# Chapter 1

## The Problem

1.10 Introduction

1.20 Conceptualization of the problem

1.30 Statement of the problem

1.40 Scope and significance of the study

1.50 Purpose of the study

1.60 Formulation of Hypotheses

1.70 Delimitations of the study

1.80 Conceptual Framework and Operational Definitions.
The methodological sophistication that science and technology have attained and the ideological revolution in the Political philosophy that the democratic nations of the world have evolved, have correspondingly changed the cognitive world, affective domain and action tendencies of human beings. The educational system of a nation too has, therefore, witnessed a significant departure from its traditional philosophy, theory and practice.

Great emphasis on rote memorization and cramming of learning experiences has been bitterly criticized in the present system of education. Education, according to Guilford (1962, 344), has been too much dominated by the learning theories based upon S-R model of the behaviourist's school of psychology.

'People are not to be considered as rats or pigeons. We must apply a psychology that makes full use of their intellectual potentialities and creative talents' (Guilford, 1962, 344). Such a change in the educational philosophy brought about a corresponding
change in the educational practices also. In the
'learning child' in the present system of education,
the Piagetian school of thought gave a new direction
by introducing the concept of a 'thinking child' in
educational horizon. Now, the time has come when the
child has to be taught the techniques of 'learning to
learn' as well as 'Learning to think' rather than
measuring various concepts by devices and techniques
advanced in learning theories. Bruner (1956) and
Liggsory (1972) have specified that the teacher in the
class-room should recognize the potentiality of the
'thinking child' and therefore, they have specifically
mentioned that "schools do not teach reasoning or
problem-solving or permit creativity". The child is
not allowed to formulate his own concepts and test them
out. Relatively insignificant and negligible research
on higher mental processes including problem solving,
hypothesis testing, reasoning, concept acquisition
and creative thinking, has tempted the present investi-
gator to shift the centre of research from a 'learning
child' to a 'thinking child'. The current literature
singularly identifies the great significance and high
relevance of studies on higher mental processes.

Identifying current trends in learning theory,
Jergenhahn (1976, 374) categorically writes that:
"Cognitive processes such as concept formation, risk taking and problem-solving are again a respectable and popular topic of study. Cognitive processes, because of their apparent close relationship to introspection, were largely ignored during the dominance of behaviourism. It should be clear that in turning again to cognitive processes, psychology is broadening its base, but it is not becoming unscientific. Behaviourism was an extreme reaction to the method of introspection and was an attempt to make psychology a science by giving it a reliable, observable subject matter behaviour. There are those who maintain that behaviourism threw out the baby with the bathwater by defining behaviour in such a way as to exclude "higher mental processes", such as concept formation and problem-solving, or thinking in general. Currently, these areas are of vital interest to psychologists and they are being explored scientifically.

Supporting such a view, Saltz (1971, p. vii) also remarks that "..... Psychologists in the area of human learning may have lost some of their fear of studying complex processes. There has developed a lively new interest in such issues as the nature of concept acquisition, the role of strategies in learning; and the more general question of the nature and function of variables like intention, meaning and imagery".

The pedagogical psychology has now adopted the concept of human engineering in the study of the child. It goes beyond the traditional concept of learning and conceives of "the individual as a feedback system which generates its own activities in order to detect and control specific stimulus character-
eristics of the environment. The concept of human engineering observes the principles of behavioural cybernetics and considers the behaving individual as a closed loop or cybernetic system utilizing the processes of auto-sensory feed-back in the continuous auto-control of behaviour (Smith and Smith, 1956).

Thus, the cybernetic theory of learning or thinking analyses the intrinsic mechanisms by means of which control is established and maintained; that is, the closed-loop sensory feed-back mechanism observes the auto regulation of interactions between the individual and his environment. In contrast, the conventional learning research conducts open-loop analyses of the relationships between extrinsic events—stimuli and reinforcements, and observed responses. In view of the fact, as Piaget (1929) observes, that "children are always intellectually active. They are striving to assimilate information and make it fit their concepts of the world, changing their concepts in order to accommodate information that disagrees with them and trying out various activities in order to test their concepts further", it is desirable to redesign our learning situations during class-room interactions to fit the control capabilities of the learner. This cybernetic concept in thinking stands as a challenge for the maximum actualization and activation, auto utilization and control, of the brain
impulses. The higher mental processes that include cognitive processes, creative thinking, problem-solving, concept formation, hypothesis formulation and testing ability, undoubtedly, are regulated by the electrical operations of the brain. In view of the insignificant and insufficient studies on higher mental processes, particularly, on concept formation and concept learning, as evident from the preceding discussion as well as from the review of relevant literature (Chapter II), it is worthwhile to shift the centre of research from traditional topics on 'Learning' to an emerging one on 'Thinking'. In this regard, 'concept formation' as one of the categories of thinking occupies a very promising place in the priority list. This alone speaks of the great relevance and significance of the present study on concept formation among the school children.

1.20 CONCEPTUALIZATION OF THE PROBLEM:

Wilson et al. (1972) have identified 'conceptual learning' as level II learning; the other two extreme being 'associative learning' as level I while 'creative learning' being level III. The present study has been conceptualized on 'concept formation' as Level II learning which includes numerous terminologies in conceptual learning.

Butcher (1970) specifies that:
"Terminology tends to vary according to the design of the experiment and the theoretical orientation of the experimenter, and rather similar processes are variously described as concept learning, concept identification, concept attainment, concept formation. 'Concept learning' best describes those experiments (e.g. Hull, 1920) in which the experimental design emphasises the similarity of the mental processes employed to those required in discrimination learning, and where the subject may recognize examples of the concept without being able explicitly to formulate it. 'Concept attainment' and 'concept identification' seems to be practically synonymous and describe the results of experiments in which the subject is required to 'attain' or 'identify' a concept or category predetermined by the experimenter" (Butcher, 1970, p. 70).

"Concept formation' rather involves the initial mental process in which the content is imprinted for the first time in the mind with its specific common characteristics to a general class of subjects by a process of generalization, discrimination, analogy or classification. It is a process by which a person develops a common response to a general class of objects having certain features in common. In the concept formation process the object is imprinted by a process of generalization, classification, or categorization on the strength of its specific basic common attributes of a general class of objects; and thus mental image is formed which helps the subject to differentiate one subject from the other. The entire concept formation process can be said to be an 'object attribute imprinting and classifying mental
process'.ondler (1961, p. 447) has defined concept formation "as the acquisition or utilization or both, of a common response to dissimilar stimuli". 'Concept attainment' or 'concept identification' starts processing on the conceptual imagery of the objects whose concepts have been already formed in the mind. Thus concept attainment or concept identification functions on the base of concept formation process. Concept attainment indicates that a subject has been subjected to learning situations, and from which, he has acquired a certain level of proficiency in the learning of concepts. Thus, concept attainment is entirely a 'learned process'. Concept identification too is a 'learned process' which employs only 'discrimination learning' as a technique of evaluating the learned materials so far as the screening of concepts is concerned. Concept learning or concept acquisition is a broader term which includes most of the terms of conceptual learning.

In view of the fact that 'concept formation' constitutes the base of 'concept learning process', the knowledge of its relationship with other cognitive or affective processes may enlighten some new facts which may help the teaching-learning process, and give new direction to developmental studies.
The learning of concepts and principles requires the students to engage in what Piaget calls 'abstract thought'. According to Piaget (1956), the child's stage of development determines the level of thought of which he is capable. In the context of school learning, the expectation from the child of the adult's learning capacity is rather misleading. This logical deduction leads us to think that there may exist some linear relationship between concept formation and intellectual development. Piaget's classification of intellectual development has a direct bearing upon the learning process. "The child in the period of concrete operation can learn concepts which require the classification of concrete objects and events. In acquiring new concepts, he can employ his rudimentary concepts of time, space, number and logic. His intellectual operations or groupings of this period show the characteristics of closure, associability, reversibility and identity. The child in the period of formal operations can handle principles as well as concepts, since principles are a form of proportional and hypothetico-deductive thinking" (Piaget, 1956).

Piagetian thinking certainly speaks of the fact that there exists a linear relationship between concept formation and intellectual development; however, it hardly points to the nature, kind and form of the
concept formation under the conditions of accelerated or retarded mental development. Does intellectual level determine the nature and kind of concept formation? It can be assumed that variations in general mental ability must bring out a corresponding variation in the units and classes of the concepts formed as a consequence of variation in the concept formation process due to the differential level of mental ability. Since the mental ability of the intellectually gifted is different from that of the mentally retarded ones, there must exist a differential kind of concept formation process leading to a differential pattern of concept formation as a product of the process. The present study, to this extent, thus, becomes an extension of Piaget’s developmental work. Hao (1971) conducted a study on ‘strategy in concept learning’ in which he has attempted to study the effects of intelligence, attitude towards problem-solving, and ego-strength on concept learning. No other dependable literature beyond this on Indian children (Chapter II) has come to our notice so far which studies how intellectual levels determine the nature, form and kind of concept formation. Mc Nemar (1964, p. 87) has specifically pointed out that "There are other areas; such as reasoning, problem-solving, and concept formation, in which one might expect to find some consideration of intelligence as an aspect". Mc Nemar’s statement,
thus, supports our contention that study on concept formation as a function of general mental ability appears to be quite relevant and significant one.

High intelligence in itself does not ensure high order of learning outcome unless it is accompanied by motivational forces. Motivation is a driving force which activates an individual to work. Lack of motivation retards work-performance to that extent. Nod Flander's social interaction model (1964, p. 202) clearly points out that expansion of student participation occurs when the teacher employs motivational factors; i.e. accepting feelings, praising or encouraging the pupils. He points out (1964, p. 202) that "restricting student freedom of participation later in the cycle classroom learning activities increases dependence and decreases achievement". The studies conducted by Murray, Edward, V. (1964), Cofer and Mortines (1964), Fowler, Mary (1965), Mc Clelland (1961), Mc Clelland and Atkinson (1962), Vroom Victor N. (1964) and others clearly indicate that motivation plays a crucial role in work-output. From these studies, again a linear relationship between motivation and work-output can be established; however, no study (Chapter II) was available which is directly related to the achievement motivation and concept formation. Relatively, achievement motivation in comparison to other types of motivation, e.g. power
motivation, affiliation motivation, approval motivation, etc., is rather more closely associated with
and has got greater bearing upon the concept formation
process; though individual differences with respect to
their level of achievement motivation may correspond-
ingly affect the nature, kind and form of concept for-
mation. It would, thus, be interesting to know the
nature, kind and form of concept formation of pupils
with high and low achievement motivation. A different-
tial finding would have its significance in educational
planning, programming and teaching-learning process.

It is, thus, evident that concept formation as
level II learning in the class-room teaching-learning
situations have two important determinants besides
many others, which bear educational significance, if
proper study is conducted. No dependable literature
(Chapter II) is available on these aspects. Conse-
quently, the findings on the present study would
contribute significantly in the advancement of the
existing literature on higher mental processes with
special reference to concept formation.

1.30 STATEMENT OF THE PROBLEM:

The problem could be pin-pointedly stated as
under:

"A Study of Concept Formation as a Function
of Intelligence and Achievement Motivation".
Pinpointedly, the present research would undertake the 'relational strategy' of concept formation as coined by Bruner, Goodnow and Austin (1956).

1.40 SCOPE AND SIGNIFICANCE OF THE STUDY:

The preceding discussion under 'Introduction' highlights to a large extent the scope, need, significance and relevance of the studies on 'higher mental processes' whereas the need and significance of the present study has been discussed briefly under conceptualization of the present study. A further elaboration of its significance and relevance would make the problem more explicit and meaningful. The study of 'concept formation as a function of intelligence and achievement motivation' is a new horizon of knowledge which has been hardly explored so far.

In view of the fact that learning outcomes are largely determined by intellectual factors and motivational forces, we intend to know the limits and nature of concept formation under different levels of achievement motivation and mental ability. The study would have a great significance in educational planning and programming. Since no literature is available on concept formation as a function of general mental ability and achievement motivation, the findings on the present study would contribute significantly to the advancement of existing literature on 'concept forma-
tion. Thus, its relevance and significance are self-explanatory. The findings would help us in designing the course-contents and other learning experiences on concept learning; in accordance with the intellectual ability and motivational forces inherent among the pupils.

Its research implications and practical applications in teaching-learning process would bring about a change in educational standard. Further, the nature, kind, forms and threshold values of concept formation of pupils would give a direction and insight to developmental studies, thereby identifying the limits of concept formation of boys and girls with accelerated mental abilities and high achievement motivation in comparison to those with retarded mental abilities and low achievement motivation. Thus, the present study has a deeper implication and wider application in education and guidance, research and training, and planning and programming of man-power. And is, thus, useful to teachers, pupils, parents, planners, guidance-workers and policy makers.

1.50 PURPOSE OF THE STUDY:

The present study aims at examining and evaluating the nature, kind, form and limits of concept formation under extreme conditions of general mental ability and achievement motivation. Stated otherwise,
specific purpose, therefore, is to study concept formation as a function of general mental ability and achievement motivation. There, thus, emerges three-fold objectives which can be specifically presented as under:

1. To study the process (i.e. nature, form and kind) and product of concept formation under different levels of mental development.

2. To study the process (i.e. nature, form and kind) and product of concept formation under different levels of achievement motivation.

3. To study the interaction of intelligence (I) x achievement motivation (ach) upon the concept formation as a process and product.

These objectives of the study reveal that the nature of treatment of data, in the present study, may convert it into an evaluative, differential as well as correlational study. The functional aspect leads to interactional analysis.

The study is evaluative or interactional to the extent its findings reveal the general attributes of concept formation as determined by general mental ability and achievement motivation. It becomes a differential study when inter-group variations with respect to either general mental ability or achievement motivation or sex differences or any other
differential components in concept formation abilities are estimated. The correlational studies deal with the intervariable relationship in which concept formation functions as a dependent variable whereas intelligence and achievement motivation operate as independent variables.

1.50 FORMULATION OF HYPOTHESES:

With a view to explicitly and objectively undertake the present study, the objectives of the study have been translated and formulated in terms of hypotheses. The following hypotheses have been tested in this study. They have been categorized as under:

(1) Differential, (ii) Interactional and (iii) Correlational studies.

(i) Differential studies:

DH₁: "Verbal intelligence would significantly affect the nature, kind and form of concept formation'. Stated otherwise, "The nature, form and kind of concept formation of the (Hi) would be significantly different from the (Li) group'.

DH₂: "Concept formation would be significantly affected by achievement motivation". In other words, "There exists a significant difference between the concept formation abilities of the (Hi Ach) and (Li Ach) groups".
H_4: "There exists no significant difference between the nature, kind, form and level of concept formation of the pupils of Hi-Ln ach and (Hi-Ln ach) groups."

H_5: "There exists a significant sex difference in the concept formation abilities of the boys and girls, when they were classified in terms of extreme groups in accordance with their verbal intelligence and achievement motivation. Stated otherwise - "There exists a significant inter-as well as intra-group sex differences between the boys and girls of the (Hi-Ln ach), (Ln-Ln ach), (Hi-Ln ach) and (Li-Ln ach) groups".

(ii) Interactional Studies:

H_6: "Relatively, verbal intelligence would have greater effect upon concept formation than achievement motivation or sex."

(iii) Correlational Studies:

H_7: "There exists positive, linear significant relationship between dependent (concept formation) and independent variables \( \text{e.g.} \) - verbal intelligence \( \text{(CH}_7-a \text{)} \) and achievement motivation \( \text{(CH}_7-b \text{)} \); however, the coefficient of correlation in case of the former would be significantly higher than the latter."
1.70 LIMITATIONS OF THE STUDY:

Research does not aim at studying everything that is conceptualized. It keeps a limit which could be included in the study undertaken, and specifies explicitly the aspects which are considered beyond the purview of that study. The present study has been delimited by the following considerations:

1. It aims at studying 'Concept Formation' as a dependent variable whereas 'Verbal Intelligence' and 'Achievement Motivation' as independent variables. No other variable has been included in this study.

2. In the present study, concept formation ability has been evaluated on the test materials developed by Bruner, Goodnow and Austin (1956). Consequently, the method, procedure and technique followed by Bruner et al. (1956) in their study have been employed.

3. Data has been collected from the Hindi Medium Higher Secondary schools of Bilaspur town only. Pupils of both the sexes have been employed. The study proper has been conducted on extreme group pupils classified on the tests of verbal intelligence and achievement motivation. These extreme groups are the criterion groups for the present study.
4. It takes into consideration sex differences but not the geographical or socio-cultural variations.

5. Primarily, it is a differential study; however, it has been extended to correlational, interactional and developmental also to some extent. It is not an experimental study; though sufficient controls and precautions have been observed in the conduct of the study and data collection processes.

6. No attempt, in the present study, has been made to extend it to any other aspect whether procedural, methodological or contextual beyond what has been stated and specified above.

7. The present study deals with 'relational concept formation process' as described by Bruner, Goodnow and Austin (1956). It excludes the other two aspects, i.e. conjunctive and disjunctive. It aims at analyzing the responses on concept formation in terms of types of strategies as advocated by Bruner (1957).

1.80 CONCEPTUAL FRAMEWORK AND OPERATIONAL DEFINITIONS:

The present study has been conceptualized, designed and developed upon 'concept formation' as
dependent variable whereas 'verbal intelligence' and
'achievement motivation' as independent variables.
These psychological constructs have been defined in
detail in different text books; without any universal
generalization; however, they have also been presented
in brief in Chapter III under the caption "The Concept'.
To avoid duplication, operational definitions have been
presented in this caption.

1. Concept Formation:

(a) Concept of a concept:

Information is received by the sensory gate-
ways of knowledge through different nerves and trans-
mitted to the brain. Perception causes the processing
of sensory data for storage in the brain. Effective
perception, thus, helps the learner to assimilate,
accommodate, adopt and organize bits of discrete infor-
mation into an integrated whole through cognitive
associations. Concepts are the consequences of
learner's integration of relevant and related percepts.
The most commonly used definition of a concept is that
it is "a common response to dissimilar stimuli"
(Kendler, 1961, p. 447).

Thus, the term concept of a 'concept' refers
to a generalized idea of a class of things. Some-
times, a concept is the result of the process of concep-
tualization, but many concepts are formed through a
series of operantly reinforced discriminations; that is, associations in which a label or word becomes associated with an increasingly discriminate class of things. (Skinner, 1968)

(b) Concept formation and concept attainment:

According to Bruner, Goodnow and Austin (1955), concept formation is the inventive act by which classes are constructed. On the other hand, concept attainment refers to the search for the testing of attributes that help distinguish exemplars from non-exemplars.

Concept formation, therefore, could be understood as referring to how concepts are initially acquired, whereas concept attainment would refer to a translation process in which a concept already in the individual's repertoire is associated with a new name or symbol. Other terms associated with 'Concept Formation' have been distinguished earlier in this Chapter.

Since definitions of a psychological construct do not provide universal acceptance of the concept, it is customary to define them operationally with a view to arrive at an objective estimation of the concept.

For the present study, 'Concept Formation' has been operationally defined 'as the scores obtained on various sets of tests of concept formation as designed by Bruner (1957). Both the sets of test, e.g.
(1) Selection Test and (ii) Inference Problem Test, have been used; and they have been scored in terms of 'Time-scores' and 'trial scores'. Concept formation ability has been evaluated from both the points of view. It also gives a global estimate of the concept formation ability of the subjects.

(ii) **Verbal Intelligence:**

The concept of verbal intelligence has been presented in brief in Chapter III. However, in view of its controversial definition, the operational definition has been presented as under.

Verbal intelligence has been operationally defined 'as the total scores obtained by a subject on the PSM Verbal Intelligence Test' designed by PSM, Jabalpur (1963).

(iii) **Achievement Motivation:**

The concept of achievement motivation has been explained in Chapter III. From the points of view of the objective evaluation of the concept, achievement motivation has been operationally defined as under.

Achievement motivation as conceived by Mc Clelland (1953, 1960, 1963) and Atkinson (1958) has been operationally defined as the total score obtained by a subject on the Achievement Motivation Inventory (AMI) designed objectively by Prayag Mehta under
Indian conditions on the rationale of achievement motivation as described by Murray in his TAT.

No other new concept has been used in this study that needs conceptual clarification and operational definition.

The next chapter deals with 'Theoretical foundation' of the study which identifies the gaps existing in the current literature on 'Concept formation' and prepares a solid base for the development of the present study.