable.

3.The Solomon four-group design

R	O_1	X	O_2
R	O_3	C	O_4
R		X	O_5
R		C	O_6

3.Quasi experimental designs

1.The pretest – posttest Nonequivalent group design

O_1	X	O_2	O_1O_3 = Pretests
O_3	C	O_4	O_2O_4 = Posttests

2.The Time series Design

O_1 O_2 O_3 O_4 X O_5 O_6 O_7 O_8

3.The equivalent time samples design

O_1 X_1 O_2 C O_3 X_1 O_4 C O_5

4.The Equivalent Materials, Pretest, Posttest Design

O_1 X_{MA} O_2 O_3 X_{MB} O_4

X_{MA} = Teaching method A

X_{MB} = Teaching method B

O_1 and O_3 are pretests

O_2 and O_4 are posttests

The experimental design used for the present research work is given as follows

Quasi experimental designs

The pretest – posttest Nonequivalent group design

O_1	X	O_2	O_1O_3 = Pretests
O_3	C	O_4	O_2O_4 = Posttests

SAMPLING PROCEDURE

The primary purpose of research is to discover principles that have universal application, but to study a whole population to arrive at generalizations would be impracticable, if not impossible. Some populations are so large that their characteristics cannot be measured; before the measurement could be completed, the populations would have changed.

Fortunately, the process of sampling makes it possible to draw valid inferences or generalizations on the basis of careful observation of variables within a relatively small proportion of the population. A measured value

based on sample data is a statistic. A population value inferred from a statistic is a parameter.

A population is any group of individuals who has one or more characteristics in common that are of interest to the researcher.

The term 'sampling' means the selection of a part of group or an entirely with the sole aim of collecting complete information.
This entirely or totality of all members is known as 'population'.

A sample as the name implies, is smaller representative of a larger whole.

- George & Hatt

A sample is a small proportion of a population selected for observation and analysis.

The selected or chosen part, which is used to determine the feature of the entire population is known as sample.

A probability sampling can be divided in to four categories, namely simple random sampling, systematic sampling, stratified random sampling and cluster sampling similarly non probability samples can be divided in to three categories, namely quota sampling, convenience sampling and judgment sampling.

1. Simple random sampling

   Simple random sampling is a process, which ensures

   That each of the samples of the size n has an equal chance of being selected for the purpose, which means that under simple

random sampling, each and every element of the population has an equal probability of being included in the sample.

1. lottery method
2. card/ticket method
3. Tippet method

2.Systematic sampling

systematic sampling is sampling in which individuals are selected from a list by taking every n^{th} name.

systematic sampling is in most methodological way and proceeds by picking up one element after a predetermined time depending on the sampling ratio.

e.g. If we want to have a sample of size 10 from a population of size 100, our sampling ratio would be

$n/N = 10/100 = 1/10$

We would therefore, have to decide where to start from among the first 10 names in our frame. If this number happen to be 8 for example, then the sample would contain member – having numbers 8, 18,28,-------,98 in the frame.

3.stratified sampling

Stratified sampling may be complex than simple random sampling, but where applied approximately, stratification can considerably improve the statistical efficacy of sampling. The basis for using stratified sampling is the existence if strata such that each stratum is more homogeneous within and markedly different from another stratum. The

higher is the homogeneity within each stratum, the higher the gain in statistical efficiency due to stratification.

The strata are so clear that they represent a partition of the population.

4. Cluster sampling

cluster sample is sampling in which groups, not individuals are randomly selected. All the members of the selected group have similar characteristics.

-Gay 1992

Suppose we are interested in knowing the demand for some consumable items in a residential area. The area is divided in to 13 blocks. We might use cluster sampling in this situation by considering each block as a cluster. We will then select any 3 or 4 blocks out of the 13 blocks at random or systematically as situation deems fit and then collect information from all families residing in those blocks.

5. convenience sampling

Under convenience sampling, as the name implies, the samples are selected at the convenience of the investigator. Here, we have no way of determining the representative ness of the sample. This results in to biased estimates. This method may be quite useful in investigate design as a source for formulating hypothesis. This is also useful in testing of questionnaire etc.

6. Judgment sampling

Judgment sampling is also called purposive sampling. Under this sampling modus operandi, researcher intentionally or deliberately draws

a sample from the population, which he thinks is a representative of the population. Needless to mention, all members of the population are not given chance to be selected in the sample. The personal bias of the investigator has a great chance of entering the sample and if the investigator chooses a sample to give results, which favor's his viewpoint, the entire study may be vitiated.

7. Quota sampling

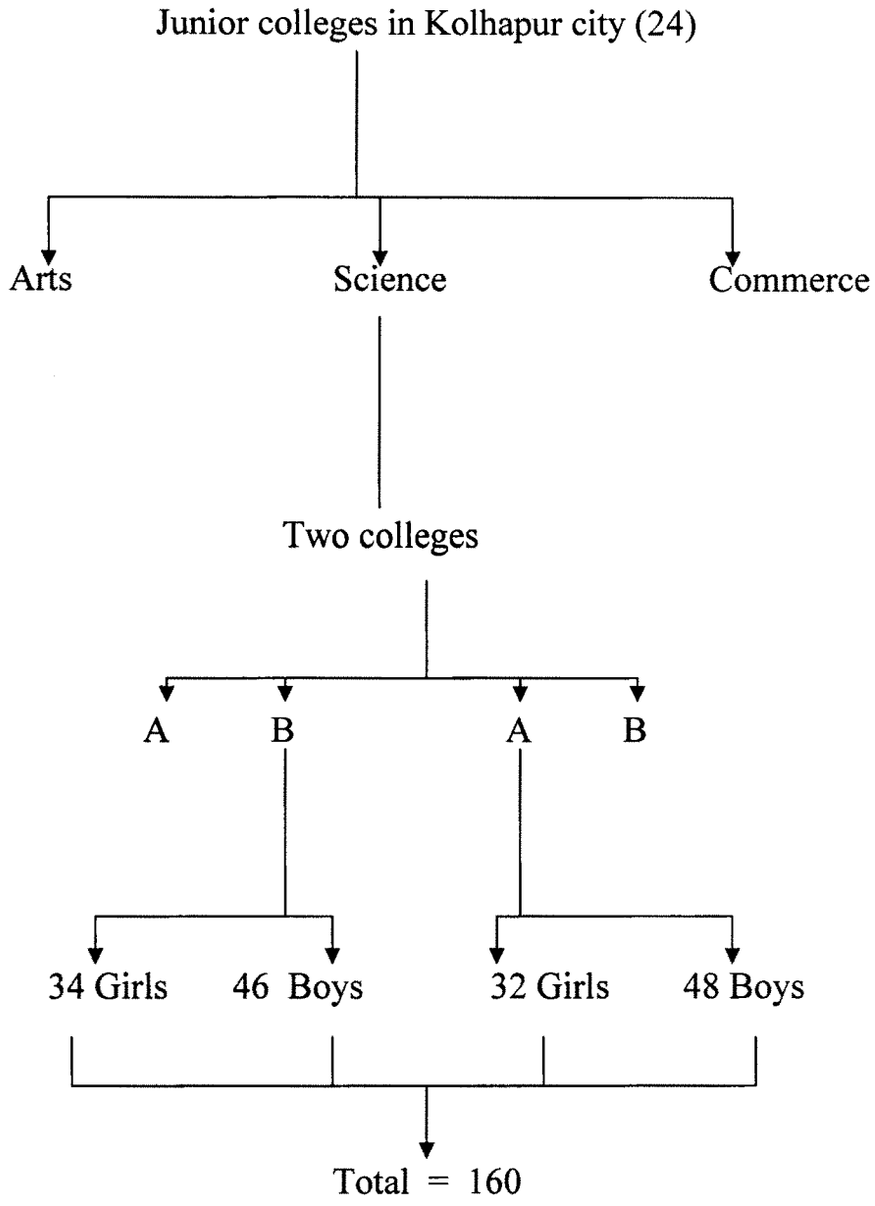
This is a very commonly used sampling method especially in social research studies. Here the sample is selected on the basis of certain basic parameters such as age, sex, income and occupation that depict the character of the population so as to make it representative of the population. So as to make it representative of the population. The investigator or field workers are instructed to select a sample that matches to this parameter.

Sample for present study

All junior colleges in kolhapur city form population of the study. The sample for the study will be selected as follows.

Fig. No. 3

Selecting sample and subject for the study



Junior colleges in kolhapur city are 24 in number. But the junior colleges which are attached to High schools and also have science stream are

only 6 in number. From these 6 colleges 2 colleges are selected by convenience sampling method i.e. the sample selected at the convenience of the investigator. These colleges have two divisions of science stream , By using simple random sampling i.e. lottery method, one division from each college is selected.

In Rajarshi chhatrapati shahu Maharaj High school and junior college seleted division contains 34 Girls and 46 Boys and in case of Maharashtra junior college the selected division contains 32 Girls and 48 Boys for this purpose stratified random sampling method is used. In this way the total sample selected is turn out to be 160.

TOOLS OF RESEARCH

Quistionnaire, Oppnionnaire, Inventories, Observation; Rating scale, Scorecard, The scaled specimen, Interview; Sociometry, Sociogram, Guess who technique; Social distance scale are the tools used for research in this study researcher is using Achievement test as a research tool.

To investigate the present problems, the researcher used the following tool to collect data.

Designing a questionnaire

A questionnaire or opinionnaire is one of the many ways through which data can be collected. Both questionnaire and opinionnaire are widely used by researchers to collect information on related study. questionnaire is a method of getting data about respondents by asking them rather than by observing and sampling their behavior. Questionnaire should

be standardized, it's anonymity can be assured and questionnaire should be designed to meet the specific purpose of research.

The questionnaire must have the following characteristics-

1.Construction of the questionnaire should be relevant and specific to the problem and reflect quality.

2.It should be as concise as possible and to the point so that respondents should not get bored.

3.Items should be properly phrased in easiest language for easy understanding with no ambiguity.

4.Questionnaire should have a very positive approach.

5.Questionnaire must possess exhaustive alternative.

6.Questionnaire should be in order with logical arrangement.

7.No or minor calculation.

8.Avoid double barreled questions and give footnotes.

9.Avoid personal and embarrassing question.

10.The precision of hypothesis.

Achievement Tests

Achievement tests attempt to measure what an individual has learned – his or her present level of performance. Most tests used in schools are achievement tests. They are helpful in determining individual's or group status in academic learning. Achievement test scores are used in placing, advancing, or retaining students at particular grade levels. They are used in diagnosing strengths and weaknesses and as a basis for awarding prizes, scholarships or degrees. Many of the achievement tests used in schools are non standardized, teacher – designed tests.

In research, achievement test scores are used frequently used in evaluating the influences of courses of study, teachers, teaching methods, and other factors considered to be significant in educational practice.

For this present study researcher is using a achievement test which is prepared by him on his own and this test carrying 20 multiple choice questions which are based on previous knowledge and present syllabus of XIth standard physics subject. This test is checked by some of the experts such as High school teachers and Junior college teachers, these questions are based on the objectives such as knowledge, Understanding, Utilization and skill.

DATA COLLECTION

Data collection is another important phase in a research project. In this step the information required for the purpose of the study is collected. Researcher has studied only two junior colleges in kolhapur city. The sample was taken from two junior colleges i.e. Maharashtra junior college and Rajarshi chhatrapati Shahu Maharaj Junior college From science faculty only.

The researcher administered Achievement test as pre test for both colleges and during experiment researcher designed concept maps with the help of students in experimental group. In this process researcher write some of the points related to selected concepts and ask students to correlate them in such a way that they represent meaningful relationships between concepts in the form of propositions and the more general, more inclusive concepts should be at the top of the map, with progressively more specific; less inclusive concepts arranged below them.

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KOLHAPUR

In this process researcher used the process of brainstorming and correlate these points properly.

After this these concept maps are checked by experts and then they are used for guiding the students and along with this Maharashtra college (Control Group) by regular method of teaching and again administered achievement test as post test for both colleges and collected the necessary data as per requirement was collected.

Analysis of the Data

The collected data from achievement test may have little meaning to the investigator until it was statistics is a process for gathering, organizing, analyzing and interpreting numerical data.

1. The raw scores obtained by administering the achievement test (Pre test and Post test) from two junior college Students presented in appendices B.

DESCRIPTIVE ANALYSIS

Data were described interms of different characteristics of groups. Several basis types of statistical measures are appropriate in describing and analyzing data in a meaningful way.

For the present study following statistical methods were used.

1. Mean
2. Standard deviation
3. 't' test

ation:

$$r \frac{\Sigma fx}{N} \times i$$

$$\sqrt{\frac{\Sigma fx^2}{N} - \left(\frac{\Sigma fx}{N}\right)^2} \times i$$

$$\frac{M_1 - M_2}{\sqrt{\sigma_1^2 + \frac{\sigma_2^2}{N_2}}}$$

M_1 – Mean of experimental sample

M_2 – Mean of control sample

N_1 – No. of cases in experimental sample

N_2– No. of cases in control sample

σ_1^2 – Variance of experimental sample

σ_2^2 – Variance of control sample