CHAPTER 3

AIMS AND METHOD OF INVESTIGATION

The aim of the present study is to find out the effectiveness of competency based approach in learning over the content based approach in cognitive areas viz Language (mother tongue), Mathematics and Environmental studies among primary school children and to see whether the competency based approach can significantly enhance pupils' status in the developmental objectives of education of the child as a learner, a person, a citizen and a worker.

3.1 Main objectives of the investigation

The main objectives of the investigation are

a. i. to study and evaluate the appropriateness of the competencies spelt out in the report 'Minimum Levels of Learning at primary stage' (NCERT, 1991) in terms of their achievability, communicability and how best they serve as a rational criteria for judging the adequacy of curricular inputs provided and learning outcomes to be expected.

ii. and to develop suitable and valid teaching learning strategies for those competencies spelt out as MLLs in areas - Language (Tamil), Mathematics and Environmental Studies, which are the key subjects as far as the primary education is concerned and for which the competencies are spelt out by NCERT for the above reason. These teaching - learning strategies are the curriculum material cum techniques to be utilised in
mastery learning model to bring about the competencies to the mastery level.

b. To find out whether competency based approach in learning is more effective in improving the academic achievement in cognitive areas - Tamil, Mathematics and Environmental Studies of standard I - V when compared to the usual content based approach.

c. To find out whether the competency based approach can enhance pupils' status significantly in each of the developmental objectives of education.

3.2 Definition of Terms

Content based approach : the usual procedure followed in the schools where emphasis is given more to the acquisition of knowledge from examination point of view. Traditional methods of teaching are generally followed and the pupil is treated more as a receiver of information than as a participant in the curriculum transaction.

Competency based approach. The development of each and every competencies spelt out as 'Minimum Levels of Learning' by National Council of Education Research and Training in subjects Tamil, Mathematics and Environmental studies for standards I-V to mastery level in each and every student utilising, Bloom's mastery learning model. In this approach the emphasis is more in the development of competencies rather than attainment of knowledge alone and the approach demands utilisation of various child centred approaches where the shift is from teaching to learning and the learner being an active participant in the process throughout

Competencies : The Minimum Levels of Learning are the essential learning outcomes. There are spelt out according to the cognitive capabilities of the child of
particular stage for subject areas Tamil, Mathematics and Environmental Studies of Standards I - V by NCERT, 1991.

Cognitive areas: Cognitive areas are the subject areas of the curriculum. The psychomotor and affective areas are the non-cognitive areas.

Mastery learning: The mastery learning is the learning outcome of the utilisation of mastery learning model which is a performance based individualized instructional procedure and mastery is defined as 80% and more of achievement in the competency.

Academic achievement: Marks obtained in the examination which is common for students under both content based approach and competency based approach.

Developmental objectives of education: Developmental objectives of education are developed by Baquer Mehdi and Gupta 1983. They refer to the objectives to be realised by every child in the primary stage regarding the different roles the child has to play in life as a learner, person, citizen and worker. These objectives are also related to different aspects of personality.

3.3 Research Design

The research design used in the investigation to find out the effectiveness of competency based approach ‘after only with control design’. The basic assumption in such a design is that, the two groups viz the experimental and control are identical with respect to their behaviour towards the phenomenon considered.
Experimental Group    Treatment Introduced    Level of Phenomenon after treatment (A)
Control Group                          Level of Phenomenon without treatment (B)

Treatment effect = (A) - (B)

3.4 Hypotheses formulated

The following null hypotheses were formulated to carry out the present investigation:

1. The academic achievement of children of standards I, II, III, IV and V of the experimental group taught by competency-based approach in cognitive areas Tamil, Mathematics and Environmental studies are not different from the academic achievement of control group taught by content-based approach.

2. There is no sex difference in academic achievement of children of standards I, II, III, IV and V of experimental group in cognitive areas Tamil, Mathematics and Environmental Studies.

3. There is no significant enhancement in the status of pupils of standards I, II, III, IV and V of experimental group in each of the developmental objectives of education due to the adoption of competency-based approach.

The present investigation is a pioneer attempt in studying the relative efficacy of the competency-based approach as is defined in the present investigation in learning in subjects Tamil, Mathematics and Environmental studies among primary school children. Hence null hypotheses have been considered to be more appropriate in the context.
3.5 **Initial phase of the investigation**

The competency based approach as defined in the present investigation involves a lot of expertise and involvement of personnel in the conduct of the investigation. The investigator herself is a trained teacher and a teacher educator in District Institute of education and training, a district level agency of NCERT setup by state government as recommended by the plan of action of National Policy on Education 1986, for taking up the responsibility of upbrining the quality of primary education. Hence the investigator was in a position to plan and prepare the needed materials and tools for the conduct of the investigation.

The competency based approach to teaching learning requires on the part of the investigator,

i. to acquire knowledge and understanding of the MLLs spelt out by NCERT, which are the curriculum prepared for primary stage.

ii. analysis of various components of Blooms mastery learning strategy.

iii. to prepare descriptive item pool which are the curriculum materials / strategies that could be used as a guide in bringing about mastery learning of the competencies.

iv. to suggest the expected learning outcomes of various teaching learning experiences provided in terms of pupil behaviour.

v. to analyse the then existing syllabus / the text books to find out the MLLs related to a particular portion of the text / lessons / contents.

vi. to identify and select various child centred and activity based teaching - learning strategies and to develop suitable examples of learning experiences and activities for these strategies. These strategies are for bringing about mastery learning of the competencies, higher order
thinking skills, inquiry skills, creativity and collaborative skills etc. and to develop suitable examples of learning experiences and activities for these strategies.

vii. to develop an evaluation procedure to be used in the mastery learning strategy.

viii. to select and identify proper tools / measures / techniques for evaluation of the effectiveness of competency based approach viz. it's effectiveness in raising pupil's academic achievement and it's effectiveness in bringing about all round development of personality i.e. pupils' realisation of developmental objectives of education.

All the above mentioned, constitute the process of the competency based approach. The following pages give a brief account of materials and methods

3.6 Methods and Materials - Development and description

The following pages give a brief account of materials and methods used in the present study.

Minimum levels of learning
Mastery learning model
Descriptive item pool
Expected learning outcomes specified in terms of pupil behaviour
Evaluation format and procedures in the context of mastery learning
Syllabus Study
School Readiness
Socially useful productive work
Teaching strategies utilised in the mastery learning of competencies spelt out as MLLs. The child-centred and activity based strategies used in the present investigation are

a. Teaching to enhance creativity
b. Concept attainment model
c. Inquiry Training Model
d. Project method
e. Science - a process approach
f. Techniques of role play
g. Techniques co-operative learning
h. Peer-tutoring
i. Child-to-child Programme

Tools for evaluating the competency based approach
a. Examinations
b. The Developmental objectives of Education.

3.6.1 Minimum levels of learning

As a follow-up of the directive of the National Policy on Education (1986), a Committee to lay down essential learning out comes, in cognitive areas Languages, Mathematics and Environmental Studies at primary stage was set up in 1990 by Ministry of Human Resource and Development, Department of Education, Govt. of India under the Chairmanship of Prof. R.II. Dave. In 1991, this committee submitted its report entitled minimum levels of learning at primary stage. These specified levels of learning set a standard which all students should achieve at the end of each grade. There will be children who can learn beyond the minimum levels specified. Such fast
learners should be encouraged to achieve more. The competencies spelt out are the results of various projects conducted since 1978, with the aid of UNICEF. These competencies are spelt out according to the cognitive ability and developmental level of children. These competencies have been arranged in hierarchy across the grades from I-V so that the learning of one competency provides the basis for learning of the next competency and so on. The objectives of learning Tamil, Mathematics and Environmental Studies and the stated MLLs are given in Appendix I. A more detailed account of MLLs and how they as the essential learning outcomes serve as criteria in the mastery learning strategy are discussed in chapter 1.

3.6.2 Mastery learning strategy

Mastery learning strategy is the individualized instructional procedure in which the student learns at his own pace, decides when he is ready for the next learning segment, takes guidance from his peer and instructions and takes criterion referenced tests to assess his ongoing assignment. In mastery learning strategy, the student is allowed to proceed to the next assignment when his performance is perfect or near perfect in his present assignment. A more detailed account of mastery learning model is given in Chapter 1 and in Appendix II.

3.6.3 Preparation of descriptive item pool for the competencies

In order to help the teachers to bring about the mastery learning of the each and every competency in subjects Tamil, Mathematics and Environmental studies every student of standard I-V, the investigator has decided to develop descriptive item pool which are brief guidelines of various content / strategies in each of competencies spelt out in Tamil, Mathematics, Environmental, studies of standard I-V that could be utilised.
by the practicing teachers of the experimental schools in bringing about mastery learning.

For preparing the item pool the investigator made a thorough study of the existing syllabus, curricular material in the text books, work books in primary schools. The descriptive item pool prepared for each competency in subjects Tamil, Mathematics, Environmental studies for standard I-V incorporates the collection of related curricular materials from the existing text books, other reference books, research works in the field of teaching - learning, source books prepared by UNESCO and NCERT (cited in bibliography), examples, ideas from practicing teachers, practical experiences during observations of class room teaching and practice teaching, inservice programmes, activities suggested in the elementary curriculum transaction suggested in reference books, materials, puzzles, pictures, stories collected from newspapers, journals and periodicals, magazine sections and story books etc.

A through analysis of various studies and research works in the field of instruction revealed that techniques for improving the creative ability, inquiry skill, higher order thinking, teaching for concept learning, process approach to teaching-learning, project method, discussion method, techniques of role play, co-operative learning, peer-tutoring, child-to-child programme in learning health and hygiene concepts are child-centred and activity based strategies and the investigator felt that these can best be utilised for mastery learning of the spelt out competencies.

Various child centred techniques mentioned above are incorporated in the descriptive item pool, apart from the activities / strategies used viz conversation, dramatizations description of one's experiences and observations orally and in writing, story telling, recitation, dictation, language games, field trips, assemblies, functions, celebrations, demonstrations, play-way, group activities, solving puzzles, solving cross-
wards puzzles, use of illustrations, maps, diagrams, pictures, group assignments and individual assignments.

Care was taken to include the suitable relevant, and appropriate curricular material and strategies for each and every competencies in Tamil, Mathematics and environmental studies of standard I-V.

The descriptive item pool prepared for each of the competency/sub competency in subjects Tamil, Mathematics and Environment studies for standard I-V can serve as a guide for the development of curriculum material, for organizing teaching learning experience for competencies sub-competencies and evaluation of pupils' attainment of these competencies. The item pool gives a detailed account of how to develop to mastery level competency/sub-competency in cognitive, affective and psychomotor aspects of instructional objectives with various learner centred models and strategies of instruction. The item pool also serve as guide for criterion reference testing. As the competencies spelt out are based on the cognitive capabilities of children of that age, it is expected that these can be mastered by every child if proper, content materials, strategies are utilised and enough time is given for the child to master.

Tryout of the descriptive item pool prepared for the MLLs

A tryout of these item pool prepared for the competencies in Tamil, Mathematics and Environmental studies of standard I, II, III, IV, and V was carried out in the government model school, Tirur Chengal MGR District for one complete academic year June 1992 - March 1993 with the strength of students in I-V standards being 37, 34, 22, 34, 44 and five teachers each on teaching on standard. Model school attached and the feed back of these programmes have helped. The model school attached has I - VIII classes, where model demonstration lessons, micro and macro teaching practices by
teacher trainees, inservice programmes for practicing teachers are organised. The try out was carried out to see (i) the appropriateness of the competencies spelt out with regard to age and development of children, its communicability and achievability suitability and validity of the teaching learning strategies, the content material cum techniques given in the descriptive item pool for the development of competencies to mastery level. (ii) Whether the strategies suggested for each competency / sub competency are sufficient enough in quality and quantity for the development of competency to mastery level and (iii) to find out whether the strategies suggested have the built in evaluation capacity lending themselves for criterion referenced testing

The tryout session revealed that the competencies developed by National Council of Education Research and Training are highly appreciable and the purpose for which they are developed for raising the quality improvement among primary school children can be realised. The competencies developed as MLLs are achievable to mastery level by each and every student as they have been / framed according to the cognitive capabilities of the children. The teachers participated in the tryout session highly appreciated the efforts involved in the development of the competencies by NCERT and felt that the competencies are understandable, achievable and they give directionality to their programmes related to the teaching-learning process. The competencies speltout as MLLs serve as the criterion for the selection of curricular material, and have built-in evaluating capacity, the MLLs serving themselves as criterion to find out the prerequisite entry behaviour of every child regarding that particular competency and also to find out whether the mastery learning is attained or not. The mastery learning model suggested is practicable and adoptable in any ordinary school situations and it is child centred, that is it is an individualized instruction strategy which aims at maximum attainment by each and every student. The curricular material and strategies and models of teaching utilised in the descriptive item pool to bring about mastery learning
of competencies are suitable and the examples provided for understanding the theory and practices of the strategies are understandable and relevant. These are most enjoyable and meaningful, children actively participate in the teaching-learning process.

The split half reliability and validity of the item pools prepared for each competency are found to be quite adequate and satisfactory.

Suggestions obtained from the practicing teachers were incorporated in finalizing the materials. The outcome of the tryout was found to be very satisfactory and encouraging. After necessary modifications and consultations with the faculty members of D.I.E.T. Tirur, the finalized materials were made into booklets of each subject for standard I-V.

Five booklets are prepared for the subjects Tamil for standard I, II, III, IV and V. Each booklet consists of the account of objectives of teaching Tamil in primary stage, stated competencies for that standard and the descriptive item pool prepared for those competencies.

Five booklets are prepared for the subject Mathematics and five booklets in Environmental Studies for standards I, II, III, IV and V.

It is not possible to enclose all the 15 booklets in the appendix as it consists of more than 700 pages on the whole. A few pages given in appendix III will give an idea about the description item pool prepared. A brief account of the curricular material, strategies of a few of the competencies are presented from subjects Tamil, Mathematics and Environmental studies of Standard I-V.
3.6.4 Expected pupil behaviour as specific objectives of learning experiences

The investigator prepared the list of expected pupil behaviour for every competency to serve as guide to the practicing teachers (Appendix IV). The pupil behaviours are the expected learning outcomes in cognitive, affective and psychomotor domain specified in terms of pupil behaviour to be resulted due to teaching-learning experiences. The pupil behaviours are the general and specific instructional objectives written adopting the taxonomy of instructional objectives by Benjamin Bloom (1971), Krathwohl (1961) and Dave (1968). These expected pupil behaviour are the results of the various activities and procedures, content cum strategies provided during instruction. These specified learning outcomes as can be used as a guide to the teachers while using the descriptive item pool, while developing curriculum Material while planning for work experience, selection of suitable strategies, selection of suitable teaching aid and planning for evaluation.

A number of models of classification of instructional objectives have since been adopted. The most convincing of these has been the taxonomical model of educational objectives developed by Bloom (1956) and his associates. It has adopted a tripartite division corresponding to the three primary aspects of pupil growth - cognitive, affective, psychomotor. In Bloom taxonomy these operations or processes have been divided and arranged in hierarchical order into the following six classes: knowledge, comprehension, application, analysis, synthesis and evaluation. The taxonomy developed by Krathwohl (1961) in the affective domain systematises the objectives in affective domain hierarchically into five categories viz receiving, responding, valuing, organisation, characterisation by a value of value complex. Psychomotor domain concerns itself with level of attainment of neuromuscular co-ordination. Dove's model (1968) identifies five broad categories hierarchically namely imitation, manipulation, precision, articulation, naturalisation. The tripartite division of instructional objectives in to domain is not
water tight or an exclusive one. Pupils growth in respect of the three domains as a result of the learning experiences provided is simultaneous. The pupil during the learning experiences emits certain explicit cognitive, effective, psychomotor behaviours which are the learning outcomes. The above mentioned instructional objectives are stated in terms of pupil behaviour as learning outcomes of teaching-learning experiences and evaluation procedures. Provided during the instructions:

The specific learning outcomes in cognitive domain in terms of pupil behaviour are: The pupil recalls, recognises, acquires knowledge of terms/facts/principles/definitions/trends/examples specifies, lists out, defines, states, discriminates between significant and insignificant/important and less important/causes and effects/events, links idea, identifies relationship between ideas/cause and effects/means and ends, compares and contrasts, draws inferences, illustrates events/trends etc by citing examples, identifies the problems, locates important events examples, cities examples, arranges facts/trends etc in a particular order, explains, elaborates, expresses orally or in written form, puts forward reason, locates errors, notices the similarities and differences, detects errors and rectifies, develops ideas, translate verbal into symbolic ones and vice versa, gives evidence, summarizes, collects relevant data, selects relevant fact/principles/examples, formulates hypotheses, advances arguments in support of the contention, discusses, suggests solutions, generates new ideas creates novel situations solves problems organise ideas, analyses the problem, verifies the inference interprets with implications, diagnoses, predicts, prepares reports, makes conclusions, applies his knowledge and understanding to new situations. Solves problem, solve puzzles and riddle, cities examples establishes relationships, discovers, synthesises, correlates, critically examines, assesses, evaluates, inducts, deducts, inquires, judges the adequacy.
The following specifications are of affective domain. The pupil admires, beautifies, appreciates, respects, receives, realises, develops attitudes / habits / values, believes, enjoys, loves, develops interests in, likes, creates novel thing, likes, cooperates, be friendly with, makes value judgements, criticises adopts himself to, plays active roles in, possesses values, perceives the underlying, prefers

The following specifications belong to the psychomotor domain

The pupil: draws, figures maps and labels them, reads silently, interprets charts/ exhibits, expresses himself in art form / drawing / dance, designs, experiments, manipulates apparatus, handles tools, demonstrates experimentally, improvises models and apparatus, prepares album / herbarium / scrap books, reports, gives colours to the drawing and clay models, conducts practical / projects / community work, exhibits his collections, collects and arranges, participates in socially useful productive work, prepares toys, participates in games and plays the role of

The investigator have suggested the expected pupil behaviour as learning outcomes for each and every competency in subjects Tamil, Mathematics and Environmental Studies for standard I-V and are given in Appendix IV. The pupil behaviour which are the specific objectives of the learning experiences provided and the in built evaluation done during the process teaching - learning. These expected learning outcomes suggested gives a sense of direction while planning the lesson and help the teachers as a guide as to what to look for during instruction.

3.6.5 Evaluation of the attainment of competencies

Evaluation is a continuous and comprehensive process. It serves different purposes. At the elementary level the purpose should not be certifying students to the next class, but studying children's mastery level, diagnosing their weaknesses and
strengths. It implies that emphasis should be on diagnostic testing which may be in the form of check lists or tests mainly structured to identify student's specific deficiencies. Diagnosing testing is mainly concerned with identification of weakness and strengths with regards to the fundamental process such as reading, writing and the four operations of mathematics. Remedial instruction means teaching which is developmental in scope. Remedial learning is concerned with two types of deficiencies the presence of poor habits and absence of good habits. Remedial instruction involves number of exercises for each of the components where the child is deficient and is allowed to more at his own pace. These are not to be speed exercises.

Entry level tests to test the entry-level behaviour of pupils before the instructional programme for a competency is started, continuous testing and monitoring followed by remedial or enrichment instructional efforts are the characteristics of evaluation in mastery learning. In mastery learning context, testing needs to be 'continuous' and comprehensive. As the instructional programme proceeds from one competency to the other, after the mastery of the first competency, the second competency is taken up in a sequential manner after due testing and monitoring.

Evaluation has to be in terms of feedback from activities which can enhance the intrinsic motivation of children. Through evaluation, the hard spots in the various competencies would become known to the teacher so that he/she could plan for necessary remedial measure or supplementary efforts. Planning for suitable evaluation calls for dedication, commitment, perseverance and above all, a professional outlook on the part of the teacher. The competencies spelt out as MLLs have in built evaluable capacity lending themselves for criterion referenced testing. Formative evaluation can be in the form of unit tests, informal tests and through activities in non-threatening situation.
Based on the theoretical model developed on the assumption about the learner, the learning process and corresponding implication for teaching and evaluation Pretam Singh, 1983 NCERT. The investigator has developed an evaluation format to be utilised in competency based approach for every student.

Name of the student:

Subject: 

<table>
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<th>Competency</th>
<th>Pretesting for prerequisite cognitive and affective behaviour needed for the competency</th>
<th>Post testing whether mastery is achieved or not</th>
<th>If mastery is not achieved diagnosis of reasons for not achieving the mastery</th>
<th>Remedial measures taken to bring mastery learning of the competencies</th>
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The advantage of frequent formative testing are the following:

* to pace the students learning
* to motivate proper effort at the proper time
* to ensure that each set of learning task has been mastered
* to reinforce learning for those who have mastered the unit
* to reduce anxiety about course achievement
* to diagnose those who have not mastered the unit
* to provide frequent feed back on teacher instruction
* to provide evidence for forecasting.
3.6.6 Syllabus Study

A Syllabus study is made by the investigator to find out the general and specific instructional objectives of the lessons of the then existing text books of Tamil, Mathematics, Environmental Studies of Standard I-V in order to list out the competencies spelt out as MLLs that are related to the particular content portion of the text books.

For this purpose the contents are analysed for revealing the underlying instructional objectives so as to find out the competencies which are related to the contents/lessons in the text books. The / lesson / content of the text books and the competencies relating to that particular lesson / content are listed and tabulated. This was done for every lesson / content portion of the prescribed text books in Tamil, Mathematics, EVS of standards I-V. (Appendix VI).

The syllabus study and the table prepared can in general develop among the teachers the relationship existing between the competencies / instructional objectives and the curricular materials given in the text books and that the contents are given importance to the extent that they are meant for the realization of the terminal learning outcomes / competencies.

3.6.7 School readiness programme

School Readiness Programme (1979) developed by NCERT is the teaching-learning experiences to be provided to children of first standard during the first six weeks of their first standard class. This programme is to be carried out to compensate for the lack of or lack of proper early childhood education. The activities included in this school readiness programme are for bringing about personal-social readiness, psychomotor readiness and academic readiness among children of first graders.
(Appendix VII). The investigator collected a detailed account of these activities related to the personal-social, psychomotor and academic readiness. The knowledge about importance of early childhood Education and the importance of school readiness programmes will be helpful in bringing about the programme more effective. The investigator has developed the expected learning outcomes in terms of pupil behaviour for these activities. Each activity is evaluated in the form of criterion referenced testing for every student.

3.6.8 Socially useful productive work

Socially useful productive work followed in our schools since 1979 is described as purposive and meaningful manual work resulting in either goods or services which are useful to the community. Such work must not be performed mechanically but will include planning, analysis and detailed preparation at every stage. The aim of this curricular area is to provide children with opportunities of participating in social and economic activities inside and outside the classroom enabling them to understand scientific principles and processes involved in different types of work and in the setting in which they are found in the physical and social environment. A record of the activities by every individual are maintained by the teachers to provide feedback both for the students and the teachers.

The programme of socially useful productive work may be summarized as follows:

a. Classes I and II helping in work situation in the home, in the school and in the community, manipulate simple material with simple tools for creative self-expression.
b. Classes III - VII/VIII Common activities pertaining to health and hygiene, food, shelter clothing, culture and recreation, community work and social service. The various activities to be carried out under these headings and further details about this programme are presented in the appendix VIII.

3.6.9 Various child-entered and activity based strategies

The following pages will give a brief account of the strategies used in this investigation in particular apart from other procedures that could have added by the teachers.

The mastery learning of the competencies demands the utilisation of various child-centred and activity based strategies and it is also that for bringing about higher-order skills among children which is the need of the hour, such strategies are to be mainly utilised. Researches in the field of teaching-learning of children, have suggested various models and methods for qualitative improvement among school children. The investigator has selected certain strategies for the utilisation in the present investigation. These by no means are the only models strategies/methods suitable for teaching in primary sections, nor do they imply that the use of these alone in the teaching of any subject would suffice for an ideal teaching method. A single best way to teach does not exist. Variety of instructional goals require alternative teaching strategies, i.e. alternative teaching methods which are intelligently matched with the objectives to be achieved, the nature and structure of the content, the needs of the learner and the emerging demands of the classroom.

a. Teaching to enhance creativity

Brain storming technique of Alex. F. Osborn (1963) and synectics method of W.J.J. Gorden (1961) are the two most prominent special methods conducted in the
form of group thinking in the condition of suspended judgements. During brainstorming sessions the interpersonal stimulation generates more ideas, one person's idea suggesting ideas to another person. Groups encourage daring, invite competition, and broaden the scope of the search for ideas. For example, pupils can be asked to suggest ways and means to reduce air pollution, how to save energy, how to minimise sound pollution, how to improve their village lake, etc. Some solutions suggested by students may be feasible and some not.

*Synectics* was designed by William J.J. Gordon and his associates (1961). According to him by bringing the creative process to consciousness and by developing explicit aids to creativity, we can directly increase the creative capacity of both individuals and the group and here the emotional component is more important than the intellectual and the irrational more important than the rational. Through metaphoric activity of synectics method, creativity becomes a conscious process. Metaphors establish a likeness, the comparison of one object or idea with another object or idea by using one in place of the other. Through these substitutions the creative process occurs, connecting the familiar with the unfamiliar or creating a new idea from familiar ideas. Three types of analogies are used as the basis of synectics exercises viz (i) direct analogies (ii) personal analogies (where students become the analogies) (iii) compressed conflict (generally two-word description of an object where the words seem to be opposites or contradict each other eg, friendly foe, tiredly aggressive smile and a frown). Examples that can be used in the classrooms are - How a school and factory can be alike? How a potato and carrot be alike? How a hotel and provision store be alike etc. Students suggest direct analogies between the two ideas/objects, personal analogies and write compressed conflicts. Synectics is used in creative writing, explaining social problem, problem solving, creating a design and broadening our perspective of a concept.
In the technique developed by Crowford's, the *attribute listing method* (1954) one thinks of specifications, limitations, needs and so on of an object or a situation. Example the pupil writes/says the attributes of a fan, a van, a school etc. Osborn (1963) recommends a *checklist procedure*, a question asking technique which ensures a wide coverage of information. Each question calls for a transformation of some kind. Examples: How can you improve a fan, How can you improve a table etc. Both the ‘attribute listing’ and ‘checklist’ procedures are combined and known as morphological analysis by Zwicky (1957) and advocated by Allen (1962). For example the problem is first analysed in terms of fundamental dimensions. For example suppose we wish to improve a van, the major dimensions and their various categories are identified (the seat/support for the human being, the support for the vehicle i.e. road, rail etc, the power supply) and by combining these categories in all possible ways, one can obtain numerous potential ways of improving a van.

Suggesting various uses for an object and free-association word responses obtained to stimulus words can be used as technique for improving originality. Types of creative activities like building blocks, painting and drawing on their own, paper folding, clay and plaster of paris moulding, threading beads, chalk work, flower decorations, making doll houses, sand play, crayon work, simple short drama, drama based on animal world stories, action songs, stories, and poems are to be developed 'by' the children. Opportunities for creative play activities, picture completion, asking pupils to find out similarities, given the plot of stories to give titles, writing couplets, triplets, quotations, limericks, haiku poems, guiding students to write or say fairy tales, guiding students to utilise languages creatively i.e examples, similes, metaphors need to be utilised by pupils in writing or speaking experiences e.g the chariot like clouds floated on the sea of ice.
Suitable examples are developed by the investigator to make the teacher of the experimental group know a wide range application of activities, so as to enable them to create and present suitable creative teaching learning activities for children on their own. These are all given in the Appendix IXa.

b. Concept Attainment Model

Another teaching strategy used in the investigation is the concept attainment model. The concept attainment model was developed by Jerome Bruner (1956). Assumptions underlying concept formation are different entities and phenomena are classifiable. All concepts which may be conjunctive, disjunctive or relational are the products of some kinds of thought processes. The educational objectives of concept attainment model are: to acquire a new concept, to enrich and clarify known concepts, to develop an awareness of thinking strategies of the model.

Based on Bruner's theory the following models are available for concept attainment: (i) reception oriented (ii) selection oriented (iii) unorganised material

i. Reception oriented CAM: Teacher presents labelled examples of the concepts in a particular sequence. The examples are labelled positive and negative. A positive example has all the essential attributes of the concept. Students receive the examples, formulate hypothesis by comparing the positive examples, and finally attain the concept and are in a position to define or describe it on the basis of the identified essential attributes.

ii. Selection oriented CAM: In selection oriented CAM, a pool of unlabelled examples of the concept is presented. Students go on selecting examples of their choice, asking the teacher to label the particular example selected is a positive example or not. The teacher in turn labels it.
Unorganised material CAM; Learners are exposed to materials which is in the form of a paragraph. The attributes related to the concept are contained in the paragraph, not always explicit. The learner have to identify the attributes and name the concept.

The instructional effects of concept attainment model are inductive reasoning, specific concept, improved concept building strategies, the nurturant effects of CAM are sensitivity to logical reasoning in communication, tolerance for ambiguity with appreciation of logic and awareness of alternative perspective.

The syntax of reception and selection models, the principle of reaction, social system and support system of the model and the typical examples developed by the investigator are presented in the appendix IXb.

c. Inquiry training Model

Inquiry training was developed by Richard Suchman (1957) to teach students a process of investigating and explaining unusual phenomenon. Inquiry teaching is based on certain assumptions. For example, it assumes that all knowledge is tentative. As new knowledge is generated, the explanation and solutions to problem change. The implication is that there cannot be only one answer to a particular question. It further assumes that human beings are curious by nature and inquiry skill may be sharpened through systematic teaching and training. It also assumes that team approach enriches the inquiry. The general goal of inquiry is to help students develop the intellectual discipline and skills necessary to raise questions and search out answers stemming from curiosity. Inquiry training begins by presenting students with a puzzling event. Suchman believes that individuals faced with such a situation are natural motivated to solve the puzzle. We can use the opportunity provided by the natural inquiry to teach the
procedures of disciplined searching. After the presentation of the puzzling situation the students ask the teacher questions. Teacher gives either 'yes' or a 'no' answer. By listening to that the child hypothesizes and puts more questions. Inquiry approach is not simply a strategy for asking and answering questions, it is a request for information, but in reality it is more than that. It is the welding of process to content, the sequential development of skills that will produce a maximum level of autonomous search behaviour in individuals. Inquiring training permits the individuals to assess an event, to recognize a problem or problems, to analyse the variables, to recognise the relevant and irrelevant questions and variables, to search out data, to take complete responsibility for the entire process of obtaining, organizing and interpretation of data.

The syntax, the principle of reaction, the social system and support system of the model and typical examples explaining the theory and practice of the model developed by the investigator are presented in the Appendix IXc.

**d. Project Method**

A project method is usually defined as a piece of whole-hearted and purposeful activity carried to completion in its natural environment. Project is also defined as a problematic act carried to completion in its natural setting.

The project method is not a technique of teaching any particular subject. It is a technique whereby the interest of child in actively doing something and in carrying out his purpose is used for the benefit of all subjects.

Essentially, the method is based on the fact that students learn through association, activity and co-operation. The problem may be a constructional type such as building up a school science museum, running a school garden, setting up a classroom library, collecting specimens for science exhibition, arranging picnic or it may be of the
project type meant for investigation such as various sources of energy, water supply of the locality, study of plant and animal life of the area. Through each project sufficient knowledge and information can be imparted on topics related to the project. For example, in a simple project like growing seeds in a box, an extensive unit on soil, plant, food, manure, surveys comparative and other areas of knowledge related to seed growing can be built up. A project helps to widen the mental horizons of the students. Examples of a few projects that can be carried out in elementary school are collected developed by the investigator are given in the Appendix IXd.

e. A process approach to science

Science - a process approach - a curriculum of elementary school stage was developed by American Association for the Advancement of science (1973). These ideas have been incorporated in our curriculum development in various contexts (Curriculum material development and Evaluation - Induction package, Regional college of Education, Bhopal, Madhya Pradesh 1991).

In science a process approach the emphasis is upon the basic and integrated processes/skills to further learning of science. These processes are arranged in a hierarchical manner. Content is not to be omitted, the child participates in process-based activities. In this approach content is not related to particular scientific discipline but is derived from familiar objects and phenomena in the child’s environment. The processes viz observing, inferring, predicting, hypothesis-making and testing are explained here.

The AAAS interpreted science in a very different way. They chose to define science in a broad sense, as a series of processes. They state that 'Children even in primary grades, will derive more from the study of science if they learn the behaviours
of scientist. Although these are complex, these have been classified into a number of process-skills, some simple and some complex: the pupil hypothesizes, induces, deduces, speculates, analyses, selects data, designs, experiments, reflects, proposes, criticizes, convinces, invents, guesses, comprehends, doubts, incubates, predicts, estimates, explains, appreciates, infers, abstracts, synthesizes, formulates, intercorrelates, generalizes, forecasts, extrapolates, interpolates and communicates through tabulating and graphing.

We know that children are curious by nature and they enjoy exploring environment around them. Another important thing is that knowledge is growing fast and the child is to be equipped with skills which may help him to update knowledge. In process approach children learn to observe, classify, infer, make and verify hypothesis. The process approach develops the intellectual skills.

In process approach, science taught to children should resemble what scientists do. Scientists observe, classify, measure, infer, make hypotheses and perform experiments. If scientists have learnt to collect information in these ways, the elementary forms of what they do can be learnt by the children in the elementary classes. Scientific creativity is possible because students will be able to look upon and deal with the work in ways that scientists do. For example, in the teaching of solar system, the children are required to learn some factual information such as the distance of the earth from the sun, diameter of sun and other facts related to the solar system, whereas in process approach, which emphasizes the learning of principles, concepts and processes, the children observe the natural phenomena of sunlight, study its effect on various objects (such as walls, floor, clothes, plants and others). They learn to record the temperature and discover that some of the objects get hot easily than others, dimensions of shadows change during the day. In this way children manipulate the objects, observe the natural phenomena and environment, formulate and verify the solutions and arrive
at certain results themselves. Five arguments have been given in favour of process based approach to curriculum. They are the failure of content led approach, the science for all programme necessitates a process approach, the information explosion makes teaching of facts questionable, science facts out date so quickly that they should not form basis of science education, skills particularly generic and transferable skills are more relevant to pupils than knowledge.

Selected typical examples revealing the process approach are developed by the investigator, so that the theory and practice of the approach is made known thoroughly to the teachers. These are given in Appendix IXe.

f. Role playing

Maier Henry W (1991) says that role playing as a training tool for practicing skill acquisition, enhancement of knowledge and a change of affect. Children’s lived experiences provide them to change their understanding of the particular aspects of world around them. A play house with toy kitchen item, a little clinic where children can play as doctors and nurses using toy medical kits, a shop, a post office can make the learning more interesting and meaningful.

The children are asked to hold imaginary conversations between the teacher and a student, between a teacher and a parent on some issue. The children can play the role of a shop keeper and customer with toy currency; as birds, animals or some historical and mythological characters. While doing role play the pupil should not be allowed to memorise the dialogues before hand, because mere memorisation does not help in effective role - playing.
A few examples of teaching-learning experiences in role playing that could be provided in language, mathematics and Environmental studies are developed by the investigator and are presented in the Appendix IXf.

g. **Techniques of co-operative learning**

By structuring positive, negative or no interdependence among heterogenous students during academic learning situations. Teachers can influence the pattern of interaction among the students and the interpersonal attraction that results.

There are several models of co-operative learning viz the team assisted individualization (Slavin Robert 1986), Jigsaw following the team assisted individualization etc. *The learning together model* of Johnson and John 1976 was developed by David and Roger. It says that the teachers can structure lessons co-operatively so that student work together to accomplish shared goals. Students are assigned to small groups and instructed to learn the assigned material and to make sure that the other members of the group also master the assignment individual accountability is checked regularly to ensure all students are learning. Students seek outcomes that are beneficial to all those with whom they are co-operatively linked.

Salvin Robert E (1986) discusses two major the critical perspective on co-operative strategies - developmental and motivational. The developmental perspective enhances learning by creating cognitive conflicts and by exposing students to higher quality thinking. The motivational theories emphasize that rewarding groups on the basis of individual learning of all members create peer norms and enhance learning outcomes.
The four basic elements that need to be included for learning to be co-operative include positive interdependence, individual accountability, collaborative skills and group processing.

The theory and procedures of co-operative learning and a few examples developed by the investigator will give an idea about the utilisation of the co-operative learning technique are given in Appendix IX.

h. Techniques of peer tutoring

Peer tutoring is a technique where peer collaborations are carried for accelerating students with mild learning difficulties. The techniques is found to be beneficial not only for the tutees but also to the tutors.

The child helps another child in the learning processes. Wherever possible, here both the tutors and tutees are benefitted. A more knowledgeable child can help his peers for example in learning mathematical tables, in reading, in pronouncing word correctly in using mathematics kit box items while learning mathematical operations, in collection of materials, in the conduct of projects, in writing, in writing reports, in preparation of teaching aids, during discussion sessions.

i. Child-to-child Programme

Child-to-child programme is an international programme designed to teach and encourage school children during 1979, the international year of the child, to concern themselves with the health of their younger brother and sisters. Simple preventive and curative activities appropriate to the local situation are demonstrated and taught to the children in school so that they may pass them on in the family or village environment.
The primary child can for example count the number of children under five in
the village or the street, find out how much each food stuff costs and how prices charge
during the year, find out how much water a family uses and where it comes from, teach
and play with their younger brothers sisters in a way which helps them to develop, tell
the family the best energy foods and how good they are for small children and the
importance of taking several meals and those foods which give a lot of energy which are
as important as protein foods, made sure that children with diarrhoea drink enough
water with sugar and the right amount of salt added. The programmes carried out in
child-to-child programme by primary school children for given in Appendix IX.

The above mentioned materials which are the components of the competency
based approach as defined in this investigation. The successful implementation of the
materials and techniques depend mostly upon how effectively the orientation is given
to the teachers in the experimental schools.

3.6.10 Developmental objectives of education

The aim of the investigation is also to find out whether the competency based
approach can enhance pupil’s status in the developmental objectives of education at
primary stage. For the purpose of finding out whether the competency based approach
has any effect in improving the pupils attainment of the developmental objectives of
education, the investigator has decided to utilised the ‘Developmental objectives of
Education at primary state’ developed by Baquer Mehdi and Gupta B.P and published
in the ‘Effective use of school curriculum - a series’ No.2 NCERT (1983). Here the
development of the child is studied and analysed both from the point of view of different
roles the child has to play in life, such as his role as a learner, as a person, as a citizen
and as a worker and from the point of view of the different aspects of his personality
viz motor, mental, social, moral, emotional and psychological which would also include
his needs, motives, interests and attitudes. Corresponding to the roles the child has to play in life as a learner as a person as a citizen and as worker, the developmental objectives of educational are identified.

Developmental of the child as a learner. This aspect of child's development refers to those abilities, skills and attitudes which the child must develop in order to become not only an efficient acquirer of knowledge but also its user and producer. Development of the child as a learner with the required competencies-knowledge, understanding and skills, attitudes and appreciations, and behaviours and habits are denoted by LC, LA and LB.

Development of the child as a person: These are the desirable changes expected in his personality and behaviour as a result of his education in school. These are certain qualities of character that have to fully attended to for his proper development in school. Development of the child as a person with the requirement competencies-knowledge, understandings and skills, attitudes and appreciations and behaviours and habits are denoted as PC, PA and PB.

Development of the child as a citizen: Besides knowing his rights, the child has to learn what his duties are towards his family, towards the community and towards humanity in general. He has to learn his responsibilities in relation to all those with whom he comes into contact, example his friends, his neighbours and other who live in the community. Development of the child as a citizen with the required competencies-knowledge, understandings and skills attitudes and appreciations and behaviours and habits are denoted as CC, CA and CA.

Development of the child as a worker: the child has to develop habits, skills and attitudes which are particularly useful for him as a worker. In fact these attitudes,
habits, behaviours and skills start developing right from the early stages of child's life and especially during the primary school years. One must appreciate the fact that work has its own education value. Development of the child as a worker with the required competencies knowledge, understanding and skills, attitudes and appreciations and behaviours and skills are denoted as WC, WA and WB.

The developmental objectives of education from the point of view of different roles the child has to play in life namely as a learner, as a person, as a citizen, as a worker are related to different aspects of personality, the motor, mental, social, moral, emotional and psychological which includes his needs, motives, interest and attitudes.

In order to find out whether the competency based approach can enhance pupils status in each of the developmental objectives of education, the pupil of the standard I-V of experimental schools are to be rated on a five point numerical scale ranging from 1-5 by their teachers prior to and after the implementation of the competency based approach and are analysed. The ratings of every student prior and after the implementation of competency based approach in each of the developmental objectives are tabulated. While tabulating direction of the shift of ratings of every student in each of the developmental objectives are be noted. The percentage frequency distribution of ratings of pupils of standard I-V before and after the experimental treatment are tabulated and from these informations the distribution of pupils under the various scale values, magnitude and direction of shifts can be noted.

For getting more informations the ratings of twenty students are taken at random from each standard and are analysed using paired t test for testing the statistical significance of the difference in the ratings received prior to and after the experimental treatment in each of the developmental objective.
3.7 Main Study

The main study consists of three steps.

i. Selection of experimental and control group

ii. Orientation of the methods and materials to the teachers of the experimental schools

iii. The conduct of the investigation programme in the experimental schools

3.7.1 Selection of Schools as Experimental and Control Groups

In order to find out experimentally whether competency based approach in learning is more effective in increasing the skills, knowledge and achievement in language (Tamil), Mathematics and Environmental studies of standard I-V, rural schools were selected. The following aspects are taken as reasons for selection of rural school for the conduct of the investigation. Rural schools generally have poor infrastructure. Majority of rural population belong to the disadvantaged and deprived sections of the society. Many of the rural schools are low achieving schools, they have poor building and other facilities; lack of sufficient staff members, some of them even single teacher schools; majority of students being the first generation learners. Rural people's apathy towards education and girls education in particular, the conditions prevailing due to wastage and stagnation, students being potential dropouts are other causes for low performance. So it was decided to conduct the experiment in rural set up. What holds good in rural school can very well be generalized for semiurban and urban schools.

Rural Panchayat union schools were listed from Villivakkam, Chengelpattu M.G.R District. The previous years (1991-93) academic achievement records of these fifty seven schools were gathered from these schools and schools which have the mean value of 48% and standard deviation value of 12%. (These values are chosen as criterion
for selection of schools for these are the most frequently appearing values in all the three subjects viz. Tamil, Mathematics and Environmental Studies in all the I-V standards in the annual examinations were identified. Further these schools possessing the above mentioned achievement standard can from a representative sample of population of rural schools of our country. (Reference: National policy on education - 1986, MIIRD, Govt. of India; Annual Report, 1991-1992, Department of Education MIIRD, New Delhi; UNESCO - APEID sponsored joint innovative project on raising the achievement level of children in primary education in India - Final National Report, 1986-1987, SCERT, Tamil Nadu, Madras. These forty seven schools thus identified are schools from the rural area, pupils are of same socio-economic status, and the administrative setup of the school, the physical facilities and environment of schools, the mode of instructions, number of teachers and their qualifications are the same. From these forty seven schools, twenty schools are selected at random and from these twenty schools again ten schools are selected at random as the experimental group and the remaining ten being the control group. Thus a multistage random selection procedure is adopted so that the experimental group is matched with the control group and that the variables that could influence the experiment are controlled according to the principle of random sampling.

List of Schools under Experimental group

1. Panchayat Union Primary School, Adayalampattu - 602 102.
2. Panchayat Union Primary School, Arkambedu - 600 062.
3. Panchayat Union Primary School, Chettiaragaram - 600 077.
4. Panchayat Union Primary School, Ellamanpettai - 600 052.
5. Panchayat Union Primary School, Erankuppam - 600 052.
6. Panchayat Union Primary School, Melapedu - 600 055.
7. Panchayat Union Primary School, Ayyapanagar - 600 058.
8. Panchayat Union Primary School, Pothur - 600 053
9. Panchayat Union Primary School, Mohaper Sector 7 - 600 058
10. Panchayat Union Primary School, Mohaper Sector 8 - 600 058

List of Schools under Control Group

1. Panchayat Union Primary School, Karlapakkam - 600 058
2. Panchayat Union Primary School, Allathur - 600 077
3. Panchayat Union Primary School, Kaladi - 600 077
4. Panchayat Union Primary School, Konimedu - 600 052
5. Panchayat Union Primary School, Mettukuppam - 602 102.
6. Panchayat Union Primary School, Noombel - 600 077.
7. Panchayat Union Primary School, Puliambedu - 600 077
8. Panchayat Union Primary School, Rajahnkuppam - 602 102
9. Panchayat Union Primary School, Vellacheri - 600 058
10. Panchayat Union Primary School, Mohagaper Sector 9 - 600 058.

Table 3.1  Strength particulars of students of experimental schools

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Table 3.2  Strength particulars of students of control schools

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The experimental group had 289, 244, 283, 264, 281 students in standard I to V and the control group had 269, 244, 239, 250, 240 students in standard I to V. The strength particulars of the students I-V standards of the experimental and control groups are shown in table 3.1 and 3.2. There are fifty teachers in the experimental group and fifty teachers in the control group each teacher taking care of one standard.

3.7.2 Orientations to the teachers

The objectives of the orientation is three fold To apprise the teachers the need for using the competencies in the mastery learning model, secondly to give training in various teaching-learning strategies for achieving the competencies to mastery level and thirdly training in evaluation procedures used in the study.
Orientation to the teacher of the experimental schools are given in the participatory method which in the participatory method which reveals satisfactory outcome regarding the theory knowledge check up and willingness for adoption of the MLLs in the existing curriculum, models and teaching strategies including mastery learning strategy and various other strategies introduced for bringing mastery learning of the competencies. The general orientation was given for a week ahead the start of the academic programme to commence. The period of orientation was found to be sufficient as they were practicing teachers for a number of years. The investigator took special care and effort to render individual guidance to the teachers of the respective standard in tackling special issues in implementing the competency based approach to that standard. Further individual guidance in materials developed for each standards were also given in particular. Co-operation and guidance is taken from the faculty members of DIET, Tirur during the orientation to the teachers. The number of teachers who took the orientation were fifty. In primary sections there is only one teacher who is incharge of the teaching learning of all subjects

The booklets prepared handed over to the teachers of experimental school are:

* Statement of MLL for standard I-V subjects Tamil, Mathematics and Environmental Studies (Appendix I)

* Mastery learning strategy - Principles and Procedures (Appendix - II)

* The 15 booklets prepared for subjects Tamil, Mathematics and Environmental Studies of standard I-V.

* The expected pupil behaviour in cognitive and psychomotor and affective domains as essential learning outcomes of mastery learning of each and every competency by every child. (Appendix IV)
Evaluation Procedures (Appendix V)

Contents of the text book of I-V standards of subjects Tamil Mathematics and Environmental studies and the related competencies to be mastered (Appendix VI).

Developing school readiness: The detailed account of activities included in the school readiness programmes for bringing about the personal-social readiness, psychomotor readiness and academic readiness amongst children of first grade (Appendix VII)

Socially useful productive work: The detailed account of SUPW programme that can be taken up by primary classes and the importance the programmes (Appendix VIII).

Diagnostic and remedial measures (taken from Diagnostic and remedial measures by Avinash Grewal, CMDE Induction package RCE, Bhopal 1991)

Usage of Mathematics kit box provided by the Government under Operation Black Board scheme. The kit box consists of seven items namely Dominoes, Cuisenaire strips, Cubic rods, Napier Strips, Spike Abacus, Fractional discs, solids. (taken from ‘NCERT programme of mass orientation of school teachers in the context of the scheme of Operation Black Board - training material Vol.II 1991, NCERT’).

Booklets dealing in detail the meaning, importance, procedure teacher’s role, illustrating examples, model lessons are given as a guide and reference materials. (Appendix IX) Topics dealt are

Teaching to enhance creativity
Concept Attainment Model
Inquiry Training Model
Project Method
Science - A Process approach
Role Play
Co-operative learning
Child to child programme

3.7.3 Role of Teachers in the Experimental Schools

Teacher is given full freedom and responsibility in the mastery learning model. Teacher selects suitable curriculum material i.e. the content, examples situations suitable to the locality for the mastery learning of the competency.

Planning and teaching for mastery: The teacher practicing the mastery learning decides what will constitute mastery of each learning unit. An achievement of 80% or more in the criterion test is decided to be as mastery level. These formative tests are intended to help teachers to identify students' error and misunderstanding. Such information is to be used to improve student learning rather than to evaluate merely the quality of learning.

Once mastery has been defined, the next task is to plan for mastery. The plans include activities and materials related to the competency and also must include additional, supplementary activities and materials for those students failing to attain the performance standard on the unit formative tests.

The function of planning for mastery is to permit teachers to be pro-active in their classroom study situation. Proactive teachers are ready to solve classroom problem as they arise. In essence, planning enables teachers to monitor student learning as a
unit by unit basis. The first such task of planning for mastery is to design a general plan for helping all students master the competency. First, the material relating to each objective viz the competency should be presented in a way that is appropriate for the vast majority of student in the classroom. Second, the activities in which the relevant material is embedded should involve or engage the vast majority of students in the process of learning. This general plan is often referred to as the original plan. The second sub-task involves the presentation of methods for interpreting and using the information gathered from formative test. A set of alternative instructional materials and learning activities keyed to each competency is developed. These ‘correctives’ as they are called are designed so as to re-teach each unit objectives. Approximate amounts of time must be allocated to the original instruction and testing.

In the phase of teaching of mastery, the focus is on managing learning rather than managing learners. Inside the classroom the function of the teacher is to specify what is to be learned, to motivate pupils to learn, to provide them with instruction materials, to administer these materials at a rate suitable for each pupil, to monitor students progress, to diagnose difficulties and provide proper remediation for them, to give praise and encouragement for good performance and to provide for review and practice that will maintain pupils’ learning over a period of time. The application of mastery learning is tremendously flexible.

The experimental school practiced the competency based approach in teaching learning for one complete academic year (June 1993 - April 1994). The control group followed the content based approach, the usual procedures and, existing modes of teaching learning. The experimental group following the competency based approach follow the same syllabus i.e. text books prescribed for the standards I-V in all the three subjects apart from developing the competency to mastery level and students the first
standard students take up the school readiness programme for the first six weeks as their school programme taken in this study.

Teachers were asked to utilize the descriptive item to prepared and developed for competences spelt out in subject Tamil, Mathematics, and Environmental studies for standards I-V which serve as the guide for the selection, development of curricular material for organizing the teaching learning experiences and for the evaluation of pupils' achievement.

Teachers were asked to utilise the expected pupil behaviour which are the specific learning outcomes. The teacher of the experimental schools are asked to use necessarily those suggested in the descriptive item pool and also check the expected learning outcomes as specific objectives apart from the activities that can be developed on their own. This was done to make the programme to be uniform in the experimental schools to expected possible extent in order to gain to status of an experiment.

Teacher plans for developing each competency following headings curriculum material development, selection of suitable teaching-learning strategies, plans for the actual conduct of the lesson, plans about adequate and management regarding the conduct of the lesson; educational technology to be utilised viz. models, aids etc., utilisation of community resources and evaluation procedures to be followed.

Teacher utilises various child centred and activity based methods and techniques, for the transaction of the curriculum material development.

The teachers who are acquainted with the various teaching strategies utilises suitable technique for particular competency to be developed to mastery level from their repertoire.
The teachers of the experimental school are asked to refer to the table showing, the then existing syllabus and the related competencies to be mastered. For example the development of competency 'comprehension of the written text or text read to them' is the competency to be developed by using various stories, lessons taken from the various resources and utilising various strategies suggested, and the mastery of every student in this competency will be helpful in meaningful learning of the prose lesson and vice versa. Thus meaningful acquisition of knowledge, understanding of the content and development of competency along with the text content or vice versa lies in the hands of a creative, efficient, thoughtful teacher. The experimental schools are to develop each and every MLL to mastery level, apart from teaching-learning of the then existing syllabus provided in the text books. As the MLLs are 'minimum' essential learning outcomes developed suitable to the cognitive capabilities and development of the child, these and the instructional objectives of the content prescribed in the text books are not mutually exclusive. The tables thus prepared can help the teachers of the experimental schools to know which are the competencies are related to the lesson in hand and to develop these competencies before moving in to the lesson or side by side so that learning of the lesson be made more enjoyable and meaningful. The teachers are also sometimes happen to utilise the contents materials / lessons prescribed in the text books as a means in the development of the competencies.

Teacher makes use of multisensory approach in teaching learning, otherwise there is generally, a communication gap between what a teacher transacts and what the learner understands. To narrow this gap, teacher can makes use of different types of items in the kit boxes, and improvised low cost - no cost aid using local resources, low cost visual aids, non-broad cost audio aids (tape-recorders), activity aids (environment being the biggest laboratory) and self learning materials (stories word games, etc)
The teacher plans completely the utilisation of selected resource materials and the classroom activities (each pupil working alone, small groups of pupils working alone or with teacher guidance, large group working alone). The teacher having a good overall view of the subject, knows his/her limitations, knows all about the pupils and the individual differences in their learning capabilities and plans accordingly.

Teacher plans for the utilisation of the community resources for example inviting experts of various discipline and professions to school for giving talks or suggestions, taking children to various institutions like primary health centre, panchayat union office, agricultural office etc. nature walk in the surrounding environment, field trips, utilising community resources for the collection of stories, folk songs of that locality, rituals followed in various occasions, collection of material and expertise for the preparation of teaching aids.

Teacher makes the children participates in the collection and preparation of teaching aid and also providing opportunities in activities of work experience and socially useful productive work.

In competency based approach, contents of the text books are not omitted but taken to be as means and not ends. For example, while teaching a poetry or story prescribed in the text, the teacher of the content based approach teaches that poem or story. In competency based approach the teacher develops each and every competency to mastery level in every student which in turn help the related knowledge, understanding and application of content matter. Contents of the text books are utilised along with other examples/information in the development of competencies. The teacher develops various poems and stories as curricular materials collected from reference books, developed by his own imagination, creativity from the local people, magazines and collections by pupils or from the elders of their family. The child also writes or says
his own poems and stories, cities examples from the poems and stories of the local writers. Visits to a monument if any of their locality and collects information about the historical incidents and stories specific to their locality or village. Thus competency based approach demands on the part of the teacher as a facilitator to keep the child as an active participant and providing learning experiences for all round development. The teacher in the competency based approach utilises text book material and information for developing the related competencies to mastery level and the development of competencies to mastery level help in meaningful understanding and application of the content matter.

Teacher also plans for evaluation. Evaluation here in mastery learning is criterion referenced. Mastery learning of the competencies are thus planned for. The scholastic and non-scholastic aspects of instructional objectives are borne in mind during the transaction of curriculum material.

The evaluation format is used for each student separately in each subject. The teachers can put a ‘✓’ mark in the pretesting when there is necessary cognitive, affective, psychomotor preconditions for learning of the ongoing competency is present in the student. This can be carried out by putting questions, or by giving some activities in an informal way to make sure the presence of necessary preconditions for successful learning of the competency. After having assessed the necessary prerequisites in all the students, the teacher starts the ‘general plan’ where the teacher provides a variety of teaching learning situations with a number of relevant content and tools for mastery learning of the competency. In mastery learning strategy as in any other best learning situations, the evaluation goes along with the teaching learning experiences as its integral part. The evaluation for testing for mastery is carried out during and after the teaching for mastery of the competency. The teacher puts the ‘✓’ mark if the student has mastered in the competency. If the planning for mastery in the competency is well
done and presented with a variety of relevant content material with effective utilisation of the variety of strategies suggested in this investigation, and also for the reason that the competencies spelt out are the outcomes of various projects conducted in rural schools by experts and actual practicing teachers in rural situations according to the cognitive capabilities of a normal growing child of particular age, the attainment of mastery by all the student is highly probable. Due to certain specific reasons, a child may not be able to attain mastery in a competency then the teacher has to diagnose the possible reasons for the non mastery of the competency of that child and writes in the evaluation format the reasons and also provide for remedial measures. The struggle of the child in the accomplishment of mastery level can be sensed and identified by the teacher during the process of mastery learning / or at the completion of teaching sessions provided for the mastery of the competency

Thus evaluation here is done as criterion referenced and the outcome of the evolution is utilised for the development of the child

Frequent visits were given by the investigator to help the teachers in writing the lesson plans and in implementing the programme

3.7.4 Role of teachers in the control group

As it has been already pointed out the present teaching - learning programme which is followed by the control group as well as other schools emphasises more on bookish knowledge, it does not allow for adequate practical work and other kinds of activities. The learner is a passive listener and it is dominated by examinations. It does not cater to the needs, abilities, attitudes and interests of children, it is rigid and not flexible. As things stand to day the accent is on information transmission, fact finding and skill development. Teacher provides learning in a formal and routine manner. As
the imparting of subject matter is dominating, the school programmes are not much concerned with the attitudes and emotional state of the learner and his values. There is also visible untouchability where in a learner does not prepare a lesson which is not taught to him/her in the class. Without a clearly defined set of criteria for measuring student progress, the teacher looses sight of their goals, and presume that such measurer as regular attendance, the completion of the syllabus in time effectively substitute measures of actual attainment of learning. The syllabus load often compels the teacher to ignore altogether certain principles of the teaching-learning process. The programmes of teaching-learning are set according to the pace of learning of the whole class and the teachers find themselves forced to ignore the strugglers, for no attempts as remedial teaching or considerations for experimentation, exploration, observation or activity based learning. The conventional text-book and lecture method of teaching, being the quickest way to complete the syllabus, becomes the best option available, forcing upon the students a joyless rote memorization, an over emphasis upon text books. The evaluation is usually norm referenced type.

The content based approach develops a few islands of excellence in the name of qualitative improvement and does not meet out the demand of quality education

Thus the content based approach utilises the text book informations not as a means but as ends.

3.7.5 Evaluation of the competency based approach

The achievements of students of standard I-V in subjects Tamil, Maths and EVS in quarterly, half-yearly and annual examinations are collected from control and experimental schools at the end of the year. The experimental and control group had common question paper for their examinations set by the educational authorities. The
effectiveness and the impact of competency based approach and the effect of various teaching-learning strategies incorporated for mastery learning can be better judged at the end of the academic year i.e. in annual examination. However, the achievement of students in quarterly and half yearly examinations were also compared to see the trend in the achievement of students of control and experimental group.

The teachers of the experimental schools were asked to rate each of the student on a five point scale for each of the developmental objectives before the implementation of the programme. The teachers were asked to rate the students of the start of the academic year when they are familiar enough with the students to rate them. The questionnaire and the ratings done are collected by the investigator. At the end of the academic year again the same questionnaire is given and the teacher are asked to rate the every children in each and every developmental objectives. This is done in separate sheets. This procedure was adopted so as to make the teachers rating more objective. At the end of the academic year the teachers of the experimental schools were asked to rate each of the students for the same objectives on a separate sheet. This was done to make the teacher's ratings more objectives.

Informal interviews with the teachers and students, classroom supervision, observations of students behaviours, review of notes of lesson note books are analysed to get information regarding.

* The MLLs - their relevance, communicability, achievability, their in built evaluable capacity.
* Whether all the students are able to master in every competency
* Use of descriptive item pools prepared as guide
* Mastery learning strategy with its pre-post test procedure, how long and how much time is taken in general to master or competency.
Maintenance of evaluation sheets for every student for each competency of the subject.

In planning and developing curriculum materials, educational technology, utilisation of community resources, providing for work experience and planning for work experience and planning for diagnostic testing and remedial teaching.

How these teaching strategies help the teachers in empowerment.

The teachers' attitude towards the adaptation of the competency-based approach.

How the environment, community resources are best utilised in the mastery learning strategy.

Pupil participation.

How much this approach is successful in bringing quality improvement.

Pupils' participation in the development of curricular materials, educational technology materials.

Attitudes and co-operation of supervisors and officers.

How far the approach is helpful in improving competency in the teachers' professional skills, creativity and originality.

Whether able to complete the syllabus in the stipulated time.

How far this approach is helpful in bringing about students' higher order thinking skills, questioning skills and social skills.

How this approach is different from the content-based approach that is followed usually.

3.8 Statistical treatment of the data

The quarterly, half yearly and annual examination marks of the equipment and control group students of standard I - V in subjects Tamil, Mathematics and Environmental Studies were compared.
i. The mean, $\sigma$, significance of difference between means are calculated for the achievement of students of control and experimental group in standard I-V in subjects Tamil, Mathematics and Environmental studies in quarterly, half yearly and annual examinations. This is done for finding out the effectiveness of competency based approach in raising the academic achievement.

ii. The mean, $\sigma$, and critical ratio are calculated for achievements of boys and girls of experimental schools of standard I-V in subjects Tamil, Mathematics and EVS in quarterly, half yearly and annual examination. This is done for finding whether there is any sex difference existing in effectiveness of competency based approach. The same was carried out for control group also to find out whether the content based approach is beneficial to either boys or girls.

iii. The percentage frequency distribution of students in various class intervals of achievements of students of experimental and control group of standards I-V in subjects Tamil, Mathematics and EVS in all the three examination are plotted so to give further details about the pattern and levels of achievement.

iv. The differences in the ratings would show whether the competency based approach has enhanced pupil's developmental aspects which are the main objectives of education viz the all round development of personality. These ratings were done only for the experimental group, for our aim is to see whether the competency based approach is good enough in achieving the developmental objectives of education. The frequency distribution of ratings 1-5 received by the students of the experimental
group prior to after the experimental treatment in each and every developmental objectives are tabulated and analysed for their change and shift. The ratings of twenty students (ten boys and ten girls) taken at random from each of the standard I-V are analysed further for the magnitude and direction of the differences/shift in rating prior to and after in each of the development objectives and the differences are tested for statistical significance utilising the paired 't' test.