Chapter 3
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This describes the conceptual framework of the plans and procedures which are in order to achieve the objectives of the study. It consists of a statement of variables, method to measure them, description of the sample, process of standardization and validation of the test prepared and procedure for measuring the understanding of biological science concepts chosen for the study.

3.1 variables of the study

3.1.1 Independent variables

Following are the independent variables
1. Gender
2. Language
3. Residential Background
4. Student level

3.1.2 Dependent variables

Understanding of biological science concepts is dependent variables

3.1.2.1 Elements of dependent variable
1. Cell,
2. Cell division,
3. Genetics,
4. Human Genetics

3.2 Population of the study

A well defined collection of objects, units, events, individuals or things.

Which are of unique interest to a research investigator, is called a population. The population of the present study consisted of all the students studying in 12th standard in the secondary schools of Lalitpur city.

3.3 Sample and sampling technique

As already described formal operational stage is good to check about the concept formation. Therefore 150 students from 8 different schools from class 12th were selected. These schools were different according to their medium of instructions and locality.

41 students of 2 different undergraduate colleges were also be part of the study, that's how researcher became able to compare their understanding with class 12th students.

Schools were selected based on medium of instructions and locality. And in these schools some students were selected randomly for administrating the test.

3.4 Hypotheses

Following hypotheses were formulated:

1. **Null Hypothesis 1(Ho$_1$):** There is no significant difference in achievement of biology between girls and boys students

2. **Null Hypothesis 2(Ho$_2$):** There is no significant difference in achievement of biology between Hindi and English medium students

3. **Null Hypothesis 3 (Ho$_3$):** There is no significant difference in achievement of biology between Hindi and English medium students

4. **Directional hypothesis 1:** Undergraduate students have more understanding of biological concepts than intermediate college students

3.5 Method

Descriptive survey method was used to conduct this study. The tool was developed by researcher to collect data.

Collected data is analyzed in two ways. Firstly mean score and standard deviation of different separate groups were calculated. With help of mean score and standard deviation, t value is found. And then researcher concluded the difference in scores of different groups whether it is significant or not. Secondly Researcher collected the quantitative data with the help of developed tool and converted it into rating scale. 5 point rating scale was used.

After converting whole data into rating scale conclusions were drawn from rating scale table.

3.6 Research design:

Design for this study is explanatory design. It is a two phased mixed method design. The overall purpose of this design is that the qualitative data helps explain or build upon initial quantitative results.

This was a suitable research design for the study, qualitative results are made on the basis of quantitative analysis

3.7 Description of the Tool

The term research instrument refers to any tool that may use to collect or obtain data, measure data and analyze data that is relevant to the subject of any research.

The format of a research instrument may consist of questionnaires, surveys, interviews, checklists or simple tests. The choice of which specific research instrument tool to use depends on the nature of the study. It will also be strongly related to the actual methods that will be used in the specific study. The present study aimed at investigating the development of understanding of concept of biological science in relation to gender, locality, and medium of instruction and level of college. But no tool was available for measuring the understanding of biological concepts. Therefore it was felt necessary to develop a test for measuring the development of biological science concept in 12th grade Science students. A test entitled 'biological science concept understanding test' was constructed and standardized by researcher and has been used as a tool in this study.

3.7.1 Need of Biological Science Concept Understanding Test

The construction of the biological science concept in standing test was undertaken to meet the requirement of a tool to assess the understanding of biological science concept in 12th grade Science students. There are many available test but they were not suitable for the local context. Development of understanding of Concept among students may be contextually different. The same situation may convey different meaning to different people. Different investigators have use test based on different concept to measure understanding at different levels. Only a few studies have been conducted in the area of understanding of concepts in science. For measuring understanding of concept

in science of higher secondary school students a valid and reliable tool was needed. Investigator decided to construct such a tool.

Understanding of concepts is the main factor for success of students in the discipline of knowledge. Thus development of instrument to measure the development of understanding of Concepts is justified.

3.7.2 Areas selected in the test

This is this was a short study so it was not possible to include every area from the Biology. So researcher included only four areas from the biology. These are

1. Cell biology, 2. Cell division 3. Genetics 4. Human Genetics

3.7.3 Format of the test

The format of biological science concept understanding test was that of multiple choice type items. Each question consists of stem and four alternatives. Out of four alternatives one was the correct answer of the question and rest 3 were the distracters, which attract or distract the respondents and also belong to different type of concepts.

3.7.3.1 Definition of the multiple choice items

The item which has one stem in the form of a question or incomplete statement premise which is generally followed by a set of 4 answers of options.

In these questions there is a stem in the form of question and four alternative answers are given and the student is required to select the most correct answer or option.

3.7.3.2 Advantages:

1. They are suitable for measuring knowledge, comprehension, application, analysis and synthesis.
2. They are suitable due to little training in testing field

Table 3.1 Test area and no. of items

S. No.	Area from the biology	No of items
01.	Cell biology	05

02.	Cell division	05
03.	Genetics	05
04.	Human genetics	05
	Total	20

3.7.4 Validation of the test

Content and criterion validity of the test were estimated and established. This help in collecting sufficient evidences of the test.

3.7.5 Administration of the biological science concepts understanding test

Biological science concepts understanding Test was administered in classroom in group. After taking the written permission from the director /manager /principal of the school or the college. Test was done in groups in the class. General introduction of was given by researcher himself and told them to go through the instruction and then start responding. For responding to values 30 minutes were given to them.

3.7.6 Scoring

Scoring of biological science concept understanding test is very easy simply one mark is given for each correct response and zero is wrong responses. After the sum of all correct responses were added to get the total marks obtained by a student in biological science concept understanding test.

3.7.7 Data sheet

Along with the instructions, items of biological science concept understanding test and answer sheet, personal data sheet is also given to the students in order to get information about gender location, family background etc.

3.7.8 Analysis of samples

For the analysis of sample, same sample is broken down between male/female, urban/ ruler and the Hindi/ English according to their already decided criteria.

3.8 Data Collection and entry

Data collection is a very important step in conducting research and can influence results significantly. As described a test was administered and

responses of students were collected. Researcher checked all the responses and assigned one mark of each correct response. After checking the test papers the data of different students was stored. The detailed description of data in presented in next chapter.

3.9 Data Analysis

Data analysis is a necessity for making well-informed and efficient decisions. Data analysis is important in education to understand problems facing an organization, and to explore data in meaningful ways. Data in itself is merely facts and figures. Data analysis organizes, interprets, structures and presents the data into useful information that provides context for the data.

Collected data is analyzed in two ways. Firstly mean score and standard deviation of different separate groups were calculated. With help of mean score and standard deviation, t value is found. And then researcher concluded the difference in scores of different groups whether it is significant or not.

Secondly scored were compared with a rating scale. Obtained score is converted to percentage.

The level of scores was like given in table 3.2

Table 3.2 scale for frequency of scores

Very poor	Poor	Average	Good	Excellent
0-20 %	21-40 %	41-60 %	61-80 %	81-100 %

After converting whole data into rating scale conclusions were drawn from rating scale table.