Chapter 1
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The secondary education commission (1952-1953) has recommended that every secondary school student should study general science as a compulsory subject. So that they can gain a basic quantum of scientific knowledge as a part of his general education.

The study of science has its special importance both in the personal and social life of any individual. It is not only the joy and bliss obtained from successful investigation of scientific problems but it also provides self confidence and insight for solving problems faced in life.

The teaching learning process plays a vital role for solving any problem. This process is an interaction between teachers and learners. Whose some behavioral changes are produced as a result of their mutual understanding and transmission. When a learner wants to learn to solve any problem, he sometimes feels it rather difficult to do so, i.e. to find the solution of the method of solving it or to evaluate the behavior by him. The steps of teaching learning includes three way communication which is the principle function in effective teaching learning process i.e. communication from teacher to learner and from learner to teacher and again from teacher to learner. Through this three way communication, the teacher could know how his learning is effective and suitable to the learner, and could direct his course of teaching correctly.

The mastery learning programme intends to be of great use to teachers when they are faced with a more heterogeneous group of students than before. It is felt that principles, which a teacher should follow to make the teaching learning process creative, are very practical. To make the teaching learning process more effective the creative ability of the learner is a very important factor and thus it is fundamental work to see how the learners have their varying creative ability.

Science is one of those human activities that man has created to gratify certain human needs and desires. The search for truth became the dominant motive in the prosecution of science. It has been pursued for so many centuries and attracted ever wider extent of attention of a much persisted group of people. Science is valued for its practical advantages though it is valued for gratifying disinterested curiosity and as an object of great aesthetic charm. It is quite obvious that the bulk of mankind value science chiefly for the practical advantages it brings with it.

In the words of Indian Education Commission (1964-66)

"There is of course, one thing about which we feel no doubt or hesitation , science based education , along with Indian culture and values can alone provide the foundation as also the instrument for the nation's progress , security and welfare." (pp 7)

The modern age is the age of science, which has given us wonderful gifts. In our everyday life we use so many things given by science, there is no sphere of life, which science has not touched. Science education occupies a very eminent place in curriculum, at both school and university education in India. Continuous advances in scientific and technological research have led to the growth and greater application of science in contemporary society. Accordingly science became a priority area in education both at the compulsory education level as well as level of specialization. Science education is supposed to perform two field tasks. The prime objective from individualistic perspective is the cultivation of scientific temper which includes a spirit of scientific enquiry, a dispossession to reason logically and dispassionately, a habit of judging beliefs and opinions and available evidence, readiness to very reject unfounded theories and principles, the courage to admit facts howsoever, unsettling or disagreeable they might be finally recognizing the limits of reasoning power itself. Secondarily it is also expected of science education that it would give individuals a firm grasp of the concepts and processes of science and impart to them the ability to use the scientific method of problem solving and the techniques of observation and experimentation in handling problems of comprehension or life. At the societal level one of the major objectives of science education is to equip individuals to participate in the creation of a society which is free from poverty, hunger, disease and evils such as violence, exploitation, oppression etc.

So from these points it is very clear that understanding concepts in science is very important. Biological science has a very important role in our life .It has influenced each and every aspect of our life. Nowadays the application of various biological sciences has made our life comfortable and easy. Genetic engineering the gene mapping , genetic code and gram cloning and recombinant DNA technology in different areas of biological science and biotechnology. Biological concepts are used in different areas like plant and animal disease and so many abnormalities. However it has been seen that in the school teaching some students understand biological concepts easily as compared to other students because each individual student differs in his intelligence and creativity from others.

The National Policy of Education 1986 has given too much importance to science education and their concept attainment, according to NPE, 1986.

"Science education will be strengthened so as to develop in the child well defined abilities and values such as spirit of enquiry, creativity, objectivity, the courage to question and aesthetic sensibility." (pp 31)

Understanding of concepts of central importance from the point of view of science education. The role and significance of biological science in the process of intellectual development has been pointed out earlier. A well planned scheme of science education is essential for developing scientific thinking among students.

In learning context stages of cognitive development have been recognized by many scientists on the basis of their educational experiences and experiments.

Piaget, (1950) has suggested 4 stages of intellectual development. Also many studies have conducted on understanding of concert in Biology chemistry physics and math e.g. Jerkins (1969), Klopfer and Coley (1963), Olstand (1969), Trobridge and Mc Dermatt (1980) and Pachal (1990), etc researchers have attempted to study the various aspects of the dynamics of conceptual understanding.

Individuals differ in their level of concept attainment on the basis of their age, aptitude, intelligence, creativity, experience etc. Biological science basically involves a set of abstract concepts represented by a set of abstract symbols, sign formulas and equations. To really understand all these students must be able to adopt the point of view of those who defined it. A formal operational stage student should be able to perform abstract intellectual operations as a Biological science is full of concepts which require concrete, formula operations and inductive generalization in abundance.

It is in the mind of the present investigator that the students of the concrete and formal operational stage of the higher secondary school find it difficult to follow concepts in biological science. Without understanding the concept of biological science, students will not be able to understand the fundamentals related with the application of conceptual understanding in science.

Many studies have indicated that scientific aptitude is related with scholastic ability or even with GMA. Many other variable can also be though of as being of as being related to the dependent variable " understanding of Biological science concepts" but due to paucity of time and other constraints only gender , living place and language were considered as important related independent variable affecting the understanding of Biological concepts.

1.2 Statement of the Problem:

Considering the above argument, the following problem was chosen for extensive and detailed study. 'A STUDY OF BIOLOGICAL SCIENCE CONCEPTS OF STUDENTS AT SENIOR SECONDARY LEVEL'.

1.3 Justification of the Study

The selection of the above problem for intensive study is justified on the following grounds. As it has been pointed out earlier the issue of understanding of biological concepts in school is very important. Why one student develops conceptual ability easily as compared to other students. What correlates of understanding are potent determinants of biological science ability are important question in this context.

Review of literature on understanding of conceptual science reveals that sufficient studies have been conducted on science ability but no co-relational study has been conducted on understanding of concept. In our country no study is available which can describe the understanding of biological concept in relation to gender, location and language.

Educator scientist and policy makers are stressing the need of developing and standing of concept in biological science among the students so that they may contribute their best for the achievement of Science and Technology in a developing country like India.

Kothari Commission (1964-66) realized the issue in the following words

"We lay great emphasis on making science an important element in the school curriculum. We therefore recommended that Science and Math should be taught on a compulsory basis to all pupils as a part of general education during the first 10 years of schooling. In addition there should be provision of special course in these subjects of the secondary stage, for students of more than average ability. This program can become meaningful and useful only if the science curricula are reorganized and brought up to date, the methods of teaching are visualized and proper facilities are provided for the teaching of the subject."

In India not much attention has been paid for the development of conceptual understanding among students through School curriculum.

The construction of the test was undertaken because it was realized that there are many test for measuring achievement in biological science but no test is there for measuring the understanding of concept in biological science at

formal operational stage, sample of students of grade 12th was selected because the students in this greater in formal operational stage of cognitive development which is very crucial from the point of view of concept formation.

All previous researches are old and in recent years ICT has been introduced in a very large manner. So we can assume that there should be a clear understanding of these concepts. But still there is a need to get a certain answer.

1.4 Explanation of important terms:-

Understanding

Understanding is a combination of two stages i.e. comprehension and application. Comprehension is an ability to translate, to interpret and to explore the ideas and things into own' words. Application is an abstraction in particular and concrete situation and applying it in subtraction in other way.

Concepts

A concept is defined as a general idea of something. It is an understanding retained in the mind from experience, reasoning and/or imagination; a generalization (generic, basic form), or abstraction (mental impression), of a particular set of instances or occurrences (specific, though different, recorded manifestations of the concept).

Biological concepts

Biology is study of living things and their vital processes. This field deals with all the physicochemical aspects of life. There are many concepts in biology but Cell Biology, Cell division, Genetics and Human Genetics are used in this study.

1.5 Objectives of the study

1. To find out gaps in Sr. secondary students' understanding of biological concepts

2. To compare the understanding of school students and undergraduate students based on achievement in biological concepts

3. To compare the understandings of male and female students based on achievement in biological concepts

4. To compare the understandings of Hindi and English Medium students based on achievement in biological concepts

5. To compare the understandings or rural and urban students based on achievement in biological concepts

1.6 Delimitations of the study

The present investigation was delimited in terms of content of subject matter, area, demography and sample. These delimitations were to complete it successfully in time. Following are the delimitations of the study:

1. The content of the subject matter consists of understanding of concepts in biological science. Out of number of areas in biology only four were selected.

2. From among many demographic variables only locality, gender and medium of instruction were selected for the study.

3. Students were selected only from the Lalitpur district of Uttar Pradesh.