Chapter — II

Conceptual Framework
# CHAPTER II - CONCEPTUAL FRAMEWORK

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CHAPTER II

CONCEPTUAL FRAMEWORK

INTRODUCTION

It is always emphasized by modern educationists that there should be more learning by the pupils, rather than teaching by the teacher in a classroom. In order to bring about such a wholesome learning, they suggest child-centred approach to the transaction of the curriculum. National Policy on Education (1986), too, has recommended child-centred and activity based learning approach which ensures greater involvement on the part of the pupils in the teaching-learning process.

Acceptance of such an approach has led to the categorical departure of conventional teaching strategies in which the pupils remain passive listeners. In the modern concept of teaching, the teacher is expected to be a facilitator of the educational exercise which revolves around the child. As far as science teaching is concerned, a teacher needs to possess the skill of inculcating scientific attitude in his pupils. He should assist the pupils in collecting information, its verification and in other processes such as drawing inferences and conclusion.

While presenting the Science Teaching Guidelines (1990) for upper primary and secondary, NCERT has suggested that new science curriculum should be designed in consonance with the levels of mental development of the child, in which topics are presented hierarchically on the basis of complexity from concrete to abstract. Methods must run parallel to the different stages of mental development of the child.
Transaction of the curriculum must involve active participation of the students in the teaching – learning process. A more individualized form of instruction is needed to optimize the transaction of each student.

Science teaching is fruitless unless practical experience or verification of facts and principles are encouraged. Hence, laboratory-oriented instruction forms the essential part of science teaching.

THEORIES OF SKILL-DEVELOPMENT IN CHILDREN

Several educational psychologists have put forward theories of learning which specify the skills that could be developed in a child during his educational process. Among these psychologists, Frobel, John Dewey, Robert Gagne and Jerome S. Bruner have propagated some theoretical notions regarding scientific skill development, through experience and experimental method.

FROEBEL’S THEORY

Self-activity in Education

Among all the great western educators, Froebel was the first, who made self-activity of the child, the basis of learning. These activities are free and take place according to the laws of one’s own nature. Hence these are called self-activities. Such activity can guide all educational work. The child can see, handle, arrange, rearrange, make and remake things himself. The teacher is required only to guide and direct him to proceed in the right direction. It is a process of self realization through the union of nature and humanity.
Learning by Doing

The modern trend of education is towards practical training rather than academic attainment. Froebel’s observations have greatly changed the modern methods of teaching, which lays emphasis on learning by doing. His songs, movements and constructions stress the practical side of education.

JOHN DEWEY’S - THEORY

Experience and Experimental Method

Dewey explains that where there is experience, there is a living being. Experience is regarded primarily as a knowledge-affair, but to eyes not looking through ancient spectacles. To learn from experience is to make a backward and forward connection between what we do to things and what we enjoy or suffer from things. The experimental methods have the following merits.

1. Experimental method is the foe of every belief that permits habits and wants to dominate invention and discovery, and ready-made system to override verifiable fact. Constant revision is the work of experimental inquiry.

2. Experimental method is fatal to dogmatism because it shows that all ideas, conceptions, theories, however extensive and self-consistent and aesthetically attractive they maybe, are to be entertained provisionally until they have been tested by acting upon them.
3. Experimental method is not just messing around nor doing a little of this and a little of that in the hope that things will improve. Just as in the physical sciences, it implies a coherent body of ideas, a theory, that gives direction to effort.

4. Mere activity is not experience. A stream of meaningful experiences should be provided. That kind of present experience should be selected and emphasized which lives fruitfully and creatively in the course of future experiences.

**Laboratory School**

Dewey has established an ideal school- the University Laboratory School, founded in 1896. Dewey wanted that the training of scholars in the School should be such as to enable them for a complete living in the social world of today. Dewey posed the following problems and attempted to find their solution:

1. How to bring the school life into closer relation with the home and surrounding life?

2. How to introduce subject-matter in history, science and art to give a positive value and real significance in the child’s life.

3. How to correlate instruction in different subjects with everyday experience and occupation?

4. How to cater to individual powers and needs?
GAGNE’S THEORY

According to Gangne, during the course of a child’s education, he should be trained in skills and competencies that will stay with him lifelong viz., number computation, spatial and manipulative classifying, measuring, inferring and model conceptualizing. Developing these skills enables a child to acquire knowledge of scientific principles.

BRUNER’S THEORY

Bruner favors learning through discovery which is a self rewarding experience that helps the child learn how to learn. According to him, learning science is to introduce the child to the ideas and various techniques involved in problem solving and inquiry skills so that he grows into an educated man.

SCIENTIFIC SKILLS

Narendra Vaidhya (1996) asserts that development of the scientific skills as the desirable outcome of science education, which provides sufficient instructional experience as regard to the acquisition of skills. These skills will function at various levels of proficiency as the growing children pass through successive grades. Stress is not only on the memory of content but also on the improvement and refinement of tools that manipulate the content with required skills. Science teaching should be in such a way that it should develop certain scientific skills which also include some general as well as abstract skills.

GENERAL SKILLS

General skills include all those skills necessary for a civilized living. In olden days, in order to be a literate person, an individual is
supposed to possess 3R’s which are reading, writing and arithmetic. In the modern context, the 3R’s have been expanded to 7 R’s which include rights, responsibilities, relationship and recreation apart from the 3 R’s.

Reading and writing constitute language skills whereas arithmetic skills enable an individual to be competent in computation, graphing, ranking, averaging, approximation dealing with symbol and reading tables. Consciousness of rights and responsibilities enable a person to be good in social skills which help him to get on with people, respect others, co-operating with the society and in building emotional stability. Relationship enhances communication skills. Useful recreation leads to development in aesthetic skills, which in the context of science learning, may be described as artistic sensitivity and the physical ability to prepare charts, models instructional and illustrative materials.

Apart from these skills, library skills, which enhances finding and consulting varied references, and safety skills which helps one prevent accidents and enables one to do first-aid whenever it is needed, are to be included in the general skills.

**ABSTRACT SKILLS**

As far as science-learning is concerned, the children should be able to understand theoretical laws and principles which are abstract in nature. Successful science-teaching is expected to develop in children abstract skills also Ability to recognize and classify things on the basis of common characteristics, ability to analyse simple and complex problematic situations, ability to check evidence, ability to verify one’s ideas, ability to judge absurdities, irrelevancies and fallacies, ability to set up control experiments and thereby to distinguish between relevant and
irrelevant variables and the development of insight into the nature of underlying assumptions and proofs may be considered abstract skills with regard to science learning.

**PRACTICAL SKILLS**

Besides general as well as abstract skills, practical skills of higher order are required for higher level of learning science. The most important skills required for developing scientific temper in students are as follows:

i) Primary process skills

ii) Integrated process skills

iii) Scientific communication skills

**i) PRIMARY PROCESS SKILLS**

These basic skills are necessary to kindle the scientific spirit in children so that they learn to adopt scientific method to solve day-to-day problems. Five sub-skills constitute primary process skills.

**a) Observation**

Observation of objects, their properties or physical nature is possible through use of our five senses or instrument such as microscope, voltmeter, or some other device that extend our senses. It is the basic skill required for the development of scientific attitude as it leads to other abilities like identification of the problem, discovery, etc. If an individual has the tendency to observe around him, he will find out a problematic issue and then goes for discovery of something that will solve the problem.
b) **Selection / Identification**

While teaching science, the child is taught to select suitable tool for working out a problem. For example, if one has to measure a cloth or the temperature of a sick person, he must know which instrument he should use to measure either of them. He needs a measuring tape to measure the cloth and a thermometer to measure the temperature. A child needs such a practical scientific skill, which helps him in his day-to-day life activities.

c) **Classification**

   It is the third primary process skill which enables an individual to classify things according to their nature and grouping of objects or events according to some identifiable properties or according to an arbitrary preconceived coding process.

d) **Measuring or Estimation**

   Students learn to measure or estimate using proper scales, in a science class rather than estimating something approximately. Estimating or measuring with reasonable accuracy is a primary process skill needed for exploring scientific method in every aspect of life.

e) **Inferring**

   Making inferences through observation and verification of laws is an important primary process skill in learning science. Assumption or logical extension made through use of our minds based on our background knowledge. Inferences made, may or may not poise to make any validity.
INTEGRATED PROCESS SKILLS

These skills are advanced scientific practical skills.

a) Formulation of Hypotheses

Constructing a theory that encompasses all existing data gathered by observation or other processes. An individual with a scientific attitude tries to study an event through systematic observation and experimentation and proposes a relationship between the variables. This process of establishing a relationship between variables in order to arrive at principles and laws is known as formulation of hypotheses and it is one of the basic steps in scientific method. Science teaching should enhance this skill of formulating hypothesis.

b) Designing Experimental Set-up

While adopting scientific method, it is needed to design an experimental set-up through which the hypotheses may be tested to give the expected result. Such designing skill is vital in developing practical skills in science.

c) Testing Hypothesis

Testing a hypothesis follows the designing of an experimental set-up through which the proposed relationship between variables may be established as positive or negative.

d) Revision of Hypothesis

A scientist, after repeated observation, formulates a hypothesis which is tested through experimentation. He collects data in evidence to accept or reject the hypothesis formulated. A science student should be able to revise the hypothesis to satisfy the data.
e) Generalisation

It is understood that observation is an important scientific skill. Through observation, a science student should be able to identify common elements and to link concepts in order to generalize them to frame laws and principles. Since facts, laws and principles form the basic content in science, generalization skill is found to be an important scientific skill.

SCIENTIFIC COMMUNICATION SKILLS

Scientific communication skills enable a scientist or a person with a scientific spirit to express his views scientifically or to gather information about an observed phenomenon.

a) Inquiry

It is inquisitiveness that has led to many discoveries and inventions. A scientifically inclined person should possess inquiry skills which help him ask questions so as to know and understand a phenomenon. In science teaching, students should be encouraged to ask questions which enhance precise understanding of scientific ideas.

b) Arranging data in a tabulated form

It is a skill of scientific and systematic expression. Data arranged in a tabulated form makes it easy for analysis and drawing a conclusion from it. It is a practical skill that equips one to follow the steps of a scientific method adequately.

c) Drawing

Science learning is not complete without diagramatic expression. Drawing the parts of a device helps to learn the mechanism of the device easily. Drawing the parts of an organism facilitates a clear understanding
of its working. It is a way of communicating scientifically and hence science students should be equipped with the skill of drawing with moderate accuracy, neatness and speed.

d) Graphical Representation

It is a non-verbal communication expressed in a scientific manner so that the receiver of the message perceives the relationship between two or more variables precisely. A science student should be trained in the skill of representing concepts graphically.

e) Interpretation

It is an important skill as it needs reflective thinking. This skill enables the students to arrive at conclusions by analyzing the data gathered. The facts are interpreted through observation and experimentation. Since it needs certain capabilities to link the results with the data in order to arrive at a conclusion, this skill should be developed in students so as to facilitate problem solving skills in their day-to-day activities.

ABL – AN INNOVATIVE APPROACH

SSA (2007) introduced the ABL concept which has been taken from the Rishi Valley practices. This has been introduced in the Corporation Schools of Chennai with slight modifications. Seeing the success of the scheme, this has been introduced in the Panchyat Union Schools.

Initially, a core team was asked to investigate the current practices of classroom process and find out the reasons for the low achievement of children. As the team members had rich exposure in the field of primary education, they had strong faith in children, parents, teachers and the
government that they would not be responsible for low achievement of children. Then, after close study in some of the schools in the corporation area, the team identified the following as the malady of conventional process.

- Teacher dominates the classroom always.
- Rare use of teaching learning materials.
- Most of the time the lecture method was followed.
- Importance was given to rote learning.
- Teacher assumes uniform learning pace and uniform level of achievement among children.
- Teachers are under the assumption that they know everything and children do not know anything.
- The gap between teacher and children are more.
- Focus is given on teaching rather than learning.
- No scope to cover the loss of learning during the period of absence of children.
- Multigrade and multi level teaching is not addressed.
- Traditional way of evaluation.
- Absence of joy based extra activities.
- Absence of play way and learning by doing activities.
- Less chance for mutual and self learning.
- Coverage of syllabus by the teacher and not by the children.
- Classroom with less facilities for learning activities.
- Instructional materials are neither investing nor attractive.
- Lack of learning freedom and time- restricted environment.
To overcome the above malady in teaching learning process, a suitable strategy called Activity Based Learning (ABL) was evolved to be implemented in the Chennai Corporation Schools.

**HISTORY OF ABL**

Activity Based Learning Method has been gaining impetus in the southern states of India, especially in Tamil Nadu, as a productive method at primary level. Activity Based Learning or ABL as it is popularly referred to, was first introduced by professor Dhave of Rishi Valley in Madanapalli in Andra Pradesh. It was the outcome of the project RIVER (Rishi Valley Educational Research), the objective of which was to reduce the burden of book load of primary children. Based on the philosophy of J. Krishnamurthy, which proposes reduction of book-load, peer-teaching, meeting individual differences and individual attention to slow learners by the teacher, it was introduced in 18 schools in Andra Pradesh in 2001. The credit of introducing ABL to Tamilnadu goes to the former IAS Officer, M.P.Vijayakumar. Through his tireless efforts, he initiated Tamilnadu Government to implement ABL method at primary level in Government schools. With the assistance of UNICEF and Sarva Shiksha Abhiyan (SSA), the Department of Education of the Corporation of Chennai designed the learning cards for the subjects- English, Tamil, Mathematics, Environmental Science and Social Studies. A pilot study was successfully conducted with ten schools from each Panchayat Union in the state during 2005-06 and Activity Based Learning Method has been introduced in Government schools of Tamil Nadu from class I to IV since June 2007.
NEED FOR ABL

In a conventional classroom, importance was given to teaching by the teacher, rather than learning by the students. Researches reveal that only 40% of learning takes place in such a classroom situation. Moreover, there had been a widening gulf between the funds allotted for education by the Government and the achievement rate of the children at primary level. Another problem that existed in the rural areas of Tamil Nadu had been the handling of multi-level classes in a single or double-teacher schools. Hence, a teaching method which requires a teacher to play the role of a facilitator in order to bring about 100% learning is the need of the hour. Activity Based Learning method is expected to fulfil these requirements as its basic concept is to promote 100% learning through training the pupils in self-learning and learning through activities.

ACTIVITY BASED LEARNING (ABL) AT PRIMARY LEVEL IN TAMILNADU

Activity Based Learning method has been introduced in Government Schools of TamilNadu from class I to IV since June 2007.

IMPORTANT FEATUERS OF ABL

MILESTONE

Learning cards are used instead of text-books. These cards are designed based on various competencies to be developed through each unit. A learning level called milestone is fixed and each milestone is comprised of various learning activities. Separate logos are assigned for
each activity. Names of animals are selected as logos for Tamil. Likewise names of vehicles for English, birds for Mathematics, insects for Environmental Science and type of lamps for Social Studies are selected as logos. The colour of the cards indicates the standard as follows:

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<th>Class</th>
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<tr>
<td>Std I</td>
<td>Dark Red</td>
</tr>
<tr>
<td>Std II</td>
<td>Green</td>
</tr>
<tr>
<td>Std III</td>
<td>Blue</td>
</tr>
<tr>
<td>Std IV</td>
<td>Yellow</td>
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**LEARNING LADDER**

Milestones of each subject are joined logically like a chain and it is known as a learning ladder. The logos are numbered and arranged in ascending order in the ladder denoting the level of the activity.

**GROUPING**

The most important aspect of ABL is grouping of the students. Each class is divided into six groups. The first and second groups are fully supported by the teacher and the third is partially teacher-supported. The fourth and fifth are fully peer-supported and partially peer-supported respectively and the sixth group is fully self-supported. For each group, there are separate group cards. Students select their own cards and join the relevant group according to the logo in the card.
LOW LEVEL BLACKBOARD

In ABL method, blackboard is used not by the teacher but by the students. On the walls of the classroom, low-level blackboard is created by painting it black up to the level that can be reached by the pupils. On this low-level blackboard, space for each child is allotted on which the pupils learn to work out sums in Mathematics, do grammar exercises in Tamil and English and draw diagrams in Science. When the teacher concentrates in a group which needs her support, other pupils use this low-level blackboard.

ACHIEVEMENT CHART AND SELF-ATTENDANCE CHART

Test and exams find no place in ABL. However, each milestone has test cards which are to be worked out after completing the activities in the milestone. Teacher assesses the attainment of the objectives of a particular unit through test cards and each child’s progress is marked regularly on the achievement chart. Students mark their attendance themselves on the self-attendance chart.

THE PROCESS OF ABL APPROACH - SSA (2007)

- Competencies are split into different parts/units and converted into different activities.
- Each part/unit is called a milestone.
- In each subject, the relevant milestones are clustered and linked as chain and this chain of milestones is called LADDER.
Each milestone has different steps of learning processes and each step of learning process is represented by a logo.

Milestones are arranged in a logical sequence from simple to complex activities in each milestone.

To enable the children to organize in groups group cards are used.

Evaluation is inbuilt in the system. Separate cards / activities are used for this purpose.

Each child is provided with workbook / worksheet for further reinforcement activities.

Children’s progress are recorded through annual assessment chart.

Each milestone has different types of activities such as introduction, reinforcement, practice, evaluation, remedial and enrichment activities represented by different logos.

TEACHING LEARNING STRATEGIES EMPLOYED IN ABL:

GROUP ACTIVITIES

At the initial stage, when the pupils are admitted in Std I, all of them sit in a single group which needs the full attention of the teacher. The logos are introduced to the pupils for the first two weeks. Later, through songs and rhymes, they are motivated to take part in the classroom activities. They are given practice in identifying the next level of card using the logos on the ladder. Before doing the activity given in a
particular card, they should know to which group that logo belongs so that he could join that group. During the initial stages of ABL class, the teacher and the pupils who have gained skill in identifying the logos should help other pupils. In due course, pupils themselves would select their group cards using the logos.

**ACTIVITIES DESIGNED FOR MILESTONES**

Learning cards are designed for the following purposes;

(i) Introductory stage activity for skill development
(ii) Reinforcement activities for skill introduction
(iii) Exercises relevant to the skill
(iv) Evaluation activities
(v) Remedial activities for slow learners
(vi) Resource development activities

Group cards are designed for multi-level teaching and test cards are sused to assess the achievement of the pupils at each milestone.

**CLASSROOM MANAGEMENT**

Since the pupils need sufficient space for movement in the class, the benches and desks are removed and teachers along with pupils sit on mats to do the activities freely. Learning cards are kept in trays according to their general as well as specific logos, the pictures of which are stuck on the front side of the trays. For example, cards under the logo butterfly in Environmental Science are kept in the tray with the picture of butterfly so as to help the pupils select their own cards according to the class, subject and level.
TEACHER’S ROLE IN ABL CLASS

In an ABL class, the teacher plays the role of a facilitator and she pays her full attention to the pupils who need her support. At the same time, she manages to guide the others who are able to learn through peer-teaching as well as self learning. In a single teacher school where multi-level teaching is needed, the teacher should be efficient enough to keep pupils from different classes occupied with their respective activities and also to maintain discipline. She should also attempt to reduce the gap between the pupils and herself and she should help to create a harmonious environment for the pupils to mingle among themselves in groups.

DEVELOPMENT OF SKILLS

The basis of ABL method is skill development. It considers 663 skills to be developed at the school level. There are some general logos which are used in the initial stages of the class which aim at motivating the pupils by transforming them from home environment to school environment. The logo ‘pot’ has activities in which the pupils make figures out of clay and through these activities their muscular movements develop so as to enhance free finger movements when they start writing. Through activities such as role play and puppet show, their expressive and creative skills are demonstrated. Group activities enable them to nurture inter-personal intelligence. Thus, ABL method focuses on all-round personality development.
BENEFITS OF ABL APPROACH

- Pupils learn at their own pace. Even if the pupil is absent on a particular day, he can continue from the place where he has left after he comes back.
- It ensures that each and every child participates fully in each activity.
- Self-learning, group learning and mutual learning are encouraged.
- Students are given full freedom to select the learning experience on their own.
- Students develop communication skills through discussion among themselves.
- Students are aware of the level they have reached.
- The gap between the students and the teacher is lessened and hence the teacher gets an opportunity to act as a facilitator, rather than a task-master in the class room.
- Provision of more time for self-directed learning is increased and teacher-directed learning is reduced considerably.
- Teachers teaching time is judiciously distributed among children. Only needy children are addressed by teachers.
- Evaluation is inbuilt in the system and it is done without the child knowing it.
- Rote learning is discouraged and almost no scope for rote learning.
- Classroom transaction is based on child’s needs and interests.
- Multigrade and multilevel in learning is effectively addressed.
- No child can move to the next higher step of learning unless he attains the previous one.
- Sense of achievement boosts child’s confidence and morale.
- Attractive cards and activity create interest among children.
- Children will have a feel of security as they sit in rounds in the groups.
- Children are allowed to move in the classroom as they choose their activity.

**IMPLICATIONS OF ABL**

In the conventional method, whether the pupil had acquired the desired skills or not, he was able to go to the next class in the primary level. However, in the ABL system unless the pupil masters the required skills, he is unable to get himself promoted to the next standard and the educationists believe that it would ensure 100% learning outcome at primary level.

**LIMITATIONS OF ABL**

In spite of the advantages guaranteed by ABL, there are, indeed, certain limitations. The play way method adopted has led to problems in classroom discipline. Since, pupils are engaged in group activities, the teacher finds it difficult to manage the class. Though the teacher spends more time with the slow learners, other pupils also need her attention.
which may not be possible if the number of students are more. If these limitations are rectified, ABL may prove to be the most effective and innovative teaching method of our times.

**CONCLUSION**

Systematic use of scientific knowledge in planning, realizing and evaluating effective teaching and learning process is achieved through educational technology. Important outcome of any learning process is the result of evaluation. Learning process is complete only after evaluation and feedback is given. Many researchers classified the science practical skills in multi-dimensions. But the mostly accepted classification is the SAPA format. Hence, the investigator followed the SAPA format with some modifications according to the level of the students of rural and urban Indian context.

Since one of the main objectives of ABL is to develop life-oriented skills in various subjects, it has been recommended by science educators as a very impressive instructional strategy in developing practical skills in science. Hence, the investigator has intended to study the effectiveness of ABL method as against the conventional method in developing practical skills in science at high school level.