Cognitive Processes

Cognitive development is the development of knowledge. It includes acquisition of those abilities which help the individual to make sense of his own self and others, social and material environments; i.e., perceiving, organising, storing, retrieving, utilising, and transacting. Any attempt to understand human behaviour comprehensively must include the study of cognition and its development, since the process of learning is more important than the actual product of learnt. With the rapidly expanding quantum of knowledge in every discipline, emphasis should be given on the effective ways of learning (i.e., on how to learn) by which the child would be able to learn on his/her own, instead of trying to give the child all the information whatsoever under the sun. Therefore, the study of cognitive processes and their development has become important in various branches and disciplines of research.

One of the basic question in education is how to train the untrained—that is, how to develop knowledge, attitudes and skills in those individuals who lack these. The goal of education is incomplete if such training is not personally meaningful, and satisfying, not socially useful and productive, and not related to the individual's
ecocultural environment. In order to make education useful, it is necessary to equip the learner and modify him/her through appropriate training or instruction with a clear terminal objective, i.e., what the learner is expected to exhibit after training which he/she did not possess before. The goal is to change the individual for the better by helping him/her acquire new knowledge and skills. For the facilitation of the natural processes of development, meaningful strategies for training need be derived from different developmental theorists.

The concise Oxford Dictionary (1985) states that the word cognition means faculty of knowing, perceiving and conceiving. According to Flavell (1985), the cognitive processes that helps us to "know" and "understand" include a wide variety of activities, such as attending, perceiving, learning, thinking and remembering in short, the unobservable events and understandings that characterize the human mind. Almost everything we do while awake involves some kind of mental activity. We are constantly attending to objects and events, interpreting them, comparing them with past experiences, placing them into categories and encoding them into memory. Cognition, therefore refers to acquisition, storage, transformation, creation, evaluation and utilization of knowledge. Thus cognitive development is the development of processes and capabilities of understanding one's world, representing it and dealing with
it. It is, therefore, at the very core of one's functioning as a person.

The greatest contributor to the theory of cognitive development is the genetic epistemologist, Jean Piaget to whom human cognition represents a broad, complex, organised process of adaptation. Cognitive development is a continuous and sequential process from birth through adulthood till death according to Piaget who maintained that this sequence is invariant though the timing and rate of acquisition vary from culture to culture. Piaget used three basic concepts to explain cognitive development: content, functions and structure of cognition. The cognitive content refers to the internal representations of the environment and the behaviour of the individual. The major cognitive functions are organization and adaptation, the former making for integration, and the later comprising of the principles of assimilation and accommodation. Cognitive structure refers to the person's way of thinking or his system of processing information. The parts of a cognitive structure are mental actions or transformations. They are stable but not permanent. They are slower to change both qualitatively and quantitatively. In fact, cognitive development is synonymous with changes in cognitive structure, the basic cause of which is the process of equilibration. According to Piaget, however, cognitive development is a process in which each successive experience of the organism is fitted,
by the process of accommodation and assimilation, into the functional cognitive structure of that moment. Cognitive structure, on the other hand, means the schmata formed by the individual for his intellectual adaptation to the environment.

Cognitive development proceeds through a series of qualitatively different stages. In each stage the child's cognition is governed by a particular kind of cognitive structure. When the structure changes, the child's thinking changes qualitatively and is in the more advanced stage of development than before.

According to Piaget (1966, 68) the interaction of the four main factors whose interactions enable the child to acquire progressively more complex structures of thought are (1) biological maturation, (2) equilibration or autoregulation, (3) social transmission or experience with social environment, (4) experience with physical environment. The significance of learning and importance of educational experiences are determined with regard to their role in the equilibration processes. Piaget said that children learn through two main modes of action: motoric and verbal. He also discussed the four stages or levels of conceptualisation or mental representation such as, object (concrete objects and sensory-motor action), index (parts, models, statues, replicas), symbol (photographs, paintings, drawings) and sign (words-spoken, read, written).
Bruner's (1967) Theory of cognitive development is closely related to that of Piaget and follows a parallel line of thought. The development of his three modes of representation namely, the enactive, the iconic and the symbolic depend upon the three elements of culture, (1) type of environment (rural/urban), (2) language systems and (3) value systems evolved out of religious beliefs, myths and conventions. Two factors generally recognised to be very influential in building up operational structures are (a) educational activities of adults (b) language itself as a crystallization of syntax and semantics which, in their general forms, involve a logic. When Piaget and Bruner's classifications along with that of these generally recognised factors are considered together, educational and cultural transmission is thought to be of prime importance.

According to Bruner cognitive growth is the result of an internal "push" and an external "pull"; and involves the development and integration of enactive, iconic, and symbolic modes of representation. From this, certain implications for schooling follow. Firstly, the skills involved in perceiving, manipulating, and symbolically representing the environment should be developed to their greatest extent. Secondly, these skills can be taught in some form or other to all children of any age, but as they develop and their mastery increases, they will need to return to the skills on a higher
level. Hence, Bruner's image of the "spiral curriculum" was thought to be preferable to images of "ladders or courses" to be run. Thirdly, instruction should be related to the mode of representation used by the child, but growth should be encouraged by bringing the other modes to bear on the same problem. Finally, teaching should be concerned with structure not facts alone, so that the child is primarily engaged in learning how to know.

Inhelder et al. (1974) view that cognitive development results essentially from the dynamic interaction between the subject and the environment. In designing effective instructional procedures for fostering cognitive development, it should be primarily noted that the more active the subject as well as the more enriched and challenging the environment, learning is likely to better-successful, productive, regarding. However, being cognitively active does not mean that the child merely manipulates a given type of material, he can also be mentally active without sensori-motor manipulations; just as he can be mentally passive while actually manipulating objects. Intellectual activity is stimulated if the opportunities for acting on objects or observing other people's actions or for discussing correspond to the subject's level of development.

Vygotsky (1930-1935/1973) believed that all higher mental functions have social origins and appear, at first, on an interpersonal plane, between individuals, before they exist
on an intrapsychic plane, within the individual. Vygotsky suggested that communication, and with it culture and social life, have profound effect on how children think. He considers that language has determining effect on cognitive development. With the early interaction between the child and his parents in the form of gestures and some articulations, the process of intellectual development follows. In the course of interaction the child learns to associate arbitrary signifiers with a signified. As a result, language becomes both intra-personal and inter-personal, which together, shape a child's cognitive growth.

Luria (1977) considers human cognition as the product of social and cultural factors. A qualitative change in these factors can bring transition in the thought processes from the sensory to the rational involving more and more abstraction and generalization.

According to Uzgiris (1977) environmental influences have been conceptualized in at least four ways:

1. As expected background: Cognitive function needs some basic requirements to develop. The development of a child is equal to another child if his/her environment is above the threshold. Otherwise the development is adversely affected.
2. **The modifier of rate**: Variation in experiences gives rise to variation in cognitive functioning. The richness of the environment is correlated with the rapid development. So an optimal stimulation hypothesis is preferred by researchers, who in turn propose a curvilinear relationship between enrichment and cognitive functioning.

3. **As modifier of pattern**: Experiences influence the pattern of development in a significant manner. In this regard, a more detailed conception of the organization of achievements at different stages of development as well as types of experiences at each developmental stage is important. This will make it possible to examine what range of achievements at one developmental level can be sufficient to permit progress to the next higher level.

4. **Selective modifier**: Different environments provide varying opportunities for certain kinds of experiences in terms of the breadth of achievement as well as the rate of progress. The effects of experience may be thought to be selective not only in terms of the time of their occurrence but also in terms of the domain of competence affected. It is important to know such differential effects for an understanding of processes involved in development, even if they do not relate to the level of achievement over a long span of time.
From the foregoing discussion it follows that theorists as well as researchers equally emphasize the socio-cultural transmission as a vital factor for cognitive development. Piaget considers it as a factor third in order for development. All of them emphasize the impact of environment on the acquisition as well as functioning of one's cognitive skills, and maintain that development depends mainly on the resources and facilities in the social setting. The socio-cultural aspects which consist of child rearing and nonformal educational experiences are the organs of a society by which cognitive skills are facilitated. Important manifestations of human mental processes are directly shaped by the basic practices of human activity and different aspects of culture. If there is any deficiency in these aspects, cognitive development of children is hampered. In otherwords, the growth of cognitive processes are not fostered in a desirable manner in an environment which lacks appropriate socio-cultural stimulations and optimal experiences with the physical environment : commonly known as disadvantaged environments.

Recently, Dash (1989) has presented a comprehensive definition of the disadvantaged child : "A disadvantaged child is one (a) who has been denied the "Right of the child" proclaimed by the UNO's declaration of 1959/1990, (b) who suffers from a prolonged deprivation and/or a continuing inadequacy of the minimum necessary provisions for the
satisfaction of biological, psychological and social needs, 
(c) who is subject to developmentally detrimental external
stresses of any kind—natural or man-made, (d) who fails to
attain optimal growth and development in physical, mental and
spiritual domains and/or educational and social spheres, and
finally (e) who, thus, fails to achieve and realise his/her
innate potentialities, if any." In India, the term
disadvantaged is used to refer to the children of the SC
(Schedule Caste), ST (Schedule Tribe), the urban slums, the
coastal fishermen communities and a large segment of rural
population.

Further, the disadvantaged children have been
categorised into specific sub-groups for research and
training, although categorising the disadvantaged into
different sub-groups is not easy and sometimes becomes
arbitrary and artificial (Dash, 1989).

(a) socially disadvantaged — those who have been
discriminated and denied opportunities because of their
social, racial, religious and/or ethnic origin,

(b) economically disadvantaged — those particularly below
the poverty line who are unable to satisfy the basic needs of
life,
(c) **educationally disadvantaged** - those who have been
denied educational opportunities, equalities, privileges and
relevant experiences for learning,

(d) **linguistically disadvantaged** - those whose mother
tongues are denied the status of a medium of communication
and/or of instruction in the schools, and

(e) **culturally disadvantaged** - those who come from deprived
or disorganised cultural backgrounds, and/or those who belong
to a different culture compared to the dominant and majority
culture of the state or the country.

Disadvantaged children are viewed as lacking
certainty, adequate experiences, and curiosity. Montessori
characterized the environment of the disadvantaged child as
lacking the order and structure of that of nondisadvantaged
peers. It is often said that children from disadvantaged
backgrounds perform poorly compared to middle class children
on scholastic tests. Their language development is relatively
poor, and their cognitive skills are not at par with the
middle class children. Montessori emphasised that the
advantaged child had an innate pride in achievement and was
curious and highly motivated to learn. The disadvantaged
child is seen as coming from a background characterized by
disorder, lack of discipline and minimal reward for
intellectual efforts. The consequences of the deprived conditions result in the lack of language development, intellectual development, lower motivation, personality development with dependence and lack of competence. They show poor achievement in cognitive tests not due to the unfamiliarity with the materials but due to the lack of learning cues essential to solve various cognitive problems. For this they are unable to face and handle the new learning and cognitive situations. As a result, they are at increased risk for lower cognitive performance, and their performance is frequently associated with later school failure (Hess, 1970, Lazar, Darlington, Murray, Royce and Snipper, 1982). A large number of studies have also been done in the department of Psychology, Utkal University to illustrate this point (Rath, Dash & Dash, 1978; Rath & Patnaik, 1978; Sahu, 1979; Jachuk, 1979; Dash and Dash, 1989).

Berlyne (1960) and Hershenson, Mansinger, Kessen (1965) view that the child is an active, stimulation seeking person. The vital roles of experience, learning and environmental enrichment in cognitive development have been stressed by Hebb (1949), Hunt, (1969) and Piaget (Flavell, 1963). According to them, though all men are created equal, it is the sort of environment in which one interacts that significantly influences the development of one's potential intellectual capacity.
The early years of life have been considered to be crucial, leaving irreversible impressions in one's life. The rate of development at this stage is so rapid that the child is able to accept almost everything if it is given to him in a form which he/she can understand. It is also true that in most of the families the parents are not able to provide enriched and stimulating environment to the children because they do not know how to do it. The more the experience we provide to the child at this stage, the richer is the benefit. Hunt used Piaget's observations and their implications for developmental and educational Psychology. The importance of experience with the environment, for building cognitive structures called schemes, which are basic to cognitive growth, can not be over emphasised.

From what is said before, it is seen that intervention during early years of development leads to a sound psychological development. Any deficiencies suffered at this stage is likely to have a major impact on subsequent development. In view of this critical importance of early years and the realisation that the course of development is not totally governed by hereditary factors, various intervention programmes have been formulated in order to prevent the occurrence of problems in later development. A basic argument for early intervention based on the interactional premise suggests that early learning lays the
foundation for subsequent development of more complex behaviour (Bricker, Seibert, and Casuso, 1980). The Psychologists of Western countries have realized and accepted this fact since long. According to them preparatory, compensatory, remedial and preventive intervention early in life seems to be urgent necessities for the disadvantaged children. The aim of intervention programme is (1) to develop realistic goal setting, (2) develop self- attribution, (3) develop a more analytic way of information processing, (4) train disadvantaged children in intellectual activities or skills in which they are deficient and (5) encourage and foster parental involvement.

Because perceptual-motor development is the basis for later cognitive development, psychologists thought that the presumed deficits in the areas of language, thought, and intellectual development can be remedied through perceptual-motor intervention. Different intervention programmes are widely recognized and fairly well established in these areas. One is Project Head Start which was conceived within a traditional preschool frame work and emphasized providing appropriate early experiences that will form the foundation for further development (Miller & Dyer, 1975). Most intervention programmes, the U.S. Head Start, Follow Through, and similar other programmes were based on the "cultural deficit hypothesis". The implicit assumption was that the
poor suffer from a number of deficits which can be remedied by appropriate interventions. The early evaluation of various programmes based on remediation of specific deficits, revealed that the academic gains are not maintained beyond two or three years. Campbell and Frey (1970) argue that a decrement in performance after the cessation of special programmes is exactly what would be expected. In their view, the differences produced are direct reactions to the programmes and once the compensatory support is removed, the intellectual stimulation in the environment falls back to its original level, unless the higher levels of functioning are internalized as regular work habits. The later evaluation of compensatory education programmes by a group of researchers in 1973 considered the possibility of "sleeper effects", positive benefits that had perhaps been dormant during childhood and were manifested later. They also considered the possibility that a new measure of school competence was a better indicator of the effectiveness of early education than the proverbial IQ and achievement tests which had been shown to wash off. Thus, the long term evaluations revealed more complex interactions than the short term ones.

Bronfenbrenner (1974), in one of the classic reviews titled: "Is early intervention effective?" Which is one of the initial evaluations of the effectiveness of early childhood intervention programmes, showed that IQ scores were
taken as the major indicator of programme effectiveness. However, it soon became apparent that other indicators of programme effectiveness had to be included in longitudinal evaluations. For example, standardized achievement tests (Lazar and Darlington, 1978), indicators of educational attainment such as rate of placement in special education classes (Vopava and Royce, 1978) and social effects such as delinquency and employment (Schweinhart and Weikart, 1984) were soon added. Today, there is an apparent consensus that in order to assess the multiple effects or early childhood education adequately, evaluations should include multiple indicators of programme effectiveness.

Though efforts to change the outcome through early intervention have had mixed results (e.g. Clarke-Stewart and Fein, 1983), generally a programme's intensity is positively related to the magnitude of its cognitive effects on children.

From the preceding discussion we have seen that if properly implemented, following the basic principles of child development, a programme yields some effect. The degree and sustainability of the effects of intervention are determined by several other factors such as parent involvement, home based intervention, and cognitive process oriented curriculum, etc. Though a few early intervention studies have been conducted in India, this study is unique in the sense that no
psycho-educational intervention with cognitive process orientation has been attempted with Nolia (coastal fisher-folk) children and for a longer period of time (more than 3 months). A review of literature is presented in the next page which critically analyses the research on the effects of early intervention.
Review of Research

According to Piaget, children up to a particular age are unable to think logically in certain respects and are unable to solve abstract problems. Such statements serve as a red flag for many developmental psychologists who believe that children can think logically if you give them a fair chance to demonstrate their competence. So their main emphasis on learning experiences as external reinforcements which facilitate or inhibit cognitive growth, is not in consonance with Piaget's thinking. This suggestion implies that the child is a modifiable and plastic organism; and given the necessary stimulations, there could be significant modifications and reshapings through these external reinforcements, in cognitive growth. Piaget did not underestimate the importance of environment. He admitted that environment plays a crucial role in providing and facilitating necessary stimulations leading to inner organisation and mutual coordination of the subject's schemata. Both the processes of assimilation and accommodation are basic to cognitive growth in the Piagetian system. Learning and maturation are not by themselves sufficient to explain cognitive growth. Piaget did not hold that learning processes have no basic role to play, but all that he stressed was that the subject's own organization resulting from accommodation and assimilation processes is vital. In other words, the child is not just a passive recipient, but an active participant in the stimulation process.
Against this background, it is essential to take into account the types of training approaches that could be administered; which would determine the curriculum and teaching practices to be followed. Therefore, the relative merits or demerits otherwise of the different training procedures need to be considered first.

**Intervention 6 specific skill training**:

Aldrich (1970) reported that a combination of verbal and manipulatory training produced significant gains in classification and class inclusion skills. The results were interpreted as representing an "isolated schema" rather than a general conceptual ability. Olmstead, Parks and Rickel (1970) demonstrated gains in children's ability to group items following training. In a follow-up assessment a year later, the training was found to have had a durable effect.

Parker, Reiff and Sperr (1971) examined the effectiveness of a hierarchical instruction programme in multiple-classification. Overall, the evidence indicated an enhancement in the ability of the 6 and 7 year olds from the training programme. However, the 4.5 year old children demonstrated little increase in multiple classification ability. The authors, in explaining the later finding, advanced two possible explanations: first, that children were too young to profit from multiple-classification instruction, and second, that the training programme needed revision.
Hooper (1972) studied classification and seriation training conditions in children aged 3.5 years to 4.5 years, in small group instructional settings. Classification instruction was not effective, whereas seriation instruction demonstrated significant specific transfer. Further, this transfer was mostly present for the older subjects. No transfer to conservation task performance was noted. Caruso and Resnick (1972) have reported similar task analysis approaches to be effective in facilitating children's dual classification skills.

Siegel and Kresh (1971) investigated children's ability to deal with a variety of classification skills within a matrix format. Stimuli comprised nine combinations of three shapes and three colours and the six attribute stimuli. Four year old children performed at the lowest level of classificatory operativity, whereas eight year old children performed at the higher levels. In the sample of children attending an experimental school in a "disadvantaged" area, it was found that the performance of white children was slightly, but not significantly, superior to that of Negro children at all age levels on all tasks.

According to Cole and Bruner (1972) "Groups ordinarily diagnosed as culturally-deprived have the same underlying competence as those in the main stream of the dominant culture, the differences in performance being accounted for by the situations and contexts in which the competence is being expressed."
According to Overton and Brodzinsky (1972) the classic distinction between competence and performance maintains that operativity of Piagetian tasks depends on two factors: one the possession of requisite logical skills (operations, competencies) and the other translation and application of those skills to meet the demand of the problem at hand (performance). They suggested that "the transition period between pre-operation and concrete operation extends from the point at which logical structures are "first-in-competence" up to the point that they are "always-in-performance" and that during this time the child's behaviour is most susceptible to task-related variables. This phase suggested by Overton, Wagner and Dolinsky (1971), may be thought of as a time during which the introduction of various task variables will lead to the activation of already present structures, and consequently, to the emergence of cognitive structures, and consequently, to the emergence of cognitive structures and meaningless once such structures are "always in performance."

Figurelli and Keller (1972) compared middle and lower SES black children aged 6 to 8 years on conservation tasks before and after training versus not training. Middle SES children scored higher on both the pre and post tests than lower SES children. Training facilitated improvement as a main effect in both SES groups, but lower SES children required more training task repetition to criterion than did middle SES children.
Brainerd (1973) had compared age and stage (readiness) as factors in the training of a number conservation skill. Non-conserving Kindergarteners were pre-tested, then they were either trained or not, they were post-tested. As a group, the trained children improved in the conservation skill (relative to untrained children), but with considerable individual differences. A partial correlational analysis of those differences showed that the only variable predicting from training was the child's stage, not his age, at the outset of training.

Sheppard (1973) challenged Piaget's position that class inclusion could not be taught didactically. He designed a training programme "for developing an awareness of class inclusion by applying a 3-step sequence of logical analysis." The experimental group was provided with training comprised of ten trials, each involving logical sequences where as the control group did not receive training. It only received the pretests and posttests. Results showed that the test of class inclusion administered in a pretest-posttest design demonstrated facilitative performance in the experimental group. No improvement was observed with the control group. "Support for the operation of internal factors in cognitive development was provided by an obtained increase from first to second posttest. Two conservations were considered to be involved - conservation of the whole and of the part."
Hamel and Vander Veer (1972) studied structure diensemble in multiple classification and seriation and amount of irrelevant information in 65 children with middle class background aged from 6 to 8 years. A significant positive correlation between multiple classification performance and multiple seriation was computed. The authors interpreted the finding as lending credence for the existence of a structure $d'$ ensemble of operational schemes during the concrete operations period. Further, it was reported that the amount of information given strongly affected the problem-solving behaviour of children.

Delacey, Nurcombe, Taylor and Moffit (1973) showed that after attending a rural compensatory preschool for five and a half a days a week over one year, Australian Black and White children showed substantial grains on tests of vocabulary, auditory association, grammatical closure and operational thinking Tests repeated eight month later, when the children were at primary school, showed marked erosion on auditory association and grammatical closure but little erosion on vocabulary or operational thinking. Scores of Black children tended to erode more than the scores of the White children. It may be concluded that a substantial part of the increment in cognitive functioning continued eight months after the completion of enrichment pre-schooling.
Denney and Acito (1974), using modelling with 2 and 3 years olds, analyzed the dimensions used by children to classify. They found that fifteen out of seventeen participants in the modelling conditions used size and shape suggesting that as multiple classification was achieved.

The efficacy of small group instructional programmes in classificatory, seriation and combined class/series skills was examined by Bingham-Newman and Hooper (1974) in 60 urban middle class 4 to 5 year old subjects in a transfer of training design. For the seriation instructional condition significant specific transfer effects were observed. However, little differences were noted for the classification, verbal intelligence and conservation task measures.

Kalil, Youssef and Lerner (1974) suggested that making comparisons between a total class and a subclass (e.g. "Are there more children or boys?") is probably contrary to the previous experiences of 6 to 7 year old children. It is more predominantly encountered situations which require comparisons between mutually exclusive classes or subclasses (e.g. "Are there more boys or girls?") rather than comparisons between a superordinate class and one of its subordinate classes. Such experiences would lead to the development of "learning sets" orienting young children toward comparing mutually exclusive classes rather than a class and one of its component sub-classes. So these
Investigators administered Piaget's class inclusion task and revised it involving several procedural variations to 64 children from each of kindergarten and first grade. Revisions relating to referencing, equivalence of subclass elements and auditory cue sequence facilitated performance when compared with Piaget's standard procedures.

A number of investigators working with children from a variety of backgrounds have demonstrated a link between specific forms of experiences and cognitive tasks (Dasen, 1974; Ghuman, 1975). Results have been found that the Punjabi children from a farming background performed significantly better on the conservation of weight than they did on the conservation of area and length. The reason for this is as follows; children from farming families learn to measure and weight quantities and develop keen awareness of the fact that the shapes of containers of rice, corn and butter etc. do not alter the weight of the objects.

Likewise, Dasen's investigation has also shown quite clearly the influence of daily life activities on the development of cognitive operations. While working with Aboriginal children he hypothesized that children living within the traditional context of their culture would perform significantly better on the spatial test ability not as well as on the conservation problems as would be Aboriginal children living near the modern city of Canberra. His hypothesis was confirmed.
Kumari (1976) has reported similar findings with Potter's children. Babu and Nanda (1984) also did similar study. Their findings demonstrated that training can be given to children with materials used in the testing situation which will improve their performance in conservation just like the pottery-making children.

From all these findings it was found that the lack of certain cognitive operations in children from other cultures may not be due to the genetic potential, but simply may be a result of inadequate experience or absence of experiences which are deemed necessary to energize and thereby actualize the latent cognitive structures. There is more evidence to support this viewpoint. Kroeger (1978) draws a distinction between competence and performance.

"Especially with somewhat older subjects, and in the cross-cultural context, it seems to make sense that subjects may have the competence (i.e. the operational structure) but not yet the performance (i.e. in this particular context) of a concept."

To test this hypothesis, she gave training sessions of ten minutes each to children from three different ethnic backgrounds: Indians, West Indians and indigenous Whites. All the children were posttested on the Piagetian Matrices and the Raven Matrices. Results of the
study are rather complex but the significant finding is that both the immigrant groups showed more improvement in their scores on the Piagetian Matrices than the indigenous group, and there was some transfer effect on the Raven Matrices test. Likewise Dasen et al. (1978) have demonstrated the effect of training sessions on the acquisition of conservation skills and cognitive operations in the Western African context.

According to the competence/performance model, an initial answer a child gives to a Piagetian task may not necessarily reflect its true cognitive level, i.e. the underlying structure or competence.

There are indications that in some circumstances very little help is needed to "actualize" the latent competence (i.e. to enable subjects to express their competence fully in their performance). A double example of this was provided in the West Berlin training study, (Heron and Kroeger, 1975) in which the training elicited operational performance in multiple classification and the experience of the pretest was sufficient to do the same for the control group in conservation of weight and volume. Another example is to be found in Bovet (1974), with Algerian Illiterate adults being tested for conservation of weight and length. During the testing
session, some of Bovet's subjects went through the complete sequence of substages. Dasen (1975, 1977) reports very rapid learning of conservation of quantity in Eskimo children aged 12 to 14, some children moved from non-conservation to full conservation after a mere exposure to other operational tasks and some moved from non-conservation to the intermediate stage in the same way, and then acquired full conservation very rapidly during the training phase. On the other hand, subjects aged 10 and 11 remained at stage 1 despite exposure to other operational tasks, but then started to acquire the necessary operational structure during the training period.

Similarly, studies summarized by Dasen, Ngini and Lavellee (1979) showed very rapid learning, indicating actualisation of latent competence occurred in 36% of the Baoule and 5% of the Kikuyu (West African and East African, respectively) subjects aged 12 to 14 years who were given training for the spatial concept of horizontally. No actualisation was evident in a control group (receiving no relevant training) nor in younger (7 to 9 years) children trained for the same concept. Similarly, no actualisation occurred when 7 to 9 years old Baoule children were trained for the conservation of quantity (liquids) and for class inclusion. On the other hand, when 12 to 14 year old Kikuyu subjects were trained for class inclusion, 85% of them showed almost immediate learning, and actualisation was also found in 42% of the control group subjects. From all the
studies, it has been suggested that some or all of the quantitative difference in concrete operational development are only differences in task performance and do not adequately reflect the presence of the underlying thought structures. An individual may have a certain concept but may not use it in some situations.

Play may have long lasting effects was supported in a study by Hutt (1976). Children were provided with a toy which they first explored and then they played with. They were rated on their inventiveness with the toys at that time and tested for creativity four years later. Children who had shown more inventiveness and exploratory behaviour were found to be more creative on the later assessment compared to the others.

Seigel, Lindas, Mccabe, Brand and Mathews (1978) took 3 and 4 years old children who were given tests of class inclusion reasoning using a standard Piagetion question format. Approximately half of the children received training in class inclusion reasoning. The remainder served as a control group were administered the same questionnaire as the training group, but with no feedback about the correctness of their answers. In the posttest the training group correctly answered more class inclusion questions than the control group.
Rao (1977) conducted a study to investigate the effect of training on the differential effects of different types of training and the transfer of training from one conservation task to another. The study was conducted on four to six year old children by half year intervals divided into five groups. The experimental groups were given conservation training on number, mass, length and weight employing two procedures - verbal and nonverbal. At the commencement of the training, the groups were tested for conservation of area and volume. The posttest for conservation of area and volume was conducted again after the training. The experimental group showed definite gains as compared to the control group of number, length, mass and weight. However, there was no significant difference between the control and experimental group with regard to the conservation of area and volume, suggesting that there was no transfer effect. Both types of training significantly affect the conservation performance.

Depauw's (1978) study investigated the values of sensory motor programmes in sensory integration. The sensory motor programme designed to enhance sensory integration utilised sensory stimulation through motor abilities. The experimental group received sensory motor training twenty minutes daily for seven months during the school year. One control group received training on remedial physical education programme and the other control
group received neither programmes. The statistical analysis showed a significant trend towards improved sensory integration after a sensory motor programme.

Rath and Patnaik (1978) did a study on two groups (advantaged and disadvantaged) of children belonging to the age group of 9+ who were administered the progressive Matrices test and a verbal reasoning test at initial stage. Then each group was divided into the subgroups of which one constituted the control group and the other two experimental groups. Incentive and training in the related area were given to them. Training appeared to be most effective in improving the test scores. The disadvantaged children improved more than the advantaged and reached the same level as the latter after training. In the tests of conservation for volume and length there is also a remarkable improvement after training in the related field. Positive transfer in learning was reported and the investigators claimed that the results would help in organising intervention programmes for the disadvantaged children.

Halford (1980) did a study in which eighty children aged 3 to 6 years were given learning set training in classification under one of two conditions: a one attribute condition in which the cells of the matrix could be filled by taking account of only one dimension, or a two attribute condition in which the cells of the same matrix
had to be filled by considering both dimension. All age groups learned the one attribute task, but the majority of 3-year-olds failed in the two attribute condition. There was a significant interaction between age and experimental condition.

Loewenthal and Kostrevski (1980) tested the effectiveness of training procedures which were hypothesized to increase children's awareness of the reader's requirements when writing descriptions of technological equipment. Pair of children took turns at commenting on each other's descriptions. Some improvement occurred in performance on verbal items and in the quality of written descriptions made by trained experimental children.

Mohanty and Choudhury's (1981) study was designed to test the assumption and predictions from a cross-cultural model that conservation of identity is developmentally prior to the conservation of equivalence and that training using "screening" and "self-transformation" techniques will be effective in inducing conservation among non-conservers (of equivalence). From the study it was found that training has significant effect in inducing conservation and the trained group generalized the effect to a different test of conservation.
Reviewing intervention approaches of the ICDS programmes, Muralidharan and Kaur (1983) pointed out that an intervention ranging from seven to eleven weeks has made an impact on the tribal children and has resulted in their gaining better language and cognitive skills. It is only natural that with adequate planned interaction, children gain in their language and cognitive growth. The ICDS scheme is the first country wide programme involving coordinated efforts for providing an integrated package of services for the young children. It is based on the widely accepted view that 80% of mental development takes place by the age eight and early environmental stimulation helps the children to achieve their full cognitive potential (ICCW, 1982).

Fuson, Secada and Hall (1983) conducted two experiments address children's ability to use and spontaneous use of matching and counting in making equivalence judgements in conservation of number tasks. In experiment 1, children aged four and half to five and half who were told to match or count in a conservation of number task made correct equivalence judgements significantly more often than those in a control condition, indicating that these children were able to and did use the correspondence information gained from matching and the specific numerosity information gained from counting make correct judgements of numerical equivalence in the face of perceptually conflicting
evidence. In experiment 2, with a more mature but not yet conserving sample, most children (94%) giving justifications other than perceptual ones and most children (91%) giving at least one Piagetian justification used either matching or counting on at least one trial. Almost half of the latter group gave a Piagetian justification on a trial on which they had already counted or matched. Matching always and counting almost always resulted in accurate equivalence judgements. Counting was used considerably more often than matching was.

Muralidharan et al. (1984) conducted a study on 144 tribal (ST) children following experimental - control, pretest - posttest design. The Anganwadi workers (AWWS) of the experimental group and control group were given pretests in language and cognitive tasks. The AWWS of the experimental group were given a ten days orientation in techniques of story telling, conversation, picture reading, songs and games, art activities etc. The workers were then supplied with picture cards, picture books, songs and games for use with children. The AWWS were asked to use the materials constantly and after about 8 weeks, a post testing was done. The results showed that in most of the tests, the experimental group showed a higher gain than the control group. It thus emerged that no matter how disadvantaged the children are, well planned early childhood education strategies do make an impact and foster the development of children.
Dash and Das (1989) did her study on perceptual-motor and Piagetian logico-mathematical abilities of 4 to 7 year old schooled and non-schooled children. About ten perceptual motor subtests of McCarthy's scales of children's abilities and about twenty one Piagetian tests measuring classification, seriation, measurement and conservation were administered. With regard to many of the Piagetian logico-mathematical abilities, the difference between the tribal and non-tribal as well as schooled and non-schooled children found at age 4 tended to decrease and even vanish at age 7. The author concluded that preschool and primary education, as it exists in India today, contributes very little to the development of certain cognitive abilities. Moreover, the negative influence of schooling are so vast for the conventional cognition of a particular culture that some groups consider education as a threat to their survival. This is because after adequate schooling children of these communities fail to contribute anything to their families, their community and their culture and many of them desert their groups.

Dash and Rath (1985) conducted a study on a group of schooled non-disadvantaged and another group of non-schooled disadvantaged preschool children. The children were given training on a battery of cognitive tasks for 8 weeks to determine the effects of training on certain other cognitive test scores. The visual Reception and Association
sub tests of I.T.P.A. and the Draw-a-design and Draw-a-child subtests of Mc Carthy battery were administered to both the groups prior to and after direct intensive cognitive training in sequential thinking, figure and ground perception, shape discrimination, visual recall and visual discriminations. Results revealed that training on these cognitive tasks considerably improved the scores of other cognitive tests, both the groups’ performances showed significant improvements but the rate of improvement was greater for the later group.

Mohanty (1988) reports three studies designated to investigate the effects of intelligence, perceptual-motor and achievement motivation training on tribal (ST) and non-tribal primary school children. The specific objectives were: (1) to study the effects of consecutive repeated administration of the RCPM intelligence test on the posttest scores of Culture-Fair intelligence test (CFIT), (2) to study the effects of game-like perceptual motor tasks plus verbalisation on a story writing task, and (3) to study the effects of some game like achievement motivation test. Results showed that (1) tribal children were not found to be having lower intelligence scores, (2) older children benefited better from training, (3) training with the RCPM transferred to the posttest performance on CFIT, (4) in RCPM scores and substitution scores of CFIT of younger children showed greater improvement, (5) in listening test, the
effects of training was found, (6) in reading test, older tribal and non-tribal children showed similar progress, (7) in story writing test, the younger tribal and non-tribal experimental children performed the best, (8) in achievement motivation test, the non-tribal children showed greater improvements.

Hodges et al. (1988) assessed E.M. Markman's hypothesis that the organizational principles underlying collection concepts facilitate children's performance on cognitive task requiring part-whole comparisons. In experiment 1, the effect of class/collection labels on both cardinality and class inclusion task was assessed. Thirty two 3-4 year old received both tasks. An additional 32 kindergarten and first grade children received the class inclusion task. For cardinality, there was no difference in performance as a function of label, a facilitative effects of the collection label was found for class inclusion. Experiment 2 assessed the effects of class/collection labels on 28 nursery school children's (aged 4 years to 5 year 5 months) demonstration of number conservation. Experiment 3 extended the age range and examined the effects of label on 56 kindergartener's and first grader's performance on number conservation. Over all results indicate that the facilitative effect of collection labels appears to be specific to the class inclusion task.
In a study by Reid et al. (1988) 72 Canadian children (aged 5 year 5 months to 7 year 3 months) were assigned to one of cognitive training for speaking skills in a two (with or without feedback) by three (degree of overt activity) crossed design. Subjects in the active condition participated in three training exercises, each subject in the passive condition observed the performance of the subject in the active condition to whom he/she was matched, subjects in the active - passive condition received a combination of the two previous treatments. Post test evaluations show that improvements in speaking behaviour were related to the feedback condition but not to the subjects initial level of competence as assessed by global performance on the five pretest tasks. The reverse was true for the four transfer tasks. The amount of overt activity did not exert a significant effect on subjects' performance of any of the tasks.

In 1988 Pasnak et al.'s study, seven kindergarteners who had previously been taught to classify, seriate and conserve number via a learning set procedure were retested one year later and compared with five controls. The significant cognitive gains that initially resulted from the special instruction had increased with the passage of time. Experimental subjects were superior to the control on a test of self perceived competence but not on a test of cognitive perspective - taking.
Parsonson et al. (1988) conducted a study in which Experiment 1 investigated whether 4 and 5 year olds could be trained to conserve mass and whether that training generalized to conservation of weight and/or volume. Experiment 2 investigated the effects on acquisition and generalization of altering the training sequence conservation concepts (i.e. by training volume conservation and probing for generalization to mass/and/or weight conservation) in four additional 5 year olds. Results of both experiments showed that training quickly and durably established generalized correct conservation and that the subjects explanations changed to confirm with acquisition of conservation. Data from Experiment 2 indicate that acquisition was unaffected by altering the sequence of training.

Miller (1989) administered the self perception profile to 120 children (aged 9-14 years) before and after a five week program of swimming instruction. It was predicted that subjects who improved most in swimming would also have the largest gains in athelatic self concept. For the advanced beginner skill group, self-concept increased as skill increased, but over all self-concept remained stable or only slightly increased as skill increased. Wasik et al's (1990) studied 65 families with children at risk for cognitive difficulties randomly assigned at the time of children's birth to one of three groups, two intervention and one control. For the most intensive intervention groups,
family education was combined with center based educational
day care programme, the less intensive intervention group
received the home based family education program, only. To
assess the cognitive performance of children the Bayley
Scales of Infant Development were administered at 6, 12 and
18 months, the Stanford-Binet Intelligence test at 24, 36 and
48 months and Mc Carthy's scales of children's abilities at
30, 42 and 54 months. On each test after the 6 month
assessment, scores of children in the educational day care
plus family support group were greater than those in the
other two groups.

Campbell and Ramey (1990) administered the
Concept Assessment Kit-conservation (CAK) to 86 low SES
subjects and random cross sectional samples of their more
advantaged classmates at ages 5, 6 and 7 years. Low SES
subjects who had early educational intervention developed the
ability to conserve earlier than those without intervention,
however, the order of difficulty for the different concepts
was similar in all groups. The proportion of nonconservers
in the low-SES intervention group did not differ
significantly from that of their more advantaged peers in the
first and third years in early elementary school, but low-SES
subjects who did not receive early educational intervention
more likely to be nonconservers. Scores on the CAK were
significantly correlated with those on the WISC-R.
Correlations with verbal IQ were higher than those with
performance IQ.
Cole et al. (1990) investigated whether students would gain from specific language intervention if they did not have the cognitive skills necessary for further language development. Effects of language intervention were compared over one year for two groups of young children with delayed language: 18 subjects (mean age 4.9 years) with cognitive skills markedly above their language level and 32 subjects (mean age 5.26 years) with similar delays in cognitive and language skills. Evaluation measures included Peabody Picture Vocabulary Test - Revised and Basic Language Concept Test. Only the BLCT resulted in significant gain differences favoring subjects with higher cognitive than language skills. PPVT-R standard scores indicated that both groups made gains at a faster rate during intervention than prior to intervention.

Heindel and Kose (1990) conducted a study to find out the effects of motoric action and organization on children's memory. In experiment 1, 240 preschool, 1st grade and 3rd grade children were required to remember a series of colour shape pairs presented in a unitary or nonunitary configurations. Half of the subjects at each grade level drew the colour shape pairs, while the remaining half simply looked at the stimulus cards. Findings revealed that the different organisations affected memory performance, however, drawing the configurations enhanced the effect of the unitary organization. Experiment 2 with 120 preschoolers and 1st and
3rd graders examined the effects of changing the activity during encoding from drawing to that of reconstructing replicas of stimuli. Findings revealed that this different activity enhanced subject's memory for unitary and nonunitary stimuli.

Mohanty and Mishra (1991) conducted a study to experimentally verify the effects of short term (15 days) cognitive intervention training on certain cognitive abilities intelligence, curiosity of preschool children. Two groups of children, belonging to 4 to 5 years age were taken. The Columbia Mental Maturity Scale (CMMS) and curiosity tests were administered on the subjects of both experimental and control groups prior to and after the training or empty time duration. The training consisted of direct, intensive training in sequential thinking, figure ground perception, shape discrimination, visual recall and visual discrimination in the form of clay modelling, sand play, block building, water play, bead stringing, physical movements, colouring and painting, fruits and vegetables, seeds, grams and grains. Results obtained were that the post intervention testing condition facilitated the $X$ CMMS raw scores or proportion scores of the subjects more than preintervention testing condition.

Das and Jena (1991) studied the effect of short term language intervention on expressive language of preschool children. Two groups of 3 years old children were
given tests of manual expression (motor activities), verbal expression (story retelling) and pictorial expression (Draw-a-child). The experimental group subjects were given a short language training for one week. All subjects were then retested on all three measures. Teacher's rating of verbal skills was taken first at the end of familiarization and then after retesting. Results indicated a significant effect of pre and post intervention treatment for all measures except the Draw a child test score and no difference between experimental and control groups.

Mohanty and Hejmadi (1991) conducted a study to find out the effects of short term verbal and nonverbal cognitive intervention training on certain cognitive abilities - Intelligence (Draw-a-child) test and creativity of 4 to 5 years preschool children. The tests were administered on the subject of three experimental and one control groups prior to and after the intervention training or empty time duration. Similarly, teacher's assessment record regarding certain motor and cognitive abilities of children were also taken prior to and after the intervention training or empty time duration. The cognitive training considered of direct, intensive training for various body parts. Verbally speaking out and showing the movement of the body parts with appropriate vocalisation of sounds in the form of music and dance. It also consisted of questioning of the children in various uses of body parts and in completing certain
incomplete figures provided to them. Results obtained were that both the experimental and control groups children were found to differ significantly from each other in their intelligence and creativity scores irrespective of testing conditions. Padmini's study (1989) concluded that properly designed special programme of activities with focus on appropriate concepts and operations as tried out in her study, can nourish and promote cognitive development to a considerable significant extent over a reasonable period of time. All children can considerably benefit by such programme, irrespective of their sex, SES, preschool background, initial status and institution of the study and such programme can be designed appropriately for different age groups.

Anandalakshmy (1990) in her play intervention study; while investigating the role of variables in the development of cognition in infancy, yielded several insights. An intervention programme is most likely to succeed if it includes the involvement and interest of the mother and is conducted in an environment familiar and stress-free for the infant.

Mohanty and Mishra (1992) did a study to investigate the effects of two training sequences on the development and generalization of number skills and logical operations. Thirty, four year old preschool children were
randomly assigned and trained for 4 weeks in one of the three treatment conditions, such as number skills (counting), logical operations (classification and seriation), and control, ten subjects in each condition. Each of the experimental treatments was based on either of two broad perspectives: the logical foundations model of Piagetian theorists and a skills integration model. Instructions/tests measuring number abilities and logical operations were designed as pre and posttest measures. Findings were that:

- both experimental groups significantly outperformed the control group on both tests,
- the number skills group significantly outperformed the logical foundations group on the number knowledge test,
- the logical foundations group significantly outperformed the number skills group on the logical operations test.

The studies reviewed so far emphasize, that the training of certain specific skills improves the performance of children and there is the transfer effect of these training. It is reasonable to discuss here some other studies where different investigators have pointed out the effects of preschool education and intervention on children's later all round development.

**Effects of Preschool education and intervention**

Muralidharan and Banerjee (1974) stipulated that children who have had preschool experience are at an advantage in both language and intellectual areas.
Schaefer and Aronson (1972) found that intervention during early years produced significant gains in linguistic and perceptual tasks.

Investigations conducted by Appelbaum and Hogarty (1973) have also provided supportive evidences linking quality of stimulation provided in the early years of life to cognitive ability in young children.

Lazer et al. (1982) assessed the long term effects of early childhood educational experience on children from low income families. The findings of twelve investigators for 22 years (1960-82) showed that the early educational programmes had long lasting effects in four areas, e.g. school competence, developed abilities, children's attitude and values and impact on the family.

Maria sa (1982) assessed the effects of preschooling on academic achievement and Psychological development of 407 first and second graders from three Brazilian elementary schools. He found that the subjects who attended preschool were more advanced than the non-attenders in terms of academic achievement, readiness, mental level, visuo-motor perception and vision discrimination.

A group of investigators (Zigler, Abelson, Tricket, Penelop and Seitz, 1982) tried to find out whether
an intervention programme is necessary in order to improve socio-economically disadvantaged children's IQ scores. They found a positive answer but with some exceptions. It was found that economically sound children did their best in the first year of programme as compared to the economically disadvantaged children. But in the second year of intervention programme disadvantaged group progressed very steadily like the other group.

Ramey, Yeates and Short (1984) tested children in an educational day-care programme between 6 weeks and 3 months of age and participated until school entrance at age five. Intellectual assessment showed that from 18 months on the educational day care children performed significantly better than children randomly assigned to a control group.

Bloomgarden (1984), from his study on Jamaican children in a day care programme, collected several stimulation activities in early childhood that encouraged children's physical and mental growth. If these actions of children in a early age can be successfully stimulated then it will enhance their mental and physical development.

Children who attended community day care meeting existing federal and state standards scored higher on preschool intelligence measures than their peers without such
day care experience (Burchinal et al. 1989). These data are also consistent with the New York City Infant Day Care study that positive effects for quality day-care on children's cognitive development.

Clarke and Clarke (1989) reviewed research on cognitive effects of early intervention with disadvantaged preschoolers. While early intervention typically yields short term advantages for children and their parents after programme termination, cognitive increments usually follow the law of diminishing returns unless the intervention sets off a chain of ongoing, positive consequences continuing interventions and maintenance of these changes is unlikely. Familial factors (including unfolding genetic and psychosocial influences) are more important for long term outcomes than brief interventions themselves.

According to Ramey and Ramey (1990), intensive targeted interventions in the first five years of life are evaluated as effective in preventing the significant intellectual dysfunction that may result from intergenerational poverty.

McKay et al. (1978) concluded that an enriched programme of activities can prevent losses of cognitive abilities, and further more the earlier the programme is begun, the more effective it can be.
Pankajam (1990) study indicates that in certain aspects of language development those children who attend pre-schools perform better than the others. She concludes that attending pre-schools with good programme, specially in rural areas definitely plays a prominent role in language development of children.

Patnaik's Ph.D. thesis (1990) relates to the effect of preschool attendance on non-verbal intelligence and academic achievement in language and arithmetic. The data did point out to true effects on most of these scores in the early grades, i.e., Grade 1 and 2; but most of the effects seemed to vanish or diminish by Grade 3. In context of U.S. Head Start programmes, this phenomenon has been referred to as the "regression to the mean".

The findings of Das's study (1980) show that the early childhood period, particularly four through six years of age, is a very critical and crucial period. During this period, all the abilities show a very rapid growth. It is, therefore, essential that preparatory, compensatory, remedial and preventive measures should be taken to provide optimum development during this period for all children.
The studies reviewed so far may be summarized as follows: firstly, though biological bases are necessary for the growth of cognitive structures, the environmental factors such as socialization practices and cultural and educational factors are equally important in the actualization of these structures. Secondly, in most of the training studies specific abilities or skills usually have given short term training so the effect is not long lasting; thirdly, the result of preschool intervention through headstart and montessori is not known. It is working but in long run it is very confusing. Preschool is having some sort of effect on children. But not all sort of preschools. In USA cognitively oriented model is working which is more effective but not highly encouraging. There is a washout effect after two or three years and the academic gains are not maintained beyond that period.
The Theoretical Frame-Work, Problem and Objectives:

The Indian Vedantic and Western Cognitive Psychology agree in emphasizing that a child is born with all the structures and potentialities that would be required throughout his/her life. Vedanta says that within man is all knowledge - even in a new born baby - and it requires only an awakening. According to Swami Vivekananda, "All knowledge that the world has ever received comes from the mind; the infinite library of the universe is in your mind. The external world is simply the suggestion, the occasion; which sets you to study your own mind." For Mahatma Gandhi, education consists of drawing out the best that is in the body, mind, and spirit of the individual. Thus the goal of child rearing, training, or education is to bring out and activate the best that is within the individual child. Piaget viewed that both genetic-biological maturation and social transmission are essential for attaining cognitive equilibrium. Bruner used the two terms that are very similar to Piaget's notion: "the push" and "the pull".

According to Piaget, concrete operation is an integrated and unified set of cognitive structures, not just an accumulation of mutually isolated, independent, and psychologically unconnected cognitive entities. The presence of such unified structures - structures d'ensemble was one of Piaget's major criteria for cognitive development. Piaget
suggested that development consists of a series of major transformations in the organization of an individual's cognitive operations, the attainment of a given stage should be marked by a whole constellation of behavioural acquisitions.

Flavell (1971) suggested that there are good reasons to think that some of the products of cognitive growth become interrelated in our heads, get linked together into organized functional wholes, both in the area of concrete operational thinking and elsewhere. "I doubt if a serious case could be made that the various processes and concepts inhabiting our cognitive systems do not interact with or otherwise link up with one another do not exhibit 'structure'." (Flavell, 1932)

So this study was designed on the assumption that proper training would produce better integration and a better tendency towards a unified whole in the various cognitive structures. With training cognitive structures are integrated or interlinked which in turn leads to the development of new cognitive structures in children. The word structure itself implies that it is a constellation or conglomeration of different parts into a unified whole such that the whole has properties unlike any or all of the parts in juxtaposition taken severally. These cognitive structures are relatively
stable and more or less permanent in each child and can be described at two different levels of abstraction, namely, competence and performance. Competence refers to the operational structure and performance the ability to activate and manifest it in particular contexts. Each child has the competence to do, that is, he/she has the structure prerequisites to solve a particular problem; but often fails to do due to lack of coordinated learning cues. The lack of performance is due to lack of environmental stimulations, mostly caused by a disadvantaged learning and experimental environment during the early childhood years. As a result of which these children are not well acquainted with such cognitive processes in their day to day life, though they are more familiar with concrete situations. According to Dash (1989), disadvantaged children very often have rich environments - rich in social, cultural, as well as physical aspects - as rich in meaning and complexity as the environments of other advantaged/normal children. What the disadvantaged children seem to suffer from is a lack of appropriate and adequate adult guidance and support in making sense out of their rich environments. If a child fails to understand the central aspects of his/her familiar-natural socio-cultural environment and his/her everyday experiences and feelings at a developmentally appropriate time, he/she may come to feel overwhelmed or rejected, even stupid at a later encounter. Many children under such circumstances give up
hope of ever understanding or making sense of their own experiences. So children who do not show satisfactory cognitive performance inspite of appropriate cognitive abilities can be enabled if they get appropriate stimulation to boost their cognitive skills. With cognitive training, there is an increase in the number of specific cognitive skills getting interlinked and intertwined. Otherwise, particularly in case of disadvantaged children, these skills remain isolated. So training leads to the organization of cognitive structures and cognitive development is marked by a constellation of those structures.

Although a number of studies have been conducted on disadvantaged children in India yet one does not find sufficient research work on intervention with these children. In the Department of Psychology, Utkal University, a number of investigations have been done on the disadvantaged, particularly the schedule caste (SC), the tribal (ST), and poverty stricken children. The Nolia children may be classified as a multiple disadvantaged (culturally, socially, economically, linguistically and educationally) group.

1. Culturally disadvantaged: These children are culturally disadvantaged in the sense that they are from a very different culture with different values, different language, different child rearing style and family pattern. The parents of
these Nolia children are mainly fishermen by occupation and fall under the lower caste group. They spend most of their time in the sea, from early in the morning before sunrise to late in the evenings till the sunset. Their wives and children see them off and wait much in advance for the Nolias to come with their catch. When they return the family members help them to draw the boats and nets to the shore, gather the fish into baskets and clean the nets. The men are hungry and tired. After a good drink and meal they are off to bed. Because of their occupation, their way of life is thus oriented due to which they are not capable of equipping themselves to guide their children. Leave alone guiding, they have little or no interaction with their family, especially their children. In view of all these factors the children are confined to the boundaries of the village. Whatever they would have picked up by interaction with people from other villages is thus limited. Whatever queries come to their mind remains unanswered because there is no one to clarify. The concept of small family or family planning is against their thinking because the larger the size of the family, the more is the income of the family. The eldest child usually engaged in keeping the children till he or she is the age of 7 or 8 when they become earning members of the family. This way the children of the Nolia people grow up inside the vicious style of living.
2. **Socially disadvantaged** - As discussed above that the Nolia men are away from the house during the whole day and return tired. They do not have time, money or mind for any social activities. The little that they earn is not sufficient to meet the minimum food needs of their family, leave alone, funding for educating their children. The only social gathering is after their return from the sea when they sit down to drink. It is only during the rainy seasons and during cyclones that these people have time but during these days they are perturbed and mentally upset because they are unable to earn a living and have to starve and the little might have been left due to a good catch is spent on the drinks. For these and other factors the Nolia children are denied of the opportunity to prove their own talents and achieve educationally or socially. Thus to sum up the main draw back of the Nolia children is their lower socio-economic level, lower caste by birth and profession and other different values.

3. **Economically disadvantaged** - Viewing from their cultural and social standards it is natural that these children should be from a very low economic bracket and are deprived of the facilities that children from medium, or high economic level enjoy. It is interesting to note here
that the gross income of the Nolia people is same as that of a middle socio-economic level people. Yet due to their illiteracy and lack of initial capital they are economically deprived. Initially for purchasing a boat and net they take loans and pay heavy interest on the amount borrowed. In many cases it so happens that they are unable to repay. Most of the time they have to give their catch at very cheap rates for the loan taken. Although their daily earning is equal to the middle economic group, the same is reduced due to unforeseen weather conditions and illhealth. During time of cyclones these people are out in the sea for days without food or any catch and actually they return home a depressed lot. Their previous earnings would have been spent by their family.

The days when the catch is bountiful these Nolia people after their catch are so happy that they give away the fish at a cheap rate, with the money they receive they give a little to their children who are around them, some to the wife to run the house and with the rest they dance and drink. Thus we see they misuse quite a good sum of their earnings. In case the fish is not sold the whole family is engaged in drying the fish on the sand and watching it to keep away birds from carrying them off. When the fish is dried the same is sold or stored in big earthen pots.
The diet of these people is very simple. They make gruel out of Ragi powder and fermented rice water. They bake the fish in the fire and eat. They hardly consume vegetables and cereals. Thus they hardly taste dal or curry. Topioca is boiled and eaten as a meal. Thus one can see from the diet these people consume they are an undernourished lot. Considering the fatigue, food and drink the male longevity is much less than the female members of their group.

4. Linguistically disadvantaged - Although these Nolia people stay in Orissa where the language is Oriya they hardly understand oriya leave alone speaking. They speak Telugu which is not polished as the urban speaking Telugu of Andhra nor is it the common rural speaking Telugu, it is a different dialect. Thus, language stands up as a barrier for them. Those children who join the schools where the medium of instruction is oriya hardly follow anything. Hearing an alien language is difficult on their part to follow. They could have picked up Oriya if in their hamlet there were a number of oriya speaking people. They are an aloof lot belonging to one caste and one profession. The text books are nothing to them but a pieces of paper with pictures and something scribbled on them. Thus the Nolia children drop out of school being disenchanted with the noise of the teacher and the scribbled papers.
5. **Educationally disadvantaged** - As discussed above that the Nolia people are culturally, socially, economically and linguistically a disadvantaged lot. It follows that they should be educationally disadvantaged. It is primarily the above factors that go hand in hand for developing the educational development of a person. These people enjoy the facilities of having government run schools. Being a backward lot these people have the benefit of getting supplementary education by private organizations. Thus we see that these people have the initial infrastructure to educate themselves. What is the reason for their poor performance educationally?

Firstly, these children attend the school for the first two or three years while they are very small and are unable to do anything in the house. In fact they are a nuisance lot and a botheraction to their parents. School for them is likely a baby sitting institution. If during the two three years they would have shown their inclinations for learning they could have wanted to continue their education further. This is not so. They are not regular in their attendance during this period due to a number of factors, sometimes due to illness of some family member, sometimes due to lack of food, clothing and many more reasons, the list is endless.
Secondly, by the time the children are of the age 7 and 8 years they become the economic units. In the sense they become partially earning members or help in the home keeping, like cooking, looking after their younger brothers and sisters or their old grand parents. During agricultural seasons, that is, at the time of sowing and harvesting paddy these children go to work because it is during this time that there is shortage of labour and they earn a good sum. A few help their parents in their fishing operations.

Thirdly, the unsuitability of the common curriculum that is being used at the elementary stage. The present day course of study as used has an urban bias and does not pay any attention to the social and cultural backgrounds of these children. This creates a sense of futility among the children and parents for whom the present-day education is not at all functional. It is their belief that it is just like day dreaming. If the course of study would have been formulated that is linked with their way of life and occupation and slowly diversified at a later stage then it would have meant something to them.

Fourthly, the timing of the formal schools also act as a deterrent to children, because it is during the daytime when the formal schools operate these children are
engaged in other gainful occupations and as such are left out of school.

Thus we find that these people have fallen in the vicious circle and therefore they are unable to get away from it even if they so want. Their horizons are very limited although the opportunity is as vast as the sea. Because of their typical socio-cultural and environmental background, these children constitute an unique sample for the study of cognitive development. However, in India no psychological research has so far been carried out on these children, although Nolia children have been the focus of literary studies and social welfare services. Whether these children manifest similar levels of cognitive development as their other counterparts is an open question.

This study was designed to develop a compensatory training programme for accelerating cognitive skills in disadvantaged Nolia children, and to try out this training programme experimentally. It was based on the assumption that whatever be the individual's genetic potentialities, cognitive development occurs largely in response to a variable range of stimulations, requiring incorporation, accommodation, adjustment and reconciliation. The more enriched and variable the environment to which individuals are exposed, the greater is the cognitive development.
There are some established, theoretically as well as empirically derived guidelines for early intervention programmes; which are very often not given due attention by the researchers and practitioners as well. These are very basic non-negotiable components of any intervention programme. So these guidelines are presented here briefly before the objectives of the study are formulated and stated.

1. Children are curious. Their need to explore and manipulate should be fulfilled through handling real things that involve more than one sense. The more all the senses are involved, the more effective and rich is the experience.

2. Most human activity is a purposeful search for pattern. This includes organizing new information and relating it to previously developed concepts. Incongruity between old patterns and new experiences stimulates questioning, observation, manipulation and application in a variety of new situations. Maintaining the right balance between novel and familiar experiences in learning situations is one of the most vital tasks in the art of teaching.

3. Learning experiences gain power if they are part of organized and meaningful wholes.
4. Children have an intrinsic need for mastery over situations, a need that they express by using their experiences to search out the significant patterns in reality and thus reduce uncertainty.

5. Children find self-fulfillment in successful learning and are not motivated merely by external rewards and approval. Children engaged in self-rewarding activities with a supportive, sensitive and consistent adult or teacher who makes demands appropriate to their own level are capable of having a happy experience.

6. Play is an essential part of learning. It is free from the restrictions of reality, external evaluations, and judgement. Children can try out different styles of action and communication without being required to make premature decisions or being penalized for errors. Play provided a context in which the teacher or the parent can observe children's handling materials and social situations, assess their functional level on stage of development and encourage experiences that further their growth. The teacher or the parent should know when to intervene unobtrusively, when to add to or change a play situation, when to provide a toy, a question, or a suggestion that will further the fantasy and broaden the experience.
7. Children learn through experience with people, real objects (things) and symbols. Things may be objects, events, processes, or relationships. Symbols may be gestures, drawings, pictures or words.

8. The symbolic processes of children develop through a sequence of representations. Initially children must understand that a real object can be represented by such symbols as a gesture or dramatic movement, then a toy or model, next a colourful or plain pictures, then a spoken word, and ultimately they must understand that an object can be represented by the printed word. The development of symbolism underlies the communication, recording and coding of experience in a condensed and systematic form. Full understanding of symbols, however, is slow to emerge.

9. Learning is an active process. The best method of learning is by doing or experiencing. Children must be given opportunities to learn actively.

10. Learning proceeds from simple to complex. Children should be provided with gradually increasing difficult learning tasks.
11. Learning is enhanced by psychological and biological maturation (readiness). It is very harmful to over-burden children if they are not biologically as well as psychologically ready.

12. Learning is enhanced by meaningful practice in a variety of contexts. Children should be allowed ample opportunities and contexts to practice - to learn actively by trial and error.

13. Organization of the learning task and materials promotes retention and application of learning.

14. Positive consequences like reward, support, success, approval, satisfaction and pride in one's accomplishments enhance and accelerate learning.

15. Negative or neutral consequences like punishment and ignoring delay or retard the learning process.

16. Imitation of appropriate behaviours of significant others (both adults as well as peer models) promoted learning which is known as observational learning.

17. The major factors affecting the development and learning of children are:
(a) heredity interacting with and subjected to the modifications by the environment,

(b) physical as well as mental maturation occurring through a series of invariant stages of development,

(c) socio-cultural transmission through socialisation and parental child-rearing styles and processes,

(d) active experiences including physical as well as mathematical-logical (or conceptual) experiences with objects, events and people,

(e) equilibrium (balance) involving dynamic and reciprocal interaction with the environment, developmental mobility, and stability or maintaining relative harmony with the environment.

18. Intelligence or cognition is more than mere accumulation of information or facts. It includes all the processes involved in knowing such as, perception and attention, memory, concepts, language, as well as analytical and critical thinking. It is the process of incorporation of the given data of experiences into an organised framework.
19. Intellectual development involves the development of the child's ability to organise and adapt through the reciprocal processes of assimilation (changing environmental stimuli to suit oneself) and accommodation (changing oneself to adjust to the environment) resulting in equilibrium (balance).

20. Since intelligence develops through dynamic interaction between the organism and the environment; timing, quality, and quantity of interactions are important determinants of the end-product.

21. Development of intelligence or cognition enhances the functional development of other areas such as, conative (psycho-motor), affective (feeling, emotions, and motivation), and social-personal.

22. Children's intellectual development proceeds through specific and predetermined stages. Each stage is characterized by the presence or absence of specific cognitive (mental) operations. Therefore, it is natural and inevitable that children think differently from adults, make different interpretations and draw different conclusions from the given objects and events.
23. There are four stages of cognitive/intellectual development: sensori-motor (0-2 years), preoperational or egocentric and intuitive (2-7 years), concrete operational (7-11), and formal operational or logical (11+ years). Each child moves through this sequence at his/her own pace.

24. Language is subordinate to cognition. Language helps to focus on concepts. Deaf-mute children can develop cognitive processes normally with proper care and training. Young babies, who can not talk, do certainly think.

25. Providing the child autonomy with cooperation (rather than simple obedience to authority), opportunity to dynamically interact with the physical objects and events), social (adults and peers), and cultural (music, arts, literature and values) significantly contribute to their cognitive development.

So the main purpose of the study was to assess the efficacy of such a specially designed activity programme in enhancing the cognitive skills in young Nolia children belonging to the age group of 5 to 10 years. This study thus involved a play-way activity-based cognitive training programme as the independent variable and cognitive development status as the dependent variable.
Objectives of the Study

The main objective of this research was to study the effects of a perceptual motor Intervention-training programme on the performances of the Nolia children using a pretesting-Intervention-Post testing design with an experimental (Intervention) and a control group, on certain cognitive tests such as:

(a) Classification - Class inclusion
(b) Seriation - Multiple Seriation Matrices
(c) Conservation - Number, length, liquid
(d) Non Verbal Intelligence Test - Draw-a-child
(e) Verbal learning and memory - Story telling

Hypotheses

The following hypotheses were formulated in this regard:

(1) Repeated presentations of the training conditions would have positive effects on the cognitive skills of children, i.e., the post intervention scores would be higher than the preintervention scores in experimental group; but not in the control group without any intervention, but just a lapse of time of equal duration.

(2) The performance of the experimental group in the post intervention testing would be significantly better than that of the control group. The Null hypothesis:
[1] There would not be any difference between pre-intervention and post-intervention performances of the experimental group and [2] there would not be any difference also between control and experimental group in post testings.

(3) There would be an improvement in the training scores of experimental group of children session to session over the sessions of intervention.

(4) The effects of intervention would persist over a period of time.

(5) With training cognitive structures would be integrated or interlinked.

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