

CHAPTER – II

CONCEPTUAL FRAMEWORK

2.1 Introduction

The quality of education that teachers provide to student is highly dependent upon what teachers do in the classroom. Thus, in preparing the students of today to become successful individuals of tomorrow, teachers need to ensure that their teaching is effective. Teachers should have the knowledge of how students learn and how best to teach. Changing the way we teach and what we teach is a continuing professional concern. Efforts should be taken now to direct the presentation of lessons away from the traditional methods to a more student centered approach. The curriculum for secondary school has to be designed so as to provide students with the knowledge and skills to enable them to solve problems and make decisions in everyday life.

2.2 Science and Globalization

All over the world, we are living through a transformation of the global economy. At the start of the twentieth century, the world's economies were based largely on agricultural production and natural resources, then on industrial production and transformation, then on services. Towards the end of that century, and certainly from the 1990s, the current, and probable future scenario, is the knowledge economy.

The expression the 'knowledge economy' or, more accurately, the economy built on knowledge evokes the new paradigm which characterizes the evolution of industrial nations. Economic structures, which previously were strongly connected to the manufacturing sector, today rely largely on knowledge and understanding. These are economies in which the generation and the exploitation of knowledge has come to play the predominant part in the creation of wealth. It is not simply about pushing back the frontiers of knowledge; it is also about the more effective use and exploitation of all types of knowledge in all manner of economic activity. New ways of working, of production and even of learning have come about with the promise of sustainable transformation of our way of doing things. In this new world of rapid change, the success of nations rests more than ever before on first-class human

resources, with the competences and abilities required by this new knowledge-based economy.

More and more, the knowledge linked to these competences and abilities is mathematical, scientific and technological, paralleling the knowledge involved in the very products of those economies. In this way, knowledge, especially scientific and technological knowledge, has become the principal resource. Consequently, the new strategies for growth have knowledge as the central axis for sustainable development and so improve the quality of life of people. And science is at the heart of this knowledge growth. The most rapid, wide-ranging and widespread influence that science has had on human society is one of the outcomes of globalization. Everyone, everywhere, is part of the global communication society. The exchange of and to access of information, previously reserved for a few, can now is available to all. This revolution has also brought about profound change in the world of work and the knowledge society. From now on, school will have to help students acquire an active repertoire of generic and specialist competences. This differs from the priorities that have governed school subjects such as science until now, where the success of students has been measured in terms of their range of knowledge. Science education has to be a key element in the development of these new competences.

2.3 Objectives of Teaching Science

Science classes provide students with essential skills and knowledge for success in later life. Students who do well in science can go on to productive careers in engineering, medicine, and other innovative fields. A science education provides students of all ages with skills that apply in other fields as well, and help students succeed in all areas of life. Without science, modern society would not be where it is today in terms of technology, exploration, and innovation. Science learning enables students to explore new ideas to benefit us all. In science classes, students learn about the environment and the need for conservation efforts. Science is one of the most technology-rich school subjects taught today. In science classes, students learn to use microscopes, telescopes, and laboratory utensils. They learn to take things apart and examine how they work, and then put them back together again. These skills can be useful in other areas of life as well; the more exposure to technology students receive,

the more comfortable they will feel using it in their daily lives. Because of the technology they use in science classes, some children will grow up to design inventions of the future. Science teaches students to follow a logical process to solve a problem. From using the scientific method to inventing a new gadget, students learn to identify and solve problems daily in their science classes. These skills apply to other school subjects, real-world careers, and even family relationships. Problem-solving forms the basis for innovation and creativity in the world, and science can be a big part of developing those skills. Harmonious development of child's personality and social efficiency are the general aims of education. If science teaching is to be made effective, then its aims should be in consonance with the general aims of education. Followings are the main objectives of science teaching -

- To acquire knowledge about fundamental principles and concepts useful in daily life
- To develop skills in experimentation, construction, observation and generalization of concept
- To develop Reflective Thinking
- To inculcate social values like cooperation, belongingness, helping to others
- Developing the child's powers of creative and inventive faculties
- Developing neat and orderly habits.
- Developing the problem solving and decision making ability to reach generalization.
- Developing interest in scientific hobbies.
- To familiarize the pupil with the world in which he lives and to make him understand the impact of science on society so as to enable him adjust himself to his environment.
- To acquaint him with the 'scientific method' and to enable him to develop the scientific attitude.

Despite good intentions and directions in India, teacher centered teaching practices still take center stage. Two pedagogical limitations have been identified as the major short comings in traditional secondary education: lecture-based instruction and teacher-centered instruction. Lecture-based instruction emphasizes the passive

acquisition of knowledge. In such an environment, students become passive recipients of knowledge and resort to rote learning. The majority of work involves teacher-talk using either a lecture technique or a simple question and answers that demands basic recall of knowledge from the learners. Lecture based instruction dominates classroom activity. Generally, only correct answers are accepted by the teacher and incorrect answers are simply ignored. Students seldom ask questions or exchange thought with other students in the class. The traditional classroom is also characterized by directed demonstrations and activities to verify previously introduced concepts. Instruction is therefore not for conceptual understanding but rather for memorizing and recalling of facts. It must be noted that students who develop conceptual understanding early perform best on procedural knowledge later. Furthermore, students with good conceptual understanding are able to perform successfully on near transfer tasks and develop procedures and skills they have not been taught. In the traditional teacher-centered education, the dominance of the teacher takes centre stage. The students rely on their teachers to decide what, when, and how to learn. This approach to instruction works relatively well.

However, it is not clear that students are learning at higher, conceptual level of thinking. How students perceive each other and interact with one another is a neglected aspect of instruction. Much training time is devoted to helping teachers arrange appropriate interactions between students and materials (i.e., textbooks, curriculum programs) and some time is spent on how teachers should interact with students, but how students should interact with one another is relatively ignored. It should not be. How teachers structure student-student interaction patterns has a lot to say about how well students learn, how they feel about school and the teacher, how they feel about each other, and how much self-esteem they have. There are three basic ways students can interact with each other as they learn. They can compete to see who is "best," they can work individualistically toward a goal without paying attention to other students, or they can work cooperatively with a vested interest in each other's learning as well as their own. Of the three interaction patterns, competition is presently the most dominant. Research indicates that a vast majority of students in India view school as a competitive enterprise where one tries to do better than other students. This competitive expectation is already widespread when students enter

school and grows stronger as they progress through school. Cooperation among students-who celebrate each other's successes, encourage each other to do homework, and learn to work together regardless of ethnic backgrounds or whether they are male or female, bright or struggling, disabled or not, is still rare.

Even though these three interaction patterns are not equally effective in helping students learn concepts and skills, it is important that students learn to interact effectively in each of these ways. Students will face situations in which all three interaction patterns are operating and they will need to be able to be effective in each. They also should be able to select the appropriate interaction pattern suited to the situation. An interpersonal, competitive situation is characterized by negative goal interdependence where, when one person wins, the others lose; for example, spelling bees or races against other students to get the correct answers to a math problem on the blackboard. In individualistic learning situations, students are independent of one another and are working towards set criteria where their success depends on their own performance in relation to established criteria. There is a difference between simply having students work in a group and structuring groups of students to work cooperatively. A group of students sitting at the same table doing their own work, but free to talk with each other as they work, is not structured to be a cooperative group, as there is no positive interdependence. Perhaps it could be called individualistic learning with talking. For this to be a cooperative learning situation, there needs to be an accepted common goal on which the group is rewarded for its efforts.

2.4 Defining Cooperative Learning

Researchers have put forth various definitions of cooperative learning. *Slavin* (1992) defines it as a process by which learners work together in groups to 'master material initially presented by the teacher'. Similarly *Kagan* (1992) regards cooperative learning as learners working together in small groups on a structured activity.

The most comprehensive definition of Cooperative Learning is given by *Johnson and Johnson and Holubec*. According to them, **"Cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other's learning."** According to Johnson and Johnson, in order for cooperative learning groups to be effective and to maximise the results, certain

principles (positive interdependence, promotive interaction, individual accountability, interpersonal and small group skills, group processing) must be present.

2.5 Elements of Cooperative Learning

It is only under certain conditions that cooperative efforts may be expected to be more productive than competitive and individualistic efforts. Those conditions are:

1. Clearly perceived positive interdependence
2. Considerable promotive (face-to-face) interaction
3. Clearly perceived individual accountability and personal responsibility to achieve the group's goals
4. Frequent use of the relevant interpersonal and small-group skills
5. Frequent and regular group processing of current functioning to improve the group's future effectiveness

All healthy cooperative relationships have these five basic elements present. This is true of peer tutoring, partner learning, peer mediation, adult work groups, families, and other cooperative relationships. This conceptual "yardstick" should define any cooperative relationship.

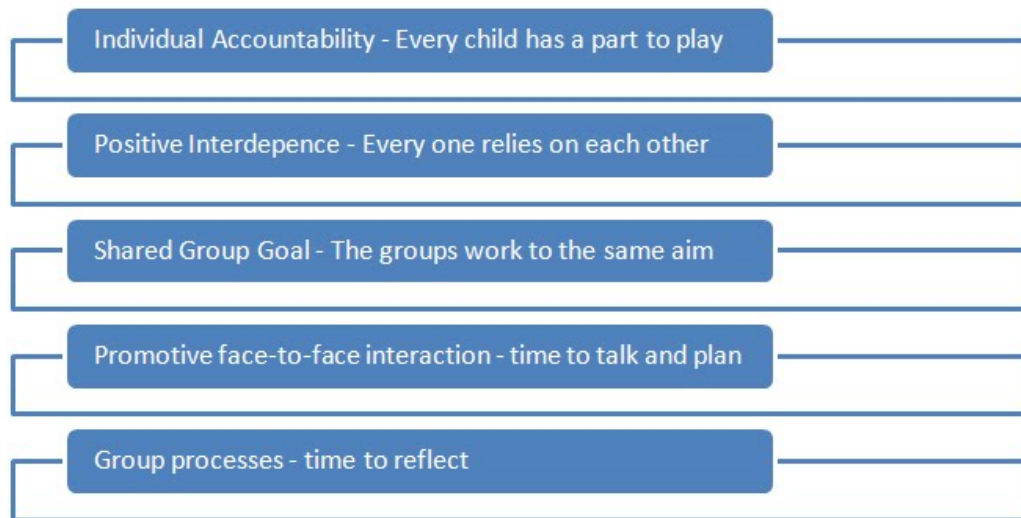


Figure 2.1: Five Elements of Cooperative Learning

2.5.1 Positive Interdependence

The first principle for an effectively structured cooperative lesson is positive interdependence which means that learners believe that they ‘sink or swim together’. Within cooperative learning situations, learners have two responsibilities firstly to learn the assigned material, individually and, secondly, to ensure that all the members of the group learn the assigned material. Positive interdependence exists when learners perceive that they are linked with their fellow group members in such a way that they cannot succeed unless their fellow group members do (and vice versa) and that they must coordinate their efforts with the efforts of their fellow group members to complete a task. All cooperative learning groups, foster positive interdependence but they do so in different ways:

- **Positive role interdependence**

Group members can take on a variety of rotating roles to help their group succeed. Role interdependence can be created among learners when complementary roles are assigned such as reader, recorder, and checker of understanding, encourager of participation and elaborator of knowledge. Such roles are vital to high quality learning. The role of checker, for example focuses on periodically asking each group member to explain what is being learned.

- **Division of labour and learning material**

Through the division of labour and learning materials, the learners are given a clear message that each learner has an important contribution to make toward the completion of the group’s task.

- **Positive identity interdependence**

Positive identity interdependence exists when a mutual identity is established through a group name or motto. According to Johnson and Johnson (1989) positive interdependence provides the context within which promotive interaction takes place within a cooperative learning group.

Besides these there can be positive reward interdependence, positive resource interdependence also.

2.5.2 Promotive Interaction

The second element is promotive interaction which may be defined as individuals encouraging and facilitating each other's efforts to complete tasks in order to reach the group's goals. Learners are shown how to help each other overcome problems, and complete whatever task has been assigned. This may involve peer tutoring, temporary assistance, exchange of information and material, challenging of each other's reasoning feedback, and encouragement to keep one another highly motivated.

2.5.3 Individual Accountability

The third element of cooperative learning is individual accountability, which exists when the performance of individual learners is assessed, the results are communicated to the individual and the group, and the learner is held responsible by the other group members for contributing his or her fair share to the group's success. It is important that the group knows who needs more assistance and encouragement in completing the assignment.

2.5.4 Interpersonal and Small Group Skills

The fourth essential element of cooperative learning is the appropriate use of interpersonal and small group skills. In order to coordinate efforts to achieve mutual goals, learners must get to know each other, communicate accurately, accept and support each other and resolve conflict constructively.

2.5.5 Group Processing

The fifth component of cooperative learning is group processing. Effective group work is influenced by whether or not groups reflect on the process and on how well they are functioning. Group processing may be defined as reflecting on a group session to, firstly, describe what member actions were helpful and unhelpful, and, secondly, make decision about what actions to continue or change. The purpose of group processing is to clarify and improve the effectiveness of the members in contributing to the collaborative efforts to achieve the group goals.

To summarize, for groups to be cooperative, the members must have clear positive interdependence, members must promote each other's learning and success face-to-face, hold each other personally and individually accountable to do a fair share of the work, use appropriately the interpersonal and small group skills needed for co-operational efforts to be successful and process as a group how effectively the members are working together. These five essential components must be present for small-group learning to be truly cooperative.

2.6 Characteristics of Cooperative Learning Groups

Cooperative learning groups can be made more effective and productive if apart from the above mentioned five elements they also have the following characteristics-

2.6.1 Heterogeneous grouping

Cooperative learning is based on the belief that the most effective groups are heterogeneous in terms of social background, skill level, physical capabilities and gender (Johnson & Johnson, 1992). Cooperative learning groups allows for valuable teacher time, for individual or group consulting functions, and for observation of learning in action, and thereby gathering information about how individual learners are doing. Working in heterogeneous groups may benefit low-ability learners because they are able to observe the strategies of high-ability learners. Similarly, high-ability learners may learn new strategies by teaching other learners in the group. Webb (1991) found that groups with equal numbers of boys and girls promoted more explaining among, learners than did same-sex groups. However, one can argue that if teachers determine the composition of the group, learners could end up with other learners whom they do not prefer to work with. Kagan (1992) defends this by saying that since one of the social purposes of cooperative learning is to overcome prejudices, learners should at least on occasion be persuaded to work at group relationships despite personal likes or dislikes.

2.6.2 Group Size

The second characteristic is group size. According to Biott (1999) there should be no fixed rules about group size. He suggests that 3-5 learners are satisfactory since any

decision made needs to be dependent on the classroom context. In contrast Kagan (1989) is very clear about group size, since it will have a marked impact on the opportunity for, and the nature of learner interaction. He points out that the number of learners in a group will determine the number of lines of communication, and hence states that teams of 4-5 are ideal.

2.6.3 Reward structure

The effectiveness of cooperative learning is also based on the reward structure for learners. According to Slavin (1983) the success of cooperative learning is highly dependent on the underlying incentive or reward structure. The reward structure can be divided into three forms:

- Individual rewards for individual achievement (learners are assigned individual rewards based on the quality or quantity of their personal performance or products and achievements)
- Group rewards for group achievement
- An interdependent reward structure

These reward structures have been proven to be most effective (Slavin, 1983). When learners' success as individuals is dependent on the success of the other group members, learners are more likely to work to ensure that their peers learn the material. However, Kohn (1991) thinks that reward undermines intrinsic motivation. Kohn believes that a carefully structured cooperative environment that offers challenging learning tasks and that allows learners to make key decisions about how they will perform these tasks and that emphasizes the value (and skills) of helping each other learn is a sufficient extrinsic motivation. Not only does knowledge and the presence of these characteristics enhance cooperative lessons but also knowledge of the way to implement cooperative learning groups.

2.7 Supporting Foundations for the Cooperative Learning

One reason why the Cooperative Learning is so popular in the educational circle is that it has sound scientific bases. But theories of the Cooperative Learning on different subjects are somewhat different. So different kinds of the Cooperative Learning lay stress on different theoretical bases. This section intends to seek for the

theoretical support for the Cooperative Learning from the perspectives of social psychology and cognitive psychology.

2.7.1 Group Dynamics Theory

A group is a dynamic whole in the sense that the interdependence between the members can change. As has been said, first, the nature of a cooperative group is the interdependence of the members that leads to the group becoming “a dynamic whole”, in which any member’s change will lead to the other members’ change; second, the nervous inner condition of the members can encourage the group to reach expected purpose. Levin also did experimental research on group aims and individual aims. The result shows that in cooperative groups individuals have strong motives. They can encourage each other and make allowance for each other. The information communication between the individuals can go on fluently. The work efficiency of cooperative groups is obviously higher than that of non-cooperative groups.

2.7.2 Developmental and Constructivist Learning Theory

The basic supposition of the developmental theory is that the interaction for the proper task can promote their mastery of important concepts. Children’s cognitive and social development has grown through companions’ interaction and association. Vygotsky, a famous psychologist of former Russia, presented “Zone of Proximal Development (ZPD)” in which he stressed the difference between the actual developmental level that enables children to solve the problem alone and the latent developmental level with the guidance of adults or cooperation of a better companion. Making ZPD in teaching, he said, is not only necessary in the teacher’s teaching, but also necessary in the cooperation with better companions. Vygotsky believed that “what the learner is able to do in collaboration today; he will be able to do independently tomorrow”.

Enlightened by Vygotsky’s ZPD, the later scholars discussed the cognitive function of the companions’ association from two aspects. One is that the companions teach each other. That is, students with better abilities work as teachers. The other is that the companions cooperate with each other. That is, the students communicate with each other equally and cooperate with each other.

Similarly, Piaget, a Swiss developmental psychologist, thought that social experience and knowledge—language, value, rules, morality and sign system can be acquired through the interaction with others. Many supporters of Piaget appeal for schools to use more cooperative activities. They think that students' interaction for the learning task can improve their achievements. And they can learn from each other through interactions. For the discussions in the interaction, there must be cognitive struggles. And because of the cognitive struggles, the insufficient deduction must come into being. At last through cooperation a better understanding will be reached.

Constructivist learning is an active constructive process. Learners are not passive to accept the external information, but active to choose the external information according to the former cognitive structure in order to construct the meaning of the present situation. The process of the construction is two ways. On one hand, learners construct the meaning of present things to trace the given information; on the other hand, the original knowledge is not taken out unchangeably, but it will be constructed according to the variation of the concrete situation. Learners' constructions are pluralistic, that is, each learner's constructions are different from each other's.

It is not only a revolution of learning psychology, but also a leap of epistemology from behaviorism to constructivism. Behaviorists think that human understanding is determined totally by the property of stimulus. The subject of understanding is passive, just as a mirror reflects an object, while constructivists think that man, as the subject of understanding, does not simply reflect reality. In the process of understanding the individuals make choice and choose methods, and they also give reality special meaning. So understanding does not come from reality itself, but comes from the interaction between subjects and objects.

Constructivism stresses the subject's conscious activity, and does not take learners as passive recipients. It considers teaching a process in which students construct their knowledge actively. And the construction takes place through interaction with others. In teaching the teacher, who is no longer the original authority, has become a cooperator who constructs knowledge with the students, and the companions have become constructive cooperators from the original competitors. Based on the constructivist theory, Cooperative Learning takes students as the main body of

teaching and the active constructors of knowledge. The students are no longer the passive receivers of outside stimulus or the objects of knowledge inculcation.

2.7.3 Behaviourism

Behaviourism as a theory was most developed by *B. F. Skinner*. It loosely includes the work of such people as *Thorndike, Tolman, Guthrie, and Hull*. What characterises these investigators is their underlying assumptions about the process of learning. In essence, three basic assumptions are held to be true. First, learning is manifested by a change in behaviour. Second, the environment shapes behaviour. And third, the principles of contiguity (how close in time, two events must be for a bond to be formed) and reinforcement (any means of increasing the likelihood that an event will be repeated) are central to explaining the learning process. For behaviourism, learning is the acquisition of new behaviour through conditioning.

The Cooperative Learning has sound theoretical bases from the perspectives of social psychology, cognitive psychology and language acquisition. Among them, the constructivist learning theory is the most important for the Cooperative Learning, which advocates that learners, during the process of learning, are active to choose the external information according to the former cognitive structure in order to construct the meaning of the present situation. Besides, group dynamics theory holds that in cooperative groups, when individuals get together for the common goal, they unite as one, respect and encourage each other to guarantee the success of their group. Also, the developmental theory indicates that the learners interacting for the proper task can promote their mastery of concepts. Vygotsky, a famous psychologist of former Russia, presented “Zone of Proximal Development”, in which he stressed the difference between the actual developmental level that enables learners to solve the problem alone and the latent developmental level with the guidance of adults or cooperation of a better companion. Whether the teaching will facilitate students’ development or not greatly depends on whether the teacher will constantly create ZPD for students and transform it to the present situation.

2.8 Cooperative Learning Strategies

There are many different forms of co-operative learning, but all of them involve having students work in small groups or teams to help one another learn academic material. Cooperative learning usually supplements the teacher's instruction by giving students an opportunity to discuss information or practice skills originally presented by the teacher. Sometimes cooperative methods require students to find or discover information on their own. Cooperative learning has been used and investigated in every subject at all grade levels.

Cooperative learning methods fall into two main categories. One set – “Structured Team Learning” - involves rewards to teams based on the learning progress of their members, and they are also characterized by individual accountability, which means that team success depends on individual learning, not group products. A second set – “Informal Group Learning Methods” - covers methods more focused on social dynamics, projects, and discussion than on mastery of well-specified content.

Table 2.1: Cooperative Learning Strategies

Method/ Strategy	Researcher-Developer
Complex Instruction	Cohen
Constructive Controversy	Johnson & Johnson
Cooperative Integrated Reading and Composition	Stevens, Slavin& Associates
Cooperative Learning Structures	Kagan
Group Investigation	Sharan&Sharan
Jigsaw	Aronson & Associates
Learning Together	Johnson & Johnson
Student Teams Achievement Divisions	Slavin
Teams-Games-Tournament	DeVries& Edwards
Team Assisted Individualization	Slavin& Associates

2.8.1 Structured Team Learning Methods

The following strategies fall under the category of structured team learning- Structured or Student Team Learning (STL) techniques were developed and researched at Johns Hopkins University in the United States. More than half of all

experimental studies of practical cooperative learning methods involve STL methods. All cooperative learning methods share the idea that students work together and are responsible for one another's learning as well as their own. STL also emphasizes the use of team goals and collective definitions of success, which can only be achieved if all members of the team learn the objectives being taught. That is, in Student Team Learning the important thing is not to do something together but to learn something as a team.

2.8.1.1 Student Teams-Achievement Divisions (STAD)

In STAD technique developed by Slavin (1994), students are assigned to four-member learning teams which are mixed in performance level, sex and ethnicity. The teacher presents a lesson, and the students work within their teams to make sure that all team members have mastered the lesson. Finally, all students take individual quizzes on the material, at which time they are not allowed to help one another.

Students' quiz scores are compared to their own past averages, and points are awarded based on the degree to which students can meet or exceed their own earlier performances. These points are then summed to form team scores, and teams that meet certain criteria earn certificates or other rewards. The whole cycle of activities, from teacher presentation to team practice to quiz, usually takes three to five class periods.

STAD had been used in a wide variety of subjects, from mathematics to language arts and social studies. It has been used from grade 2 through college. STAD is most appropriate for teaching well-defined objectives, such as mathematical computations and applications, language usage and mechanics, geography and map skills, and science facts and concepts. Typically, it is a cooperative learning programme in which students work in 4-member heterogeneous teams to help each other master academic content and teachers follow a schedule of teaching, team work, and individual assessment. The teams receive certificates and other recognition based on the average scores of all team members on weekly quizzes. This team recognition and individual accountability are held by Slavin (1995) and others to be essential for positive effects of co-operative learning.

2.8.1.2 Teams-Games-Tournament (TGT)

Teams-Games-Tournament uses the same teacher presentations and teamwork as in STAD, but replaces the quizzes with weekly tournaments. In these, students compete with members of other teams to contribute points to their team score. Students compete at three-person “tournament tables” against others with a similar past record in mathematics. A procedure changes table assignments to keep the competition fair. The winner at each tournament table brings the same number of points to his or her team, regardless of which table it is; this means that low achievers (competing with other low achievers) and high achievers (competing with other high achievers) have equal opportunity for success. As in STAD, high performing teams earn certificates or other forms of team rewards. TGT is appropriate for the same types of objectives as STAD. Studies of TGT have found positive effects on achievement in math, science and language arts.

2.8.1.3 Team Assisted Individualisation (TAI)

Team Assisted Individualisation (TAI; Slavin et al. 1986) shares with STAD and TGT the use of the four-member mixed-ability learning teams and certificates for high-performing teams. But where STAD and TGT use a single pace of instruction for the class, TAI combines cooperative learning with individualised instruction. Also, where STAD and TGT apply to most subjects at grade levels, TAI is specifically designed to teach mathematics to students in grades 3-6 or older students not ready for a full algebra course.

2.8.2 Informal Group Learning Methods

2.8.2.1 Jigsaw

Jigsaw was originally designed by *Elliot Aronson* and his colleagues (1978). In Aronson’s Jigsaw method, students are assigned to six-member teams to work on academic material that has been broken down into sections, (for example, a biography might be divided into early life, first accomplishments, major setbacks, later life, and impact on history). Each team member reads his or her section. Members of different teams who have studied the same sections then meet in “expert groups” to discuss

their sections, after which the students return to their teams and take turns teaching their teammates about what they have learnt with the others sharing the same section material.

2.8.2.2 Learning Together

David Johnson and Roger Johnson at the University of Minnesota developed the Learning Together models of cooperative learning. These involve students working on assignment sheets in four- or five-member heterogeneous groups. The groups hand in a single sheet and receive praise and rewards based on the group product. Their methods emphasise team-building activities before students begin working together and regular discussions within groups about how well they are collaborating.

2.8.2.3 Group Investigation

Group Investigation, developed by *Shlomo Sharan and Yael Sharan* (1992) at the University of Tel-Aviv, is a general classroom organisation plan in which students work co-operatively in small groups with inquiry, group discussion, and shared planning and project realisation. In this method, students form their own two- to six-member groups. After choosing sub-topics from a unit being studied by the entire class, the groups further break their sub-topics into individual tasks and carry out the activities necessary to prepare group reports. Each group then makes a presentation or display to communicate its findings to the entire class. A study in Israel by Sharan and Shachar (1988) found positive effects of Group Investigation on achievement in language and literature.

2.9 Benefits of Cooperative Learning

Most classroom practice has been predominantly “talk and chalk” or “teacher centred”, and this may have slowed down some learners’ achievement levels and brought down their creativity and motivation to learn. Often, the result has been low levels of motivation, and competition rather than cooperation during learning. Research now strongly supports the advantages of Cooperative Learning over competition and individualistic learning in a wide range of learning tasks. Consequently, it is strongly recommended that teachers adopt techniques and

activities that enhance Cooperative Learning as a way of maximising pupils' learning achievement, motivation and development of skills. A few of the advantages of Cooperative Learning are listed below. For convenience, they have been categorized in three categories as under-

2.9.1 Development of Self Confidence and Motivation to Learn

- Learners are known to learn more when they are driven intrinsically (from within themselves). Cooperative Learning enhances learner driven (intrinsic) motivation.
- Cooperative Learning increases the number of ideas, quality of ideas, feelings of stimulation, enjoyment, creativity of expression and involvement. It therefore enhances creative thinking.
- The teacher constantly monitors progress and rewards effort during Cooperative Learning. An activity every success the learner achieves is positively rewarded.
- Low achieving learners can contribute to the group and experience success (inclusive learning) during Cooperative Learning. Since the achievement of the group is shared among group members, no one feels left out.
- Cooperative Learning provides support and care for each member of the team. Children's confidence is enhanced and psychological stability provided for.
- Cooperative Learning increases learners' self esteem and personal worth. By associating themselves with group achievement, learners gain high self-esteem.

2.9.2 Promoting Student Achievement in Content Knowledge and Skill

- All learners increase their understanding of ideas by explaining them to others. This is ensured because individuals work in pairs/groups to accomplish a task.
- Learners who work with others at a task better understand the steps in finding the solution. This improves their practice and retention of the new material.
- Success associated with Cooperative Learning drives the learners to learn better. As a result of participating actively their achievement levels also rise.

- Cooperative Learning allows for ongoing evaluation by learners and teachers both during and after group activities. The process is a joint effort of the two parties and the reason for lack of progress is easily identified; and corrective measures can be instituted.
- The processes learners go through sharpen their intellect and new ideas are generated by individuals and the whole group when they are at task. The urge to get the solution to the problem results in highlighting the level of reasoning (Metacognition).
- Active learning experience is provided through the activity. The ‘practice’ aspect keeps learners alert throughout the task.
- The inability of some learners to perform well in some subjects, it argued, stems from attitude especially coupled with fear. Cooperative Learning eliminates fear for many individuals and builds positive attitude.

2.9.3 Development of Social Skills

- Learners get to know and trust each other. The arrangement forces learners to work with each other and in so doing; the pupils gain a high level of companionship, trust, understanding and feeling for each other.
- Activities are structured such that every member of the group/pair has a role to play. The skill of taking turns and playing roles is therefore developed.
- Learners are assigned to others to form pairs or work in groups. Each member is expected to work within their group. The social skill of identifying and belonging with a group is enhanced.
- Cooperative Learning encourages optimal use of resources. The learners use materials in groups/pairs, so the skill of sharing is developed.

2.10 Challenges faced during Implementation of Cooperative Learning

2.10.1 Loss of Control - Cooperative learning is a structured approach that requires instructor support and guidance. In order for cooperative learning to be utilized in the classroom, instructors must receive training to be proficient in implementing the

techniques. Maximum learning will only emerge if proper training is received by the instructor and then transferred to the student.

2.10.2 Group Work - Depending on the age level, students may resist using cooperative learning in their classrooms. Lecture does not require much interaction and participation from the students; therefore, they can get as much or as little from the class as they like. Being required to work in a group may ruffle a few feathers with the students because now they are being asked to participate and contribute to their learning. In addition, they are also asked to learn new concepts and taught how to work in a group. They may not be accustomed to working in a group, and therefore, may be unsure of the dynamics involved in group work.

2.10.3 Time Requirements - With cooperative learning, the textbook is used only as an instructional supplement, so it is necessary for instructors to create additional materials for the students. Usually these materials are made from scratch because many instructors' manuals offer limited suggestions for group activities. Creating these new materials can be very time consuming. So, not only are instructors spending a large amount of time implementing this new way of learning, but they also have to create the materials to go along with it.

Nevertheless the benefits of cooperative learning outnumber the limitations which can be overcome with a little planning and effort. To evaluate the effectiveness of the same in Indian conditions with small children in Science classroom the same was implemented by the researcher.