EFFECT OF JIGSAW ON THE PERFORMANCE OF STUDENTS AT SECONDARY LEVEL

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The thesis in entitled: *Effect of Jigsaw on the performance of students at secondary level* submitted by Mr. Gul Nazir Khan, in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Education has been completed under my guidance and supervision. I am satisfied with the quality of this research work.

Dated:____________________

(Dr. Hafiz Muhammad Inamullah)
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DECLARATION

I, Gul Nazir Khan, a student of PhD at Institute of Education and Research, University of Peshawar, do hereby solemnly declare that the thesis titled “Effects of Jigsaw on the performance of students at secondary level”, submitted by me in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Education, is my original work, except where otherwise acknowledged in the text and has not been submitted or published earlier and shall not in future, be submitted by me for obtaining any degree from this or any other university of institution.

Dated:__________________

_____________________
Gul Nazir Khan
In the Name of Allah
The Most Merciful, and the Most Compasionate.
DEDICATION

This Effort Is Dedicated To

Prophet Muhammad ﷺ

&

To My Parents

Whose Love and Prayers Transform My Dreams To

Reality
ACKNOWLEDGEMENTS

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ABSTRACT

The present study is about Jigsaw, a technique of cooperative learning. Cooperative learning has a rich track record of almost three decades of positive education outcomes. The objectives of the study were to evaluate the effectiveness of Jigsaw on the academic achievement of chemistry students at secondary level, assess the change in attitude of students and explore the enhancement of self-esteem of the students at secondary level. To achieve the objectives of study two schools of Government sector of Khyber Pakhtunkhwa Province at Peshawar city were selected as a convenient sample. Students of 9th grade were selected for the study because the diversification of science into branch subjects as physics, Chemistry and Biology starts from grade-9 in the Government school of Khyber Pakhtunkhwa province. Chemistry subject was selected as the investigator is working as subject specialist in the aforementioned subject in one of the Government higher secondary school of Khyber Pakhtunkhwa province. At the onset of the study pre-academic test were conducted from the students of both the experimental and control groups of both the schools. Similarly self-esteem scale of Rosenberg and Classroom life instrument of Johnson & Johnson were filled by the students of only experimental groups of both the two schools. The students of the Grade-9 of both the schools were divided into control group and experimental group. To the control group traditional teaching were carried out in the presence of their own teacher. The experimental groups of both the schools were taught with the help of investigator and concerned teacher. The experimental groups were taught with Jigsaw, a cooperative learning strategy for a period of 12 weeks while the control groups were taught with traditional teaching method. Two teachers having almost equal qualification and teaching experience were selected for teaching to groups, i.e. control and experimental groups. The investigator first gave some training regarding Jigsaw techniques. Efforts were taken to give both the groups’ equal time of engagement. The time of engagement for each class i.e. control and experimental, were 45 minutes. In Jigsaw method the processes of teaching consist of dividing the students in to base groups of 5-7 members. The unit’s topics were divided into sub parts. Each student was assigned a sub part of the topic and student was provided a
sheet covering the key points regarding the topic. Enough time was given to learn the assign task. From base groups students moved to the expert group where they were meet the students having same topic. Here students were engaged to thoroughly discussed and rehearsed for presentation to the base group. When the expert group separated, students came to the base group where they presented their topic to the group members. Students were allowed to ask questions to clarify the concept. Finally individual quiz was administered to assess the students’ performance. The time duration applying for Jigsaw method were 12 weeks. The data obtained through pre-tests and post-test were analyzed through s.p.s.s. The study revealed that experimental group of both the schools outnumbered in academic achievement than control group. In case of self esteem, experimental groups of both the schools were significantly different in pre-treatment self esteem and post-treatment self esteem. Class room life instrument from experimental groups of the two schools exhibited that students were very much enthusiastic about the Jigsaw teaching method. Students praised teacher’s support, valued students friendly support. Students have positive attitude about class room environment and towards the subject of chemistry. The implications were discussed.

**Key words:** Cooperative learning, Jigsaw, Self esteem, classroom life instrument, Khyber Pakhtunkhwa, Peshawar.
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<tr>
<td>CL</td>
<td>Cooperative learning</td>
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<tr>
<td>SPSS</td>
<td>Statistical package for social science</td>
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<td>JCL</td>
<td>Jigsaw cooperative learning</td>
</tr>
<tr>
<td>CLI</td>
<td>Class room life instrument</td>
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<td>School-1</td>
<td>Government High School Cantontment-1</td>
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<td>Students Team Achievement Division</td>
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<td>TGT</td>
<td>Team Game Tournament</td>
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Chapter 1

Introduction

1.1: Rationale:

During my teaching experience I have come across a number of students who are weak in the subject of Science and chemistry. Students were also observed shy in the class room skills like discussion, debate, asking questions and have low confidence in expressing their views. The support to the above findings were provided by Zubeida Mustafa (2015) in her article referring Lala Rukh Malik that it is our culture that does not want individual to ask questions, make informed decisions and deters curiosity. In order to enhance the academic achievement self esteem, and social skills etc Researcher, Academics & Educationists recommend cooperative learning as a method of instruction.

Most our Class room’s timing is focused on students-teacher interaction. Interaction among students is given less attention. The learning methods in which students interact and perceive each other are perhaps the neglected aspects of our class room environment. Our training institutions also support the teachers in the selection of appropriate interaction between learning resources and learners, and less time is given to the interaction techniques among the students. The above statement is endorsed by Johnson & Johnson, (1994). They were of that student-student interaction inside the class room is perhaps the undermined aspect of our instructions. He posed the question of interaction of fellow learners and commended that it is one of the weaken area of our learning environment.

Students can interact with each other in the learning environment in a there fundamental ways. The first one is that they can work independently without giving concentration to other fellow students. Second is the competition in which they can
compete with each other to find out who is the best. Finally is the third in which students can work cooperatively with the learning interest of their own and other members of their groups. In our education system, parents and teachers have a lot of expectations from their sons/students. One of the contemporary issues to the parents and their children is that parents often want to get good academic records and high profile job for their children, taking less or no care for their overall development in life. For that very purpose students work hard and compete with each other, hence competition is the most dominant phenomenon as observed by Johnson & Johnson, (1994). In this competitive environment Students rarely cooperate with each other. Cooperative learning is in contrary to competitive or individualistic learning. In cooperative learning students work together, share their ideas and resources to achieve the desired targets. The essence of Cooperative learning is cooperation among students. This cooperation among the students is the rationale for using Jigsaw, a technique of Cooperative learning.

1.2-Definition of Cooperative learning:

The definition of Cooperative learning has been made as an instructional model that can teach diverse contents to a variety of students at different grade level and is dynamic in nature. Students work together in a small heterogeneous group in Cooperative Learning to master the contents of subject matter, (Dyson & Casey, 2012). Students are divided here in cooperative learning in small groups in the class room or any other projects. In this approach students work together on an assigned concept or topic which lead them to perform task and action necessary for effective learning. The outcome is increase students’ achievement and develops self-confidence of individuals. Doymus (2008) elaborated that cooperative learning develops communication skills and the students participate actively in this method. Cooperative
learning method is applicable with varieties techniques in education. The detail of these techniques is: Team Game Tournament (TGT), Student Teams achievement division (STAD), Group Investigation, Learning Together, Jigsaw and Reading-Writing-Presentation (RWP) technique.

Jigsaw Classroom (2000), argued that Jigsaw is a type of cooperative learning technique, in which each students of a group is enabled to specialize in some topic of a learning unit. In Jigsaw techniques students are assigned to group, called base group having minimum two students and maximum six students. Students meet with the members of the other groups that have been assigned the same topic. These unions of the students of the same topic occur in the expert group. After mastering the topic in the expert, group students then return to base group and teach the materials to the other members of the group.

1.3. Theoretical Framework

Slavin (1987), reported that theoretical perspective of cooperative learning is based on two major theoretical perspectives which are relatively cognitive and motivational. In cognitive theories; the main stress was on the effects of working together. This working together or group work is the driving force behind my PhD project, because in our institution students reluctant to cooperate each other.

There is a reward system or extrinsic motivation in motivational theories of cooperative learning. After the successful completion of academic work students were provided some incentives. Positive interdependence is one of the five elements of cooperative learning, in which students perceive that their achievement or failure depends on their working as a group members,(Johnson, Johnson, & Holubec, 1986). Incentives or rewards are given less consideration by our school teacher, As a result students interest become almost decline.
Slavin, (1995) argued that from a motivational perspective cooperative learning environment create a situation in which the success of a group goal depends on the achievement of attaining individual goal. Students are therefore, likely to encourage members within the group to do whatever helps they could get to succeed and to help one another within a group. Students’ motivation is therefore increased to do academic work due to Cooperative learning. The two theories as Slavin (1987) pointed out, that is elaboration and developmental are directly applied to cooperative learning. Damon (1984), stated that when students interact with each other they have to discuss and explain each other point of view which leads to greater understanding and mastery of their critical concepts. So interaction among the group members is the essence of developmental theories. The struggle of conflict resolution during cooperative learning activity results in the development of higher level of understanding as elaborated by Slavin, (1990). While contender of the elaboration theory suggests that to explain the materials to someone else is one of the most effective means of learning.

Due to cooperative learning the development of critical thinking also occurs. This critical thinking is the foundation based of the second theoretical perspective of cooperative learning. Johnson, Johnson, & Holubec, (1986) argued that cooperative learning activities increases elaborative thinking and more frequently giving and receiving of explanations, which has the capacity to increase the quality of reasoning, depth of understanding and the accuracy of long term retention. Therefore, from both the developmental and cognitive theoretical point of view, the use of cooperative learning methods should lead to improved student learning and retention. The two theoretical perspectives that are cognitive and motivational of cooperative learning are given lesser attention in the current practices carried out in our schools.
1.4 Advantages of Cooperative Learning: It is cooperative learning that provides the opportunity to the students to exercise their activities in their class rooms. Students openly discussed their problems to fellow students; consider ways of solving the problems and respect alternative perspective. The above viewpoints were endorsed by Zakaria (2010). He argued that due to cooperative learning students are given more space and opportunities to discuss, create solutions, solve problems, present thoughts and help each other. Students have the opportunities to explicitly express their ideas with other students in cooperative learning. The strategies of cooperative learning are used widely because it is firmly founded on theory, verified by research and almost every teacher can find to use it in a way which is consistent with personal philosophies conclude by Johnson, Johnson & Stanne (2000). In the following figure the benefits of cooperative learning are, increased achievement, transfer of knowledge, increased self confidence, increased productivity, increased independence, increased autonomy etc.

Figure 1. Concept Map: Student Benefits from Cooperative Learning
1.5: Background of the study:

The pioneer in the development of group work goes back to the work of John Dewey (1916), Rudolf Dreikurs (1971), and Morton Deutsch (1962). In order to promote a higher level of thinking, Dewey (1916) in the early twentieth century promoted group interaction. Dewey (1916) was of the view that promotion of learning occur when there is the possibility of interaction among the group members in social activities. Dreikurs et al (1971) viewed that group work satisfied the need of being accepted and as a whole promoted concerns for the group as, therefore students work was better in group. They also developed cooperative learning. Deutsch, s (1962) work was the development of theory of competitive and cooperative situation which later became the base of enormous and present research.

1.6. Elements of cooperative learning:

Many instructors/teachers are of the view that a cooperative learning technique is simply putting the students into group work. Unfortunately this is not the case, in cooperative learning each individual is assigned with a proper task. Johnson, Johnson, & Holubec (1990), asserted that cooperative learning’s task is by five definite elements. Face to face interaction applies to interaction among students, helps each other to complete a definite target and learn materials. Positive interdependence means sink or swim together. Social skills range from fundamental good manners to an understanding how group can achieve its objective. Group processing, monitors the implementation of the group as a learning component. Teacher or group leader should observe the group process, comment on its effectiveness and make suggestion for its improvement. Individual accountability means that everyone has to perform his responsibilities. These elements of cooperative learning are discussed in details in
chapter-2. Kagan (2011), described four elements of Cooperative learning and used the word PIES, which means positive interdependence, individual accountability, simultaneous interaction and equal participation.

1.7. Steps in Structuring of Cooperative learning: Establishing a task structure (Structure in your class room) for a cooperative learning activity involves five specific steps, namely, Specifying the goal of the activity, structuring the task, Monitoring group performances, Teaching and evaluating the collaborative process, and debriefing.

1.8. Types of Cooperative Learning Groups:

In class room the implementation of cooperative learning are in many ways. Depending upon the duration of cooperative learning, the groups in the cooperative learning are divided into:

1.8.1: Informal cooperative learning groups: In this type of learning group very little structure (typically small, short term, adhoc groups) are involved. The duration of informal cooperative learning group is from a small number of minutes to one class tenure. The main focused of the students’ attention to learn the materials. The materials to be covered in a class session are organized by the Students in advance, set an environment conducive to learning, make sure that students process the material being taught cognitively, and at the end of the class give a conclusion to a class session.

1.8.2: Informal cooperative learning groups: It includes additional structure (such as the lecture format). Informal cooperative learning groups help to answer the main problem considered in the lecture. Here the knowledge transferred to the notes of the students from the notes of the professor without touching through the mind of either one.
1.8.3: **Formal cooperative learning groups:** Formal cooperative learning group that are highly organized, structured and typically task oriented. Here students are sit in a disciplined and well ordered class room. The activities in the cooperative learning are target specified.

1.8.4: **Cooperative base groups:** Cooperative base groups are long term formal groups in which students are encouraged and supported. These groups are applied to those activities involving long tenure.

All these groups provide leveling fields for students to learn inside and outside of the class room to personally interactive and intellectually active.

1.9. **Classification of methods of cooperative learning:**

The methods of cooperative learning are many. These methods of cooperative learning are classified on the basis of structure of groups and types of activities involved. The various types of cooperative learning methods as mentioned by Mohammed (2011), are STAD (Student team achievement division) developed by Robert Slavin (1979), in which students work in structured group, learns new materials but take individual quizzes. The next method is TGT (Team game tournament) first used by DeVries et al. (1978), here teams compete with one another and students take collective quizzes. The other method is TAI (Team assisted individualization) first applied by Slavin et al, (1984), students take responsibility for all management, checking and helping one another on their own. Each student in each group works in a different unit and change unit when exercise is correct. Other members help them. Finally the next method of cooperative learning is Jigsaw. Jigsaw method was originally developed by Aronson et.al (1978). In this method the topic is divided into various sections according to the students in the group, and each member become expert in his work.
1.10. Significance of the study:

Mostly students considered chemistry as difficult subject and have great anxiety and fear towards chemistry. There is a critical need for the development of such instructional strategies that will promote positive attitude towards subject, teacher, school, student’s fellows and learning environment. This new instructional strategies will also increase students motivation to study and towards that particular subject area. However as investigated by Dold (1992), this fear or phobia of students towards chemistry is not inborn but it is produced by our teachers and students. Science phobia can only be occurred when teachers severely insist on application of rules and remembering the science formulas. The development of science phobia initiated when there are no activities in the class room and concept development of science topics. Moreover teachers are unaware of the vital relationship between feelings of students; own self, subject matter and students’ academic output. Jagede (2007) concluded that all the students demonstrate anxiety towards the subject of chemistry. This anxiety is universal irrespective on the basis of gender and urban or rural based. However the intensity of anxiety is varying among male and female and among urban and rural. It is lower in male and urban based than in female and rural based students. In education cooperative learning model is popularizing. It attracts global interest of the educationists, scholars and researchers. Chemistry subject can be made more enjoyable for the students by the use of cooperative learning. In addition to enjoyment cooperative learning can also increased academic achievement. In the subject of chemistry, Jigsaw techniques of cooperative learning very few studies could be found in the previous research literature in the context of Pakistan, as investigated by the researcher. Another reason and perhaps the vital one is for choosing chemistry as a subject for the research study was that the investigator is
graduated in the subject of chemistry and has taught chemistry to secondary level over the decades.

To explore the relationship between the chemistry teaching and cooperative learning Jigsaw technique was the rationale behind this study. There were enough studies regarding the appropriateness of students’ team achievement division (STAD). However the researcher after thorough studies selected Jigsaw technique of cooperative learning perhaps a few researches have been carried out on Jigsaw in Pakistan. It was also important to check whether cooperative learning, Jigsaw method, was feasible and effective in our class room, where there was too much pressure on the students for competition from parents and teachers.

The study fruitful to a wide majority of students, teachers, educationists and researchers in studying, teaching and finding problems in the field of cooperative learning and chemistry. Besides the study added and broadened the existing knowledge of research and methodology in the field of science education.

1.11. Statement of the study:

In order to increase the achievements of students, change the attitude of students and increase their self esteem our education system needs cooperative learning to be implemented in their class rooms. In addition various techniques of cooperative learning ought to be implemented in our class room’s environment. Based on the above literature the problem was stated as “The effect of Jigsaw a cooperative learning on the academic achievement, self esteem and attitude of secondary students of Khyber Pakhtunkhwa in chemistry subject”
1.12. Research questions:
The following questions were the main focus of the study.
1: Were there any differences in academic performances (achievement) in the subject of chemistry between the control and experimental group?
2: Were there any differences in the attitude of the students of experimental group towards academic environment?
3: What were the differences in students’ self esteem before and after treatment of Jigsaw techniques in the experimental group?

1.13. Objectives of the study:
The overall objective of the proposed study was to examine the effect of Jigsaw on the performance of chemistry students at secondary level. The major objectives of the study were to:
A: Evaluate the effectiveness of Jigsaw on the academic achievement of chemistry students at secondary level.
B: Assess the change in attitude of students
C: Explore the enhancement of self esteem of the students at secondary level.
The minor objectives of the proposed investigation will be to:
1: Compare the academic achievement of the two groups i.e. experimental and control groups based on pre-test and post-test for the two schools.
2: Analyze the academic achievement of the two groups’ i.e. control and experimental groups on the basis of post test for the two schools.
3: Explore the students’ attitude towards teacher.
4: Investigate peer support in Jigsaw cooperative learning group.
5: Scrutinize students’ attitude towards group learning.
6: Examine students’ academic self-esteem in the class.
7: Inspect the students’ overall analysis about their self.

1.14. **Hypothesis:**

**Ho:** There were no significant differences between the control and experimental groups in academic achievement

**Ha:** There were significant differences in academic achievement between control and experimental groups.

**Ho:** There were no significant differences in attitude of the students in the experimental groups.

**Ha:** There were major differences in attitude of the students of the experimental group.

**Ho:** There were no main differences in the self esteem of the students of experimental group before and after the treatment of the Jigsaw cooperative learning technique.

**Ha:** There were main differences in the self esteem of the students of experimental group before and after the treatment of the Jigsaw cooperative learning technique.

1.15. **Delimitations:**

Because of time constraint and economic problems the study were delimited to only the Jigsaw technique of cooperative learning because the investigator thought that in local setting this technique had not been investigated. Due to culture constraints two boys Government high schools in district Peshawar were selected as the sample of the study. The method of choosing the sample was convenient in nature. Similarly due to time shortage the study covered only three units of the chemistry subject being taught to 9th grade students in Khyber Pakhtunkhwa.
1.16. Limitations:

The present investigation due to cultural restrictions was only limited to male students of Khyber Pakhtunkhwa. Moreover due to local climatic condition the study commenced from the 15<sup>th</sup> April, 2013 to 15<sup>th</sup> June 2013, which were lasted for 08 weeks (44 days/33 hours). More over due to administrative problems identified by the principal of the two schools, and lack of space available for group discussion the randomization of the sample were not carried out. It is due to this non-randomization of sampling that the study is quasi experimental in nature.

1.17. Definition of the Terms:

Jigsaw: A type of cooperative learning in which the students form home groups, take an assignment, studied it, and then move to expert group. In expert group the students become mastery of their assignment. Finally students met in the home group where they discuss their assignment to other students.

Self esteem: It was the evaluation of an individual about himself/herself. In this study self esteem were measured through Rosenberg self esteem scale.

Achievement: It was the academic achievement gained by the students at the end of the study. It was measured through teacher made test in the subject of chemistry.

Attitude: It is overall inclination of an individual towards something. In this study the tendency of students towards teachers, fellow students, school etc.

Class room life instrument: It was the instrument to measure the overall inclination or attitude of the students towards teacher, students, group work, school etc. It was prepared by Johnson et al.

Experimental group: One section of the class 9<sup>th</sup> of both the schools of District Peshawar, which were taught through Jigsaw cooperative learning technique.

Control group: One section of the class 9<sup>th</sup> of both the school-1 and school-2
Of district Peshawar Khyber Pakhtunkhwa, in control group traditional methods of teaching were applied.

**Peshawar**: Capital city of province of Khyber Pakhtunkhwa in Pakistan.

**School-1 & school-2**: The two schools were selected through convenient sampling. The name of the two schools were Government higher secondary school cantt-1 (School-1) and Government higher school cantt-2 (School-2)
Chapter 2

REVIEW LITERATURE

2.1-Introduction:

The review literature for this study focuses on the practical application and research studies covering all domains of cooperative learning strategies, academic achievements and cooperative learning, self esteem and cooperative learning and attitude and cooperative learning. The review literatures were collected from research papers, Term papers, websites of cooperative learning and books were also referred.

In Islam, due stress is given on cooperation with one another. Allah says in the Holy Quran, “Cooperate in good and piety and don’t cooperate in sins and transgression” Quran (5:2). Covey (2004) described the seven habits of highly effective people, in which synergy (the six habits) are the essence of cooperation. According to him synergy means that the whole is greater than the sum of its individual parts. Synergy is the agreement of a group collectively to subordinate old scripts and to write a new one.

It is only the effective teachings that facilitates the involvement of students and provide the grounds for the students to innovate new ideas. As mentioned by Biggs (2007), that effective teaching not only develops general principles of teaching, but also ensures students participation in learning activities which enable students to create innovative ideas, replicate and resolve the problems in the target content areas.

In order to attain a shared goal, students work in small heterogeneous group, Slavin, (2000). A student of mixed abilities, different age group, and different gender and of different social background is involved and can benefiting from cooperative learning. Cooperative learning is a highly structured activity. Feedbacks are also given to students and are appreciated for their contribution in team learning.
In cooperative learning, small group having students of variety academic abilities, use different learning strategies to improve their understanding of particular subject. Cooperative learning is very powerful teaching method. In cooperative learning each individual not only responsible for learning his own materials but also making sure the learning of subject contents of his/her team mates and as a result create the atmosphere of achievement.

It was considered in early days that a quiet class with no students’ activities is a learning class. It was believed that learning will only possible when there is complete calm in the class room. The above observations were also reported by Slavin (1991). He remarked that once there was time when a class having a pin drop silence was considered as an ideal learning class. The school’s head/principal when walked down the class hoping to feel a quiet and silent class. Today however, the notion has been changed. Now a day, many schools are eager to implement programs that inculcate voices in the environment of class rooms. These programs are named as collaborative or cooperative learning, promote learner to debate and discuss and at last teach these learning materials to other students’ fellow.

Roger T and W. Johnson (1994), quoted Ashley Montagu’s (1965) statement that Society cannot survive without the cooperation of its individual members, and it is due to the cooperation of its members in the society that has made possible the survival of man possible. The individuals who are most likely to survive are those who are best enable to do so by their group in human societies.

This idea was explained by Allamma Muhammad Iqbal the national poet of Pakistan. He says that the nation destiny lies in the hands of its individual members and each member in the human society is the star of destiny of a nation.
In cooperative learning students usually perform their work in three or five little groups to achieve a common shared goal. To maximize their own learning and the learning of other members students work together. There is a difference between a structured leaning group of cooperative learning and simply having students work in a group. Students are working their own work in a group and are sitting at the same table, but are free in talking as they work, are not considered to be learning group of cooperative learning, because of no positive interdependence. It could be perhaps called individualistic learning with talking. For cooperative learning situation, a group must be a shared and common goal must be there on which a group is reinforced. When a group is assigned a task and only one person does the entire job and the other members go along with a free ride then it is not a cooperative learning group. An important element of cooperative learning is individual accountability which means that all students need to know the goal of group and materials for the whole group to be successful. Simply putting students into group does not mean a cooperative relationship. A group activity has to be managed and structured by the teachers.

2.2. Elements of cooperative learning:

There are certain conditions if implemented in cooperative learning environment then it is expected to be more fruitful and productive than individualistic and competitive learning. The conditions are listed by Johnson & Johnson (1999) as:

Social skills

Positive interdependence

Individual accountability

Face to face promotive interaction

And group processing
According to Johnson & Johnson (1999), these five critical elements make cooperative learning successful. These five elements are presented in the Figure-2.1 (Adopted from Johnson & Johnson 1999.)

2.2.1. Positive interdependence:

The success or failures of the students depend on their cooperation, if students cooperate with each other they will succeed and will collectively enjoy their success. On the other hand if the students do not cooperate with one another in their work, the ultimate result will be their failure. Positive interdependence means the students believe of swim or sink together in a cooperative learning environment. Positive interdependence is the primary requisite for a successful structured lesson plan of cooperative learning. The learner in the cooperative learning environment has two major responsibilities i.e. the learner should not only learn the assigned materials but also provide an environment conducive for the learning of other learners. Here group result is important than individual result.
Technically this dual responsibility of the learner is called positive interdependence. Positive interdependence exist when students perceive that they are linked with group mates in such a way that they cannot succeed unless their group mate do (and vice versa) and/ or they must coordinate their efforts with the efforts of their group mate to complete the goal target. In a learning group positive interdependence can be structured in a number of ways.

**Positive goal interdependence:**

The targets of the goal to be achieved must be present in the lesson plan. Students believed that a group goal can only be achieved only if group members perform his assigned duties.

**Positive Reward:** On successful completion of group work each group member relieved the same reward. Celebration of the group success and reward enhance the quality of cooperation.

**Positive resource interdependence:**

Positive resource interdependence stands that only a portion of necessary resources, information and materials are to be provided to each and every member in a group. These partial information, materials, and necessary resources are to be combined for group goal in the last.

**Positive role interdependence:**

The role assigned to each member in a group is interconnected and complementary that mentioned responsibilities that the group requires for the accomplishment of its task.
2.2.2-Face to face promotive interaction:

In an industrial organization it is the group effort that counts. There is really no room for stars in an industrial organization. You need talented people, but they can’t do it alone. They have to have help.

(John F. Donnelly, President, Donnelly Mirrors)

The outcome of Positive interdependence is face to face promotive interaction. It can be defined as the encouragement and facilitation of individuals by the other individuals for the completion of their task to reach the group targets. Students have the opportunity to interact and coordinate with other students and provide the ground for other students to take advantages of the available resources. In face to face interaction individuals are provided help, assistance and necessary resources. Individuals can exchange information, resources, process information and give feedback for improving performance. Individual in interaction challenge each other result and give reasoning to give high quality decision making and give solution to the problem under consideration.

Face to face promotive interaction is individuals supporting each other in a cohesive group, for example, helping, assisting, supporting, and encouraging one another. In this kind of interaction students each other in a cohesive group i.e. helping, supporting each other in a group.

2.2.3. Individual accountability/personal responsibility:

What children can do together today, they cannot do alone tomorrow
Individual accountability is the 3rd most important elements of the cooperative learning. The existence of individual accountability is manifested when the performance of an individual is measured. In individual accountability the results are given to the individual or group and students are held responsible for his/her fair contribution to the achievement of the group. It is of paramount importance for a group to know who need more support, assistance, and encouragement in completing the assignment. Each individual in a group is made responsible to accomplish his/ her task, and provide necessary assistance if needed to an individual.

In order to ensure that each individual is accountable personally for his/her contribution to the group work teacher should take the following steps:

The effort of each member to the group work should be assessed.

Reinforce the individual as well as group work.

Prevent students from doing unnecessary activities in the group so that students are not distracted from the group goal.

Make sure that every member is answerable for the final result.

Structure individual accountability can be completed by the following ways:

The size of the group should be kept as small as possible. Smaller the group size high will be the individual accountability.

Conduct an individual quiz to each individual.

Students should be examined and call them one by one randomly to present their work to the whole class.

Each group should be Observed and record the frequency of member contribution to the group’s work.

Nominate one individual the role of checker.
Peer tutoring should be implemented in the group work when all students do this it is called simultaneous explaining.

### 2.2.4 Group skills:

I will pay more for the ability to deal with the people than any other ability under the sun. (John D. Rockefeller).

Small group skill is fourth essential elements of cooperative learning. To coordinate effort and to attain mutual goal learner is required to:

- Get to know and trust each other.
- Communicate clearly and efficiently to each other. Group skill can only be achieved, when there is clear communication and coordination among its group members.
- Accept and Support each other.
- Resolve conflict constructively. Conflict can be created if the group members are unaware of their task and responsibilities. Conflict resolution can be handled technically by assigning responsibilities to each individual in a group.

### 2.2.5 Group processing

Take care of each other; share your energies with the group. No one must feel alone, cut off, for that is when you do not make (Willi Unsoeld, Renowned mountain Climber).

Group processing is actually the reflection of the cooperative learning. What are the weak areas of group activities? what areas of group learning needs improvement? What are the strong points of the activities? and what are the short comings of the whole process? These are the questions which are to be discussed at the end of the session of cooperative learning activities. Group processing is the most pivotal element of CL (cooperative Learning). The effective nature of the group work is influenced by group reflection i.e. what is the performance of the group work?
Group processing can be made effective by the following measures. Describe what member actions were helpful and unhelpful. Cooperative members in a group is appreciated here in this reflection session. Make decision about what action to continue or change. Those actions which are effective and fruitful are to be continued and developed. Group processing is occurring at two levels – whole class and small group. Teacher should allocate some time at the end of each lesson to monitor small group processing. Teacher should also in addition to small group processing concentrate in the processing of the whole class. The groups should observed by the teacher. Also the teacher should analyze the problem while working cooperatively faced by the students, while working together teacher should give feedback to each group on the basis of their work. Make a reflection session to the whole class and share the observation to the whole class. If there is a peer observer in a group, then the observation of these peer observers should be added to get the whole class data collectively. Deutsch (1962) asserted that cooperative learning is an extensive field of inquiry that was the subject of laboratory research into the effects of cooperation on performance as early as 1940; late 19th century research has shown that cooperative learning is fruitful to learning. It was in 1970 reported by Antil et al (1998), that cooperative learning was used as a teaching method to learning through experimental work in the area of learning and instruction, group dynamics and social relationship. In planning a Cooperative learning activity, you need to decide the type of interactions between you and your students, the type of interactions among your
students with one another, the responsibilities you will assign and the selection of materials as well as the task.

The fundamental reason behind the students-teacher interaction is the promotion of independent thinking by the exchange of views between teacher and students. The teacher role is to interrupt whenever necessary and then retreat thus providing a room for the students to grasp the new information provided.

Students-students interaction in cooperative learning is prolonged and intense. In cooperative learning students take responsibilities for other learner slowly and gradually. The feedback, assistance and reinforcement should come from the students in the group during cooperative learning in contrast to individual or competitive learning in which the feedback is coming from the teacher.

The other element of cooperative learning is the task to be done learned and the materials that comprise cooperative learning activities. There will be pre-planned task in cooperative learning completed in time, carried out in stages and be placed within the context of other. Task specialization and division of labor are typically used by Cooperative learning. Here the large task is broken down into smaller sub-parts on which group work is occurred. As a result these work come together to generate the whole and thus the contribution of each group member is acknowledged. Hence each group may be provided an opportunity to concentrate their efforts in mastering a preplanned activity; these are smaller yet meaningful part of larger target which if achieved the whole class will be rewarded.

Success of cooperative learning activities depends on the proper assignment of roles. Individual are often assigned specialized role within their group in addition to groups’ tasks. The mode of conveying of responsibilities and role expectation determine the victory of cooperative learning activities. If there is some ambiguity in someone’s role
or if the group target is unclear, cooperative learning quickly changed into disorderly
discussion, in which there may be numerous passive and uninvolved individuals.

2.3. Role of learner in Cooperative Learning:

Some of the more popular cooperative student role functions that can be assigned
within or across groups are suggested by Johnson & Johnson (1991).

Summarizer-the role of the summarizer is to paraphrase and on the agreement of the
group make a major conclusion before the whole class.

Checker- if there are some controversial or debatable statements and conclusion, then
the checker role is check for authenticity against references or text.

Researcher- researcher’s role is to acquire background information and to read
reference documents when there is requirement of more data. There is difference
between a researcher and a checker. The checker certifies the accuracy of the work in
progress while the researcher provides critical information to complete the task of the

Runner-the role of runner is to acquire anything necessary for the completion of task,
i.e. equipments, materials, reference works.

Recorder-the major products of the group is written and recorded by the recorder

Supporter-when their individual assignments are completed the supporter praises the
individual and consoles those they are discouraged. Writing major contributions by
the group on the chart for all class, progress of the students is identified

Observer/troubleshooter- during the whole class reflection or debriefing the observer
take notes and record information. If the problem arises report to the group leader and
if the solution of the problem is insurmountable then it is presented to the instructor.
2.4-Foundation of Cooperative Learning:

Starting from a single root cooperative learning is a model of instruction that developed along four separate branches: the curricular approach, the conceptual approach, the complex approach and the structural approach. The conceptual approach was developed by David and Roger Johnson. Conceptual approach is based on the assumption that the key principles of instruction should learn by the teacher and then adopt these principles to classroom environment. Robert Slavin and his colleagues developed the curricular approach to help teachers to deliver specific learning outcomes in their class rooms. Structure cooperative learning was based on the work of Spencer Kagan. Structuring cooperative learning is independent on content and is used in different situation such as in the achievement of mastering content or concept development or team building. Dyson & Casey, (2012), described that Elizabeth Cohen and her colleagues developed the complex approach that sought to enhance academic, thinking, and linguistic skills by the use heterogeneous groups of underserved children.

Johnson et al, (20000) reported the meta-analysis of 164 studies investigating the comparisons of eight cooperative learning methods with that of competitive learning. There are five areas on the basis of which the various cooperative learning was evaluated. These areas are (a) How ease these cooperative learning methods are in their initial use in the class room? (b) How ease these methods are in learning? (c) How easy these methods are in the long term maintenance of use of the methods? (d) How these methods are adaptable to changing conditions? (e) How these methods are applicable to various grade level and subjects.

The result of this meta-analysis is that learning together is the most efficient and applicable cooperative learning technique. Besides learning together, the other
cooperative learning techniques like academic controversy, students’ team achievement division, Jigsaw, team assisted individualization, group investigation, team game tournament and cooperative integrated reading and composition are in the ranking order respectively.

2.5-Cooperative learning methods:

According to Doymuş, (2008a), Slavin, Leavey, & Madden, (1986); Twons, (1998) Aronson & Shelley, (1997); slavin, (2000),Seetharaman & Musier-Farsyth,(2003); Oh & Shin, (2005); Eilks, (2005); the various methods/models of cooperative learning are:

2.5.1: Team Accelerated Instruction (TAI):

Team Assisted individualization (TAI) combines both individualized and cooperative learning. Give each student a specified amount of content to work (e.g. pages, problem sets, questions and answers). Also assign each learner to a team. Heterogeneity among the team is important. Ask each team member to have their work checked by another teammate. Assume the role of checker to as many members as possible. Give the checker the answer sheet when necessary. Record the score on a master score card. Team scores are based on the score obtained by each member in a group and their completion of units in every week. Reward those teams that complete a preset numbers of units with a minimum average score. Assign one student monitor, rotate this assignment frequently to each team to manage the routine checking, distribution of the individualized materials and administration and recording the quizzes.

2.5.2- Teams-Games- Tournaments (TGTs):

In TGT the same general format as that of STAD is used. However students play academic games instead of giving individual quizzes to show their capability in the
topic studied. Here students are assigned to four or five members learning team. Each team is made as heterogeneous as possible to show the structure of the whole class. Present new materials via lecture or discussion and provide work sheet of problem set, vocabulary words, question and such from which students can review the main points of lecture or discussion. When lecture/discussion is complete, students then study work sheets, quizzing each other, clarifying difficult or confusing points among themselves and raising question of you when necessary. Before team members begin give one member of each group the answer to all the problems or questions on the work sheet and assign this member the task of checking the oral or written response. Allow the team member sufficient time for discussion. After the team member had sufficient time to discuss the work sheet, give them team 20 question as weekly tournament. Competition must always be seen as fair by the learners and every learner has an equal opportunity to contribute to a winning team.

2.5.3-Learning Together (LT):

Learning together strategies was developed by originally by David Johnson and Roger Johnson (Walters 2000). Students work together in four or five heterogeneous groups on a group assignment sheet. During the discussion if the student asks the question from the teacher, the teacher will refer the students to the group for finding the answer. After the group discussion the group leader is chosen to present the result to the entire class. Groups receive awards together on their performance. Score are based on the individual performance and group performance but there is no individual competition. Learning together strategies provide teacher a conceptual framework to plan and tailor cooperative learning according to circumstances; students need and school contexts, (Ghaith, 2003).
2.5.4-Group Investigation (GI):

The pioneer of group investigation model was Thelen (1960) and Sharan, Sharan (1989). In group investigation student take an active part in planning what they will study and how? They will form cooperative groups according to common interest in a topic. All group members help plan how to research their topic. Then they divide the work among themselves and each group member’s carries his or her part of his investigation. Finally synthesize and summarize its work and present its finding to the whole class, Joyce and Weil (1972), Sharan and Hertz. Lazarowitz (1980), Sharan and Sharan (1972).

2.5.5 Student Teams and Achievement Division (STADs):

In STAD students are assigned to four or five members learning team. Each team is made as heterogeneous as possible to represent the composition of the entire class. Present new materials via lecture or discussion and provide work sheet of problem set, vocabulary words, question and such from which students can review the main points of lecture or discussion. When lecture/discussion is complete students then study work sheets, quisling each other, clarifying difficult or confusing points among themselves and raising question of you when necessary. Before team members begin give one member of each group the answer to all the problems or questions on the work sheet and assign this member the task of checking the oral or written response. Allow the team member sufficient time for discussion. After the team member had sufficient time to discuss the work sheet, give individual a written quiz over the material on the work sheet in which the individual may not help each other. Score the test immediately and form the individual into team score by averaging all.
2.5.6 Cooperative Integrated Reading and Composition (CIRC):

It is a wide-ranging approach to class room environment in text-book reading, grammar composition, and spelling secondary level. In Cooperative Integrated Reading and Composition (CIRC), first students are required to sit in a reading group and are taught. Students then return to the group of mix ability and work on series of cooperative learning, namely setting problem and problem solution, partner reading, identification of character, making prediction, summarization, spelling and reading comprehension exercise and vocabulary.

Gupta & Ahujja (2014), reported that this CIRC method give a ground to assist students and teachers and make students capable of effective readers.

2.5.7 Jigsaw Technique (JT):

Different techniques are used by cooperative learning method with various goals. Jigsaw, developed by Aronson et al (1978) Snapp, (1978) & Sharan, (1998), is one of them. The authors Blaneey, Stephan, Rosenfield, Aronson & Sikies, (1977), described the method as follows:

“The materials to be learned were divided into as many parts as there were group members. Each student learns only one part of the total materials and was, in turn, responsible for teaching his part to his group members. However each group member was responsible for learning all the curriculum materials for testing (p-123)” reported by Shlomo Sharan (1980).
Jigsaw is chosen by various researchers because it can be applied in the classrooms and makes it for the students to comprehend the subject.


The foundation principles of all these techniques are the same. The investigator used the subject jigsaw in this research developed Doymus. In the subject Jigsaw technique, the whole topic is divided into smaller subtopics. Later, students taking the topic of the same subject are placed in to home group. Slavin (1988), explained that
there are two essential elements for effective Jigsaw method, one is there must be a group goal and the other is individual accountability. Without group goal students will be difficult to motivate. Similarly there must be some form of assessment to recognize each student’s performance. Manning and Lucking (1991), add another element of group heterogeneity.

Two subgroups were formed from each Jigsaw group in which the students are randomly divided. These subgroups are represented in Figure 2.3

![Diagram showing the nature of group in Jigsaw](image)

Fig 2.3 showing the nature of group in jigsaw

The organizations of the other groups were occurred in the same way as the first. For example if the 9th chemistry unit-2 is the structure of atom have eight subtopics. These subtopics are: Introduction to structure of atom, Dalton Atomic Theory, Rutherford
Experiment, Rutherford atomic model, Bohr atomic model, Electronic configuration, Isotopes, and uses of isotopes. These students were divided into “home groups” according to the strength of the class, and the number of topics in the unit. Each home group contained four to seven students. Home group students were given the given the same topic. In order to ensure the participation of all students in the jigsaw method there may be increased or decreased in the number of home group. Each home group according to Doymus (2007) then prepared and presented their respective topic to the whole rest of the class. In the base/home group each student first study his/her part of the subject assigned. 30 minutes were given to each home/base group for presentation and 20 minutes were spared for discussion with the class. Answers were given by the home group if questions were posed by the class during this discussion. The base/home groups then segregated apart like parts of Jigsaw riddle, (Doymus 2008b; Mattingly and Van Sickle 1991), and the movement of members of home group to Jigsaw group (JG) occurs in which students were assembled by other base/home group, who were given the same assignment. Formation of Jigsaw groups started like JG1, JG2, JG3 and JG4 (see Fig. 1).

The teacher asked the students to master their subtopic. After this students were summarized their respective topic. Jigsaw group then took 30 minutes for presenting their own topic to the whole class, after presentation, open discussion is started which will lasted for twenty minutes. The students then were return to the base/home group which were had one master trainer of his respective topic. The master trainer student was responsible of teaching his specific sub-topic to the remaining students in the entire class. The whole process of the Jigsaw technique lasted for various tenure. Various researcher/ investigators used various time periods for the JCL. Pandey and

Fig 2.4 showing the nature of group in jigsaw (A1, A2, and A3 etc are the student individual) adopted from Kemal Deymus et al, (2007).

2.6-Outcomes of Cooperative learning:

2.6.1- Academic achievement:

Cooperative Learning had a rich history of experimental and theoretical based research. The above statement is equipped by Johnson and Johnson (2002) with the testimony of separate research studies of more than 249. These studies compared the
usefulness of competitive, cooperative, and individualistic learning in the classroom environment at college level. The outcomes of these 249 separate research studies exposed that cooperative learning results in critical thinking, greater achievement, transfer of learning, and problem solving, than either competitive or individualistic learning. The reason for the extensive use of cooperative learning is due to many elements. There are a lot of reasons to implement cooperative learning. The most important three reasons are: (a) Theory is the foundation stone of cooperative learning. There are a variety of theories in sociology, anthropology, economics, education, political science, and other social sciences. The foundation of cooperative learning is in cognitive development, social interdependence, and behavioral learning theories. (b) The research available on cooperative learning provides ample evidence on the validation of cooperative learning perhaps more than other instructional methods. These research studies are numerous in numbers, generalizable, in-depth and have a wide range of applicability. The validity of effectiveness of cooperative learning is further strengthened by more than 900 research studies comparing individualistic, cooperative, and competitive learning methods. This body of research has a huge applicability and generalizability, because the research studies were conducted in wide varieties of subjects, different age and grade level, different countries, different settings, and by different researchers in eleven decades. The research participants have varied widely according to gender, class, culture, age, and economic background. There was also a wide variety of research tasks and measuring dependent variables. There are still unusual areas of research studies conducted on cooperative learning, that is it has focused on a numerous and a vast majority of achievements. The very diverse and numerous outcomes that are affected by cooperative learning are academic achievement, attitude change, self-esteem, analytical reasoning, decision
power, transfer of learning, retention, time on task, motivation, conflict resolution, understanding alternative perspectives, friendship, social support and many more outcomes over the past 100 years. Such diverse outcomes can be achieved by no other instructional strategies as cooperative learning.

(c) Another important factor and the 3rd one is the availability of variety of learning methods, which cause the extensive use of cooperative learning. These teaching methods are easy available for teacher use. Their ranges are very flexible in conceptual and concrete in nature. Teacher of any subjects and grades can find ways to apply these cooperative learning methods which are harmonious with the practices and philosophies of the teachers. There are so many teachers and numerous cooperative learning methods that their operation cannot be all listed here. The following ten cooperative learning methods are listed which have gained too much attention. Jigsaw (Aronson, et al., 1978), Constructive Controversy (CC) (Johnson & Johnson, 1979), Complex Instruction (CI) (Cohen, 1994b), Cooperative Structures (CS) (Kagan, 1985), Student Teams Achievement Divisions (STAD) (Slavin, 1978), Learning Together (LT) (Johnson & Johnson, 1975/1999), Teams-Games-Tournaments (TGT) (DeVries & Edwards, 1974), Cooperative Integrated Reading and Composition (CIRC) (Stevens, Madden, Slavin, & Farnish, 1987), Group Investigation (GI) (Sharan & Sharan, 1976) and Team Assisted Individualization (TAI) (Slavin, Leavey, & Madden, 1982).

There is an increased academic achievement, student’s attendance, improved behavior, increased self confidence and motivation, increased liking of school and fellows students as evident by documentary results. The teaching methods of Cooperative learning are inexpensive and relatively easy to implement.
Cooperative learning is based on numerous experimental works, researches, and observations. Johnson et al. (1991) argued that the classroom environment employing cooperative learning is well structured and productive. It is founded on substantiated works of many educationists and investigators in the field of learning environment. Slavin (1991a), elaborated that the outcomes of cooperative learning has been extensively studied with students of all age groups, different ethnic background in many subject areas and all types of school setting.

How successful is the cooperative learning than individualistic or competitive learning in promoting achievement and productivity is the very pivotal question pragmatists ask? More than 875 studies have been conducted during the past 90 years. When all of the studies were included for analysis the average cooperative learner performed at about two third a standard deviation above average students learning in individualistic or competitive environment.

Since the beginning of the 20th century, there have been hundred of studies and researches completed on the efficacy of cooperative learning. According to Johnson et al, (2000), Cooperative learning is one of the most productive areas and well established areas of research, theory and practice of education.

In another study by Kuntz, McLaughlin and Howard (2001) comparing individualized instruction, cooperative learning, and traditional instruction on the students of special education. The outcomes of the study revealed that the students who used cooperative learning and individualized instruction scored higher in the subject of mathematics than the students who used traditional instruction methods.

Active role of students in the class room ensured the learning of students (Bermejo, 2005). Cooperative learning provide opportunities to the students to take active participation in the class room, it also allow the teacher to be the facilitator.
In a study by Vermette et al (2004) on cooperative learning, reported that students are taught how to integrate with one another in a group that are capable of doing more than the individualized efforts.

Cooperative learning promotes students attendance and students achievements. It increases students’ retentions. It develops new methodologies in teaching and classroom environment. It inculcates problems solving abilities of the students. Low grading students improve their performances when grouped with the higher grade students. Cooperative learning can be practiced in a large lecture class involving students in order to improve their critical thinking, constructive activities and their interaction with one another.

It was reported by Onwuegbuzie (2001), that Slavin (1990) had mentioned a high quality studies of more than seventy comparing cooperative learning strategies with those of compared traditional methods in elementary and secondary schools. Of total seventy studies, 67 studies measured effect on students’ academic achievement. In 41 studies (which contribute 61%) significant difference were reported in the achievement between the control & experimental groups, 25 studies, (37%) corresponded to the two groups i.e. experimental and control group having no marked difference between the two methods were observed. It was observed remarkably that in only one study the control group performed better than experimental group. Meta analysis conducted by Johnson et al (1981) of 122 achievement studies. The majority of these studies measured several outcomes besides achievement. In addition to increase in achievement level, there are increase in the level of self esteem, attitude towards school, attendance rate and time on task. The full scale review was conducted by Newman and Thompson (cited in Slavin, 1992). The review consist the reports of 27 high quality studies including 37 comparisons of cooperative versus control
methods. A statistically significant proportion of the mentioned studies (68%) supported the use of cooperative learning methods. Cooperative learning as compared to traditional instruction is both effective and enjoyable teaching strategy and it results in positive learning and significantly higher learning gains. Students were given the opportunity to work together with their fellow colleagues and such working together develops cooperation and care for others in the students. However, being new to the developing countries like Pakistan Zaheer & Nasir (2010) exposed that most of the perspective teachers who first time exposed to cooperative learning viewed that such novel method in Pakistan have yet to make their grounds at both college and school level. Teachers resist about the implementation of cooperative learning on the ground that the current system of our education is content based memorization and on individual based students’ performance through competition. As reported by Panitz, T (n.d), teachers resistance of implementation of cooperative learning were due to lack of confidence in the teachers, lose control in the class room, fear of the loss of content coverage, lack of familiarity with alternative assessment techniques, lack of prepared materials for use in the class and teacher’s ego.

Abrami, et al (2004) suggested that professional development of teachers should be given heavy emphasis to enhance teachers’ perceptions that they can succeed in implementing an innovation in their own context. Kosar (2003) concluded that cooperative learning in contrast to routine method resulted in higher achievement in the subject of social science. The duration of her experiment on 7th class was for two weeks. Furthermore, Coffey (2008), conducted another study and their findings are that students who work at faster pace are not bored because other students in the discussion are involved.
Cooperative learning promotes students faculty interaction and familiarly, which is perhaps the neglected area of class room teaching. Cooperative learning develops a supportive environment for the management of conflict resolution and promotes positive a societal response to a problem. It develops students’ attitude towards subject matter, school and class fellows. Cooperative learning create more positive attitude towards teachers, principal and other school personals by students and also in reverse create a more positive attitude by teachers towards students. Cooperative Learning sets the targets of high expectation for students and teachers. The outcomes of cooperative learning methods, especially Jigsaw method are academic and social development. Manning and Lucking (1991) described that Jigsaw cooperative learning technique could result to social reimbursement for students of varieties racial and abilities backgrounds.

2.6.2: Cooperative Learning & Attitude:

Attitude may be defined as a tendency to reply in a complimentary or adverse style to a given attitude object, Oskamp and Schultz (2005). The object of attitude can be anything, such as chemistry teachers, chemistry lessons, chemistry practical taught in school. Borisch (1996) argued that social interactions can shape the attitude and value of adult learners. Although books, newspaper, magazines and audio-visual media are the sources of learning for us about the world, yet discussing with others formed our attitude and values. This exchange of information and knowledge with those people who gained their knowledge in different circumstances refine our views and thoughts. Cold lifeless facts are turned into feeling and then to attitude and morals that direct our behavior. Cooperative learning is important in helping learner to think independently inside and outside of the class room. Students usually demonstrate less
boredom and report liking of school environment, according to research conducted on Jigsaw class rooms.

Change in pupils, attitude towards themselves, towards class mates and towards school was investigated by Geffener R (1978). His experiment lasted for eight weeks. Each week four educational treatments were implemented with 5th grade students for 3 hours. The experiment includes small group learning without interdependence, Jigsaw group, innovative non group learning and traditional non group instruction. Pupils maintain a positive attitude towards themselves, their fellow mate, and school in both interdependent and small group treatments.

2.6.3: Cooperative Learning & Self-Esteem:

According to Johnson & R. Johnson (1989), individuals with low self-esteem are:

On the basis of their assumptions that they will fail despite their hard work, lack of confidence and as a result have minor achievement due to setting low standard for them. The persons with low self esteem exhibit different psychological disorders such as depression, insomnia, nervousness and anxiety, as well as psychosomatic symptoms are developed. Persons having low self esteem are agreeable, easily convinced, conforming and highly affected by criticism.

Due to feeling awkwardness, vulnerable to rejection and self conscious people are socially withdrawn. Individuals suffering from low self concept are conscious of themselves and others by noticing mistakes in other people and try to destroy them.

Blaney et al 1977 conducted a study in which the jigsaw group meets three times a week. These jigsaw group meeting were lasted for 6 weeks. Liking for school, extent of feeling like by class mates, liking for one's group, self esteem and reported interest in cooperative or competitive activities with class mates were the dependent variables. Major increases were noted from pre test to post test for one’s group.
In competitive state, self-esteem is based on one’s capability that if he wins then he is a worthy person and if he loses then he has no value. Losers attribute their failure to lack of ability and winners attach their success to higher ability. In contrast to competitive situation, in cooperative situation, individual tends to interact, promote each other success, and give perfect response. Such relations tend to encourage self-esteem of an individual.

2.7. **Advantages of Jigsaw:**

One of the key benefits of the Jigsaw techniques and cooperative learning methods is to enhance cooperation and reduce competition. Jacob (1990) asserted that it is important for the students to see each other as collaborators and not as competitors. Holiday (2002), argued that peer pressure is the key factors on low ability group of students to increase their level of work. This peer pressure is the source of motivation in these students due to interdependence.

2.7.1. **Academic benefits of Jigsaw technique:**

Here in this portion studies applying the technique of Jigsaw are reviewed. Lucker, Aronson, Sikies & Rosenfield, (1976) conducted a study on academic achievement of 5th and 6th grade students of different ethnic and racial background. The participants for the study were 25 Mexican American, 242 white and 26 black children. The experiment took place for 45 minutes a day, each day for two weeks. The result for the study revealed that experimental group showed a significant increase than control group in the achievement of minority group children. The effectiveness of Jigsaw cooperative learning was examined by Doymus (2008). He compared Jigsaw cooperative learning with non-Jigsaw group at tertiary level in teaching chemical bonding. The study included 36 undergraduate students from two different classes enrolled in 2005-2006, in the general chemistry class at Ataturk University, Turkey. It
was discovered from the result of the study that the achievement of Jigsaw group was higher than non-Jigsaw group. In another similar study conducted by Doymus, Karacop and Simsek (2010), comparing the independent variables as Jigsaw cooperative learning and animation versus the traditional teaching methods. The students were in the first year general chemistry. The dependent variables were students’ understanding of electrochemistry in the subject of general chemistry.

There were three different classes in the Department of primary science education in the academic session of 2007-2008. The three classes were randomly assigned to Jigsaw group, animation group and control group. The result indicated that Jigsaw cooperative learning and animation group performed better than control group. Doymus (2007) compared individual learning method with jigsaw learning method in the subject of first year general chemistry. He measured the understanding of students on chemical equilibrium. The result indicated that students participating in Jigsaw cooperative learning group outnumbered than individual learning (non-Jigsaw group).

Students taught with Jigsaw method result with greater academic achievement than other students remarked by Aronson (2005), the original developer of the Jigsaw Method. Koc et.al (2010), argued that as compared to traditional teaching method, Jigsaw techniques and group investigation were more successful in escalating scholarly outcomes.
Chapter 3

METHODS AND PROCEDURE

3.1-Nature of the study:
The study was experimental in nature. Experimental designs are often considered as the most complicated design in all other research designs. All other standard designs are judged against this gold standard experimental design. The experimental study is applied when you want to find out the effect of independent variables on dependent variables. The three main components of experiment in a social science are variables (dependent and independent), instrumentation (pre-test and post-test) and experimental and control group.

In this experimental study there were two main variables dependent and independent variable. Independent variable was Jigsaw cooperative learning and in dependent variable there were academic achievement test, self esteem and students’ attitude.

3.2-Research Design:
What are the major types of research design? We can classify design by simple asking some basic questions. If in the study there was random assignment of sampling? The true experimental design will be present if the answer is yes. On the basis of assignment of sample the experimental design may be true experimental design if there is random assignment of sampling and quasi experimental design if there is non-random assignment of sample to control and experimental group. The present is quasi-experimental in nature because of non-randomization of sample.

Similarly another question is “Is there a control group?” If the answer to the above question is yes then true-experiment, and non-experiment is existed if the answer is no to the above mentioned questioned.
Due to Discipline problems the administration of both the schools were reluctant for the randomization of the students to both experimental and control group. Because of this non randomization of the subjects to control group and experimental group the study was Quasi-experimental in nature as stated by L.R Gay (2000).

The Pretest-posttest Nonequivalent-Control Group Design was used for this study. The group design is symbolized as

\[
\begin{align*}
E &= O_1 \quad T \quad O_2 \\
C &= O_3 \quad - \quad O_4
\end{align*}
\]

Where \(O_1\) and \(O_3\) stood for pretest and \(O_3\) and \(O_4\) represent posttest, \(E\) was Experimental group, \(C\) was used for Control group and \(T\) was applied to treatment i.e Jigsaw Cooperative Learning. The design was differ only from the pretest-posttest
control group design on the grounds of not involving random assignment of students to groups. Existing groups were pretested, administered a treatment and post tested.

3.3-Target Population:

All the male students of the 9th grade of Khyber Pakhtunkhwa were taken as a population of this study. The students in the study were checked for academic achievement test in chemistry, Rosenberg self esteem and class room life instrument.

3.3.1-Sampling:

The students of two schools located in the heart of Peshawar city were selected as a sample for investigation. The 9th grade students of the Governments high school No - 1 were divided by the school administration into six sections. The investigator was assigned the section of 9th D by the administration of the school. This 9th D was identified as experimental group. Similarly with consultation of Chemistry teacher who was teaching chemistry to class 9th A, were assigned as control group. The two groups of both the schools were tested for academic achievement test, self esteem scale and class room life instrument. The population and sampling for the study were shown in the table and figure in the following.

3.1: Table showing the population and sample of the study

<table>
<thead>
<tr>
<th>Population of the study</th>
<th>All the 9th grade chemistry students of Khyberpakhtunkhwa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>Only two of the government school of district</td>
</tr>
<tr>
<td></td>
<td>Peshawar i.e. government higher secondary</td>
</tr>
<tr>
<td></td>
<td>School Cantonment-1 (School-1) and</td>
</tr>
<tr>
<td></td>
<td>Government Higher Secondary School</td>
</tr>
</tbody>
</table>
Students in the control group of School-1 37
Students in the experimental group of School-1 38
Students in the control group of School-2 35
Students in the Experimental group of School-2 41

Figure 3.2: Showing Sample of the Study

3.4-Nature of the Students:

The students selected for the study were:

The participants of the study were between the ages of 14-15 years of various ability levels.

Exposed to 8th-grade Annual examination and had qualified that examination.

The students were never exposed to chemistry subject before the onset of Jigsaw technique.
However the students were taught at 8th grade, the subject of General Science covering part of the contents of Physics, Chemistry and Biology.

3.5-Experimental Validity:

Farooq (2001) argued that only a valid experiment can contribute significantly to the development of knowledge. As described by Campbell and Stanley (1966), there are two major types of Experimental validity. These two experimental validity are internal validity and external validity.

3.5.1-Internal validity:

Internal validity occurs only when the change observed in the dependent variables is due to independent variables and other extraneous variables. If the extraneous variables are controlled the result is said to be due the treatment (independent variables), as a result the study will be internally valid. The following internally validity threats were tried to minimized in the experimental work of the project.

3.5.1.1-History:

History means the events that happened during the course of the study that can influence the result. History were tried to reduced by the pre-test.

3.5.1.2-Maturation:

Maturation is the repetition of process of experiment on the participants. It means, participants becoming stronger, more coordinated or tired as the study progressed during experiment. Maturation were minimized by involving all students and made them accountable for their given task.

3.5.1.3-Testing:

Testing is a threat to validity arises in pretest and posttest study. When the participants knows what to expect, learns some things from pretest and become aware
of the information given in the test. This threat were reduced by minor changing the post-test.

3.5.1.4-Instrumentation:
When there is a different pretest and posttest a threat to validity arises due to instrumentation. The changes observed on the dependent variables are due to the change in the pretest and posttest not due to independent variables. There was no big change in the post test.

3.5.1.5-Statistical Regression:
Statistical regression exist when the researcher uses extreme groups as the participants i.e. student at the high or low end of the normal curve.

3.5.1.6-Differential Selection:
When participants with different characteristics are in the study the result in the dependent variable will be due to difference characteristics not due to independent variables. There care should be taken to select sample of the students having almost the same characteristics. This will make sure internal validity of experimental research to some level.

3.5.1.7-Experimental Morality:
It refers to the participants who drop during the course of the study. This is the most occurring and common threat to the experimental study. The participants especially students of the secondary school are often not regular during the study.

3.5.1.8-Compensatory Rivalry by the Control group:
Compensatory rivalry by the control group is also called John Henry Effect. Henry wanted to know that man was superior to machine so he tried extra hard. Some individuals think that their traditional way of doing things is challenged. So they try
extra hard to prove that their way of doing things is best. Students and teacher of the rival group work hard to prove their way of doing things.

3.5.1.9-Compensatory Equalization of Treatments:

To keep everybody happy in the control group, a control group is given extra resources; extra time, and facilities. As a result this could cloud the effect of treatment. The students in the control group are given extra treatment and are supposed to learn smoothly and better than experimental group.

3.5.1.10-Resentful Demoralized of the Control Group:

On the other hand opposite of John Henry Effect also happened, in which control group is demoralized because they are not part of the chosen group. They considered themselves inferior to the students of experimental group because of the lack of selection. The net effect is that their performance becomes lower.

3.5.2-External validity:

External validity refers to the generalizability of the findings of the experimental study. According to Borg & Gall (1989), external validity is existed when the findings of the one experimental setting are applied in another experimental situation. If the extent of generalizability is high then the experiment is said to be externally valid. External validity is the extent to which the relationship between independent and dependent variables can be generalized and applicable to other population, other measurement variables, and other settings.

3.6-Instruments for the Study:

The three instruments for the study were students’ academic test, Rosenberg self esteem scale and Class room life instrument.
3.6.1-Preparation of the instrument:

The journey of data collection was started in the first week of April 2013. In Pakistan no standardized academic test is available in the subject of chemistry at 9th grade as described by Hussain, (1998). Academic test was prepared for the students of 9th class covering only chemistry subjects. The test include 30 items of multiple choice questions of one credit each and ten short items notes of two credits each. The total marks of the test were 50. The items were selected mostly based from the exercise of the text-book of grade-9 chemistry at the end of each unit. The validity of the test was carried out by the subject specialists in the subject of chemistry. Those subject Specialist were, Mr. Muhammad Daud Assistant Professor Government Degree college Kohi Sher Haider Bara Khyber Agency, Syed Muhammad Sohail Lecturer in Chemistry Edwards College Peshawar and Mr Musharraf Senior Trained Graduate Teacher in Islamia Collegiate Peshawar.

Consultation with teachers and principal of the school and from the result of the pilot studies, the following items were omitted from the test, moreover some of the translated of some items of B & C section were rephrased. The total number of students that were chosen for piloting the instrument of academic test was 69, belonged to various schools. The result of the piloting the instrument were the item that were extremely difficult were eliminated. For example the item 6 of the test instrument was removed because only 14 % of the students have right choice in the pilot study. The item 6 is:

An element have eight electrons that element belongs to -------------</p>

An element have eight electrons that element belongs to ----------- group. (Alkali metal, Halogens, Noble gases, carbon family)

Similarly the item like:

Which of the following element have tendency to give electron?
(Carbon, phosphorous, carbon, sodium)

Only 7% of the student opted the right choice therefore it was discarded.

For short item the items like “polar bond” and “groups of the periodic table” were eliminated from the test because only 5% of the students had rightly responded.

The post-test were slightly modified so that threat to external validity was minimized.

The following items were added:

The number of Neutrons in Silver $^{107}$Ag is ------------------- (40, 50, 55, 60)

The numbers of isotopes of Chlorine is-------------- (2.3.4.5)

Which one of the followings can be divided into simpler components?

(Water, hydrogen, carbon, iron)

The average atomic mass of an element is compared with---------------. (C-12, Ne-20, O-16, H-1)

Similarly in part- B of the academic test comprising of short items explanations were also modified. The concept of mole, formula, structure of atoms and “explain why an atom is neutral” were incorporated in the academic test.

The instrument before piloting and final usage was consulted with the experts in the subject of chemistry to check its validity and ease of its comprehension.

An attitude scale was adopted from Johnson & Johnson (1983) class room life instrument (Annexure-4). Permission was granted from these authors through email (Annexure-7). Johnson class room life instrument were translated for students comprehension in Urdu. The instrument consisted of 41 items on likert type scale having five points. The points of agreement are absolutely true, true, do not know, absolutely false and false. This scale was modified according to local setting. The scale covered 12 factors. Before the instrument was given, instructions about filling the instrument and demonstration were given to the students.
In order to evaluate the self esteem of the students a self esteem scale of Rosenberg (1965) were used as an instrument before and after treatment. Rosenberg scale of self esteem required no explicit permission. Rosenberg self esteem was translated into Urdu for students’ comprehension. Rosenberg self esteem was a ten-item scale designed to measure the self esteem of high school students. The scale measured personal value, self confidence, self satisfaction, self respect and self criticism (Annexure-1). The self esteem scale consist of four points likert scale from strongly agree to strongly disagree. Rosenberg (1965) reported that the internal consistency reliability for college students range from 0.85-0.88. Test retest reliability for Rosenberg self esteem for two week is 0.85 and for 7 months is 0.63 (Silber and Tippette, 1965, Shorkey and Whiteman 1978) as cited by Statisticsolution.com. Rosenberg instrument of self esteem was also explained to the students and the procedures of filling the self esteem scale were explained to the students.

3.7- Procedure of the Experiment:

Before the onset of the experiment an academic test (also called pre-academic test) were administered to both the control and experimental group. However self esteem scale and class room life instrument were administered only to experimental group. Here at this point students of 9th grade of the two schools were divided into experimental and control groups. With the consultation of their concerned teachers only three units of 9th grade chemistry subject were selected for the study. To both the groups science teachers of almost having the same qualification and experience have been selected with the approval of the school administration. In the control group, the subjects were taught by using the teaching-centered method. In contrast with the Jigsaw, students in the control group were required to use their textbooks as a main source of learning.
In the traditional teaching method, generally the teacher was writing the concepts on the board and then explains it to students. There is only one way traffic, where only the teacher has a dominant role. There is a calm environment in the class room where interaction of students in case of resources sharing and discussion never occurred (As observed by the investigator in the control group class).

Students listen and take notes as the teacher lectured on the content.

In this process, student's performances were observed and the studies were directed according to the feedback obtain from them.

As inquired from the students of the control groups with both the schools, teacher write in detail the main concepts of the subject of chemistry and students write these materials in their exercise books and memorize it for the preparation of the examination. At the end of the three units academic post test were solved and given by the students of control group.

3.8-Method of teaching to the Experimental group

-The experimental groups were taught with selected Jigsaw, a cooperative learning technique. The teacher teaching to the experimental group was informed by the researcher to the steps in the jigsaw cooperative learning. The concerned teacher was apprised of the process of jigsaw cooperative learning in two or three sessions before the start of the experiment. In the presence of the teacher jigsaw technique were applied in another class room. Difficult points were discussed and clarified the vague concept.
The main process of treatment in the experimental group consists of the following steps.

1: Students in the experimental group were randomly assigned by the concerned teacher to the home group/base group. The home groups consist of 5-7 students.

2: The units of chemistry of class 9th were divided into 6 or 7 sub topics according to the number of students in the home groups. The main points of these subtopics were written on a sheet.
3: Each student was given a sheet covering a one subtopic. 10 minutes were given to students to read the sheet. This is the end of day-1.

4: On day 2 students then move to Jigsaw groups or Expert group where every student has been assigned the same sub-topics. In Jigsaw group the students fully discussed their sub-topics with other students. The time for discussion was 45 minutes. The students master their sub-topics in Jigsaw group. Here the teacher role is to look after the group discussion and give clarification to the vague points.

![Home Group Diagram]

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lxxvii
5: On day 3 students then return to home/base group where they discussed with fellows their sub-topics and share his sheet with each other.

6: Day-4 and day-5 were specified for presentation by each student followed by the question-answer session.

7: On the last day of the week unit assessment were carried out by short test of 20 credits having 6 multiple choice questions and 7 short notes.

8: Thus a unit of chemistry was covered in one week having six working days (a total of 4.5 hours).

The above mentioned processes from point 1 to 8 were applied for 2nd and 3rd phases of the study.

After the periods of 44 working days of teaching through Jigsaw technique post-academic test, Rosenberg self esteem scale and class room life instrument were fulfilled by the students in the experimental group.
3.9-Procedure for Data Analysis:

The data includes academic test, Rosenberg self esteem scale and class room life instrument. Followings are the detail of the analysis these measuring instruments.

3.9.1- Procedure for Analysis of Academic achievement test:

First of all for pre-test and post test, a test of Normality was calculated to find out whether the data was normality distributed or not. Paired students t test was applied to analyze the data. For this test to yields accurate results, the sample must have from normal distribution (scistatcalc.blogspot.co.uk).

The normal data of the academic tests for various groups were also expressed in Histograms.

The formula for T-test is the following.

\[ t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}} \]

Where

\( \bar{x}_1 \) & \( \bar{x}_2 \) are the mean of the groups

\( S_1^2 \) and \( S_2^2 \) are the standard Deviations of the two samples

And \( N_1 \) and \( N_2 \) are the size of the group

The students’ T-test was calculated through SPSS version -17.

The procedure for data analysis in spss was that open the data in file in spss, go to Analyze> Compare means > Paired sample T-test. In the dialogue box click Pre-
academic test and Post academic test, then click the arrow to move them into the right box and finally click OK.

Rosenberg Self esteem includes the statements followed by the option of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The scoring method for the scale is:

- Strongly Agree (SA) = 3
- Agree (A) = 2
- Disagree (D) = 1
- Strongly Disagree (SD) = 0

However, the items with an asterisk (*) sign are negative statements and are scored in the reverse order i.e.

- Strongly Agree (SA) = 0
- Agree (A) = 1
- Disagree (D) = 2
- Strongly Disagree (SD) = 3

The scale has a total score of 30, greater the score obtained by the students in the scale high will be his self esteem.

To find out whether the data is normally distributed or not, a test of normality were calculated and were expressed in histogram. The formula for T-test is the following:

\[
 t = \frac{x_1 - x_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}
\]
Where

$X_1$ & $X_2$ are the mean of the groups

$S_1^2$ and $S_2^2$ are the standard Deviations of the two samples

And $N_1$ and $N_2$ are the size of the group

The student’s-test was calculated through SPSS version -17.

Paired sample T-test was calculated for the self esteem by the following path in SPSS version-17:

Open the data in file in spss < go to Analyze> Compare means > Paired sample T-test.

In the dialogue box click Preselfesteem1 and Postselfesteem1, then click the arrow to move them into the right box and finally click OK.

3.9.3-Data analysis Procedure for class room life instrument:

Class room life instrument consist of 41 items. The statement of the instrument are finished with the choice of five points of agreement which are absolutely true, true, do not know, absolutely false and false.

The scoring procedure of the positive statement according to the choices is:

Absolutely true =5

True = 4

Do not know =3

Absolutely false = 2

False = 1

However in case of negative statements the above scoring procedure was reversed.

Absolute true =1

True = 2

Do not know 3

False = 4
Absolutely False = 5

These score were then summed for the whole class and averaged for each statement. The mean score were calculated before the treatment of experiment and after the treatment of experiment. On the basis of these average score it was concluded that the students’ attitude were:

Positive if the mean score is greater than 3,
Neutral if it is 3,
Negative if the mean score value is below 3.

The result was calculated through MS Excel and SPSS Version-17.

The result was then compared and deducted.

3.10-Subject to be taught during experiment:

The study was related to the subject of chemistry of the 9th grade being taught at government high schools at Khyber Pakhtunkhwa. The study covered at least 3 initial chapters of the grade 9th chemistry text book.

3.11-Variables:

The variables are of two types, dependent variables and independent variables. The two variables in this study were:

3.11.1-Independent variables:

The types of variable which effect are to be noted. In this study the independent variables were two, i.e. Traditional teaching method and Jigsaw cooperative learning method

3.11.2-Dependent variables:

The dependent variables are the variables in which the outcomes of the independent variables are to be observed. In this study, the dependent variables included academic achievement, self esteem and attitude of the secondary school students.
3.12-Ethical Consideration:

A letter from the Director of IER was written to the concerned authorities for granting the permission to carry out the study. Similarly permission was also taken from district education officer (Male) Peshawar for initiating the study. An informed consent letter was sent to the parents of the students to take permission for the study. The letter was duly signed by the parents of the students who were participated in the study. Similarly the permission of taking the picture of students from their parents was also granted. Similarly students were informed about the steps taken during the experiment of Jigsaw Cooperative learning. Students took part in a drill of Jigsaw Cooperative learning before the start of the experimental study.
Chapter-4

ANALYSIS OF DATA

The pre-academic and post academic test obtained by the students of control and experimental group of both the schools were marked and the date were coded and fed into SPSS for analysis. Similarly the scale for self esteem was filled by the students of experimental groups of both school-1 and school-2 and was scored according to the key provided in the scale of Rosenberg self esteem scale. It was coded and entered into SPSS for analysis. It was analyzed using the test of normality and students’ T test. On the other hand the responses obtained from attitude scale of class room life instrument were fed into MS excel. It was analyzed by averaging the score of the responses collected.

4.1: Test of Normality:

In statistics the concept of normality is very important. Normal data must have a bell shaped curve. Specifically a normal data have 68.26 % of the data within ± 1 standard deviation from the mean. For parametric test to work optimally the variance of data must be the same throughout the data set. This is known as homogeneity of the variance. Spss calculate two statistics for testing normality, Komogorov-smirnov and Shapiro-wilk (Dan Flynn)
Table 4.1 Tests of Normality

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnov&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic  Df  Sig.</td>
<td>Statistic  Df  Sig.</td>
</tr>
<tr>
<td>Cantt-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preacademic test 9&lt;sup&gt;th&lt;/sup&gt;-D</td>
<td>.138  38  .064</td>
<td>.936  38  .031</td>
</tr>
<tr>
<td>Postacademic test 9&lt;sup&gt;th&lt;/sup&gt;-D</td>
<td>.078  38  .200*</td>
<td>.969  38  .367</td>
</tr>
<tr>
<td>Control group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preacademic test 9&lt;sup&gt;th&lt;/sup&gt;-A</td>
<td>.155  37  .025</td>
<td>.923  37  .013</td>
</tr>
<tr>
<td>Post academic test A</td>
<td>.156  37  .023</td>
<td>.971  37  .442</td>
</tr>
<tr>
<td>School-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental groupd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preacademic test 9thB</td>
<td>.111  41  .200*</td>
<td>.887  41  .001</td>
</tr>
<tr>
<td>Posttest cantt 2 9th B</td>
<td>.123  41  .122</td>
<td>.965  41  .244</td>
</tr>
<tr>
<td>Control group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pretest 9th A cantt 2</td>
<td>.123  35  .199</td>
<td>.937  35  .047</td>
</tr>
<tr>
<td>posttest 9thA cantt2</td>
<td>.113  35  .200*</td>
<td>.977  35  .657</td>
</tr>
</tbody>
</table>
a. Lilliefors Significance Correction

* This is a lower bound of the true significance.

Since SPSS report highly significant value “<.001”. The p value is greater than .05 in most cases therefore it was concluded that the data was normally distributed.

School-1

Experimental group

Histogram 4.1
4.2 Histogram School-1 experimental group post academic test

![Histogram of Preacademic test 9th A]

Mean = 8.54
Std. Dev. = 3.07
N = 37
Histogram 4.3  School-1 Control Group pre-academic test

postacademic test

Mean = 16.82
Std. Dev. = 5.447
N = 38
4.4 Histogram School-1 control group post academic test

**Post academic test A**

- Mean = 12.3
- Std. Dev. = 3.307
- N = 37
4.5 Histogram School-2 Experimental Group

![Histogram](image)

- **Mean**: 10.78
- **Std. Dev.**: 3.063
- **N**: 41
4.6 Histogram post academic test School-2 experimental group
4.7 Histogram pre-academic test control group

School-2

Control group

![Histogram of pretest 9th A cantt 2](image)

- Mean = 0.08
- Std. Dev. = 2.774
- N = 36

![Normal Q-Q Plot of Preacademic test](image)
In the 4.8 histogram, since the graph is bell shape, therefore it was inferred that the data distribution was normal. Since the data is normally distributed, paired students t test was applied to analyze the data. For this test to yields accurate results, the sample must have from normal distribution (scistatcalc.blogspot.co.uk)
School-2

Tables-4.2: Showing the comparisons of pretest and posttest of Experimental group and Control group (School-2) of Paired sample statistics

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std: Dev</th>
<th>Correlation</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>41</td>
<td>10.78</td>
<td>3.953</td>
<td>0.451</td>
<td>0.003</td>
</tr>
<tr>
<td>Post-test</td>
<td>41</td>
<td>23.244</td>
<td>7.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>35</td>
<td>8.89</td>
<td>2.774</td>
<td>0.454</td>
<td>0.006</td>
</tr>
<tr>
<td>Post-test</td>
<td>35</td>
<td>11.03</td>
<td>2.537</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2 showed the correlation between the pre-test and post test of the experimental group was 0.451. Similarly in the control group correlation between the pre test and post test was 0.454. The correlation significant value for Experimental group in School-2 in both pre and post test is 0.003. Since the value is smaller than 0.005. In contrast to experimental group, in control group the significant value is 0.006 greater than 0.005 for control group in School-2
Table 4.3: T-test Comparisons: School-1

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std:dev</th>
<th>Std:Error Mean</th>
<th>df</th>
<th>t-test</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest and posttest</td>
<td>-12.463</td>
<td>7.117</td>
<td>1.11152</td>
<td>40</td>
<td>-11.23</td>
<td>0.000</td>
</tr>
<tr>
<td>Control group</td>
<td>-2.143</td>
<td>2.779</td>
<td>2.799</td>
<td>34</td>
<td>-4.530</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

The T-test result in the table revealed for both the groups show a significant difference in the achievement between the pre-test and post-test. The above table 4.2 represents the score of the academic achievement of control and experimental group of School-1.
**Table 4.4 - School-1**

Tables showing the comparisons of pretest and posttest of Experimental group and Control group (School-1) of Paired sample statistics

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std: Dev</th>
<th>Correlation</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>38</td>
<td>9.71</td>
<td>3.279</td>
<td>0.228</td>
<td>0.168</td>
</tr>
<tr>
<td>Post-test</td>
<td>38</td>
<td>16.82</td>
<td>5.447</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>37</td>
<td>8.54</td>
<td>3.07</td>
<td>0.460</td>
<td>0.004</td>
</tr>
<tr>
<td>Post-test</td>
<td>37</td>
<td>13.3</td>
<td>3.307</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In School-1 the correlation between the pre-test and post test in the experimental group is 0.228 and in the control group it was 0.460.
Table 4.5-t-Test Comparison: School-2

Experimental group | Mean  | Std:dev | Std:Error.Mean | df   | t-test | Sig  
-------------------|-------|---------|----------------|------|--------|------
Pretest and posttest | -7.105 | 5.680   | 0.921          | 37   | -8.715 | 0.000 
Control group
Pre-test &posttest | -4.757 | 3.320   | 0.546          | 36   | -7.772 | 0.0000 

Since the t test result for the two groups in the control is 0.0000 smaller than 0.05 and in the experimental group is 0.000 also smaller than 0.05 representing a marked significant improvement in the post test.
Table 4.6: Comparison of post-test:

Paired Samples Statistics

<table>
<thead>
<tr>
<th>School-1</th>
<th>Post-academic test</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental group</td>
<td>16.81</td>
<td>37</td>
<td>5.522</td>
<td>.908</td>
</tr>
<tr>
<td></td>
<td>Control group</td>
<td>13.30</td>
<td>37</td>
<td>3.307</td>
<td>.544</td>
</tr>
<tr>
<td>School-2</td>
<td>Experimental group</td>
<td>23.6857</td>
<td>35</td>
<td>8.07600</td>
<td>1.36509</td>
</tr>
<tr>
<td></td>
<td>Control group</td>
<td>11.03</td>
<td>35</td>
<td>2.572</td>
<td>.435</td>
</tr>
</tbody>
</table>
Table 4.6- SHOWING CORRELATION

<table>
<thead>
<tr>
<th>School- 1</th>
<th>N</th>
<th>Correlation</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control-experimental group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest-comparison</td>
<td>37</td>
<td>-0.097</td>
<td>.567</td>
</tr>
</tbody>
</table>

School- 2

Control-experimental group
Posttest-comparison | 35    | -.117       | .503 |

Table 4.7- Table showing post-test comparison based on t-test for School-1 and school-2:

<table>
<thead>
<tr>
<th>School-1</th>
<th>Mean</th>
<th>Std:dev</th>
<th>Std:Error.Means</th>
<th>df</th>
<th>t-test</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-test comparison</td>
<td>3.514</td>
<td>6.707</td>
<td>1.103</td>
<td>36</td>
<td>3.187</td>
<td>0.003</td>
</tr>
<tr>
<td>School-2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test comparison</td>
<td>12.657</td>
<td>8.758</td>
<td>1.48</td>
<td>34</td>
<td>8.5520</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The T-test significant value for School-1 in the control and experimental group for posttest is 0.003 lower than 0.005, therefore we reject the null hypothesis that there is no difference between the control group and experimental group.
Similarly the significant value for posttest for School-2 in the control and experimental group is 0.000 lower than 0.05, showing that there is a marked difference between the control group and experimental group in the posttest.

4.4-Data of Self esteem shown histogram:

4.8-Table showing Tests of Normality

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnov\textsuperscript{a}</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Pre-self esteem1</td>
<td>.154</td>
<td>40</td>
</tr>
<tr>
<td>Post-self esteem1</td>
<td>.140</td>
<td>39</td>
</tr>
<tr>
<td>Pre-self esteem2</td>
<td>.154</td>
<td>40</td>
</tr>
<tr>
<td>Post-self esteem2</td>
<td>.121</td>
<td>40</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Lilliefors Significance Correction
4.9-Histogram showing the self esteem: Experimental group School-1

Normal Q-Q Plot of preself esteem2

Mean = 21.03
Std. Dev. = 4.016
N = 40
4.10 HISTOGRAM SHOWING THE POST SELF ESTEEM FOR EXPERIMENTAL GROUP OF SCHOOL-2

![Histogram of self-esteem scores](image1)

*Mean = 21.18
Std. Dev. = 3.802
N = 40*

![Normal Q-Q Plot of self-esteem scores](image2)
4.11-HISTOGRAM SHOWING THE PRE-SELF ESTEEMS EXPERIMENTAL GROUP OF SCHOOL-2

postselfesteem2

Mean = 23.35
Std. Dev. = 3.215
N = 40
4.5-Data of Self Esteem Shown in Tables:

4.9- Table showing the comparisons of self esteem In Correlation

………………………………………………………………………………………...

School-1 (Experimental group)

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Std:Dev</th>
<th>Std:Error.Mean</th>
<th>Corr:</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment self esteem</td>
<td>39</td>
<td>20.95</td>
<td>4.039</td>
<td>0.647</td>
<td>0.284 0.080</td>
</tr>
<tr>
<td>Post-treatment self esteem</td>
<td>39</td>
<td>23.59</td>
<td>4.500</td>
<td>0.721</td>
<td></td>
</tr>
</tbody>
</table>

Since the value 0.080 is greater than 0.005, therefore it was concluded that there is no statistically significant correlation between pre-treatment and post treatment self esteem. That can be interpreted as increase or decrease in one variable does not significantly relate to increase or decrease in the other variables, (http://statistics-help-for-students.com)

Table 4.10: Table showing correlation for self esteem School-2

**Experimental group**

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Std:Dev</th>
<th>Std:Error.Mean</th>
<th>Corr:</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment self esteem</td>
<td>40</td>
<td>21.18</td>
<td>3.802</td>
<td>0.601</td>
<td>0.337 0.034</td>
</tr>
<tr>
<td>Post-treatment self esteem</td>
<td>40</td>
<td>23.35</td>
<td>3.215</td>
<td>0.508</td>
<td></td>
</tr>
</tbody>
</table>
Since the value 0.034 is smaller than 0.05 therefore it was concluded that there is a significant correlation between the pre-treatment self esteem and post treatment self esteem. That means increase or decrease in one value do significantly relate to decrease or increase in the other value.
4.11 TABLE SHOWING T-Test Comparison for Self Esteem:

School-1 (Experimental group)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std:dev</th>
<th>Std:Error.Mean</th>
<th>df</th>
<th>t-test</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre &amp; post-treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-esteem</td>
<td>-2.641</td>
<td>5.112</td>
<td>0.820</td>
<td>38</td>
<td>-3.220</td>
<td>0.003</td>
</tr>
</tbody>
</table>

School-2 (Experimental group)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std:dev</th>
<th>Std:Error.Mean</th>
<th>df</th>
<th>t-test</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- &amp;post-treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self esteem</td>
<td>-2.175</td>
<td>4.069</td>
<td>0.643</td>
<td>39</td>
<td>-3.381</td>
<td>0.002</td>
</tr>
</tbody>
</table>

The significant value in the tables for self esteem represent that there is a statistically significant difference is present between the pre-treatment self esteem and post-treatment self esteem of the two experimental groups in the two schools. So we reject the Null hypothesis of no differences before and after the experiment in both the experimental groups.

4.6- Class room life Instrument (Attitude scale):

The attitude scale consists of 40 item covering 12 factors as mentioned in chapter-3. The responses of the students were scored according to the formula, absolutely true-5, True-4, Do not know-3, False-2, absolutely false-1. These score were then summed for the whole class and averaged for each statement. The mean score were calculated before the treatment of experiment and after the treatment of experiment. On the basis...
of these average score it was concluded that the students attitude were positive if the mean score is greater than 3, neutral if it is 3 or negative if the mean score value is below 3. The result were compared and deducted.

4.7-Comparison of Various factors of Class room life Instrument in-Tables:

Pre-treatment and post-treatment Analysis of Class room life instrument of School-1 (Experimental)

4.12 TABLE:

Factor -1: Teacher academic support: *(School-1, Experimental group Pre & post attitude)*:

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-</td>
</tr>
<tr>
<td>Q-1: My teacher cares about how much I learn.</td>
<td>3.24</td>
</tr>
<tr>
<td>Q-2: My teacher likes to see my work.</td>
<td>2.53</td>
</tr>
<tr>
<td>Q-3: My teacher likes to help me learn.</td>
<td>2.4888</td>
</tr>
<tr>
<td>Q-4: My teacher wants me to do my best in school work.</td>
<td>3.4888</td>
</tr>
</tbody>
</table>

Table 4.12 showed the teacher academic support before and after the treatment of Jigsaw cooperative learning during the teaching learning process. The mean score of students’ response is nearly 3, showing neutral attitude before Jigsaw cooperative learning. After Jigsaw cooperative learning the mean score of the students’ response reached to above 4, showing positive inclination of students towards teacher academic support.
4.13 TABLE

Factors-2: Teacher personnel support: *School-1, Experimental group Pre & post attitude:*

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-5: My teacher likes me as much as he likes other students</td>
<td>2.467</td>
</tr>
<tr>
<td>Q-6: My teacher cares about my feelings.</td>
<td>2.91</td>
</tr>
<tr>
<td>Q-7: My teacher really cares about me.</td>
<td>3.2</td>
</tr>
</tbody>
</table>

The table 4.13 showed teacher personal support towards their students in experimental group, the result revealed that the mean score obtained after the treatment of Jigsaw cooperative learning (JCL), are higher than pre-treatment of JCL.

4.14 TABLE

Factor-3: Student academic support: *School-1, Experimental group Pre & post attitude:*

<table>
<thead>
<tr>
<th>Statements</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-8: Other students in this class want me to do my best school work.</td>
<td>2.35</td>
<td>3.91</td>
</tr>
<tr>
<td>Q-9: In this class other students care about how much I learn.</td>
<td>2.533</td>
<td>4.90</td>
</tr>
<tr>
<td>Q-10: Other students in this class want me to come to class on regular basis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.4</td>
<td>4.61</td>
</tr>
</tbody>
</table>

Table 4.14 analyzed that student academic support was more during the treatment because there were differences in the average responses of the students in the pre and
post test of class life instrument (CLI), before and after the treatment of Jigsaw cooperative learning (JCL).

4.15 TABLE

Factor-4: Students personal support: (School-1, Experimental group Pre & post attitude):

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-12: In this class other students like me the way I am.</td>
<td>2.56</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Q-13: Other students in this class really care about me.</td>
<td>2.59</td>
<td>4.09</td>
<td></td>
</tr>
<tr>
<td>Q-14: In this class other students really care about my feelings.</td>
<td>2.66</td>
<td>4.78</td>
<td></td>
</tr>
<tr>
<td>Q-15: Other students in this class like me as much as they like other students.</td>
<td>2.77</td>
<td>4.53</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.15 clearly showed that personally students were very much cooperative with one another. They cared, liked and showed respect to the feelings of their fellows as was evident from score of CLI in the post-treatment of JCL.
4.16 TABLE

**Factor-5: Goal Interdependence:** *(School-1, Experimental group Pre & post attitude)*:

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-16: When we work together in small groups, We try to make sure that everyone in the groups learns the assign materials.</td>
<td></td>
<td>2.02</td>
<td>4.5</td>
</tr>
<tr>
<td>Q-17: We work together in small groups, Our job is not done until everyone in the group has completed the assignment.</td>
<td></td>
<td>3.689</td>
<td>4.76</td>
</tr>
<tr>
<td>Q-18: We work together in small groups; we all receive the same grade.</td>
<td></td>
<td>3.24</td>
<td>4.66</td>
</tr>
<tr>
<td>Q-19: When we work together in small group, our grade depends on how much all members learn.</td>
<td></td>
<td>2.94</td>
<td>4.99</td>
</tr>
<tr>
<td>Q-20: When we work together in small group, I have to make sure that the other members learn if I want to do well on the assignment.</td>
<td></td>
<td>2.95</td>
<td>4.45</td>
</tr>
</tbody>
</table>

In table-4.16 represented student responses towards goal interdependence. Their achievement depends on the cooperation of peer fellows. Their responses to fairness of grading and assignment interdependence were quite noteworthy i.e. for fairness of grading, before treatment of JCL it was 2.94 and after treatment it was 4.99, and for assignment it was 3.689 and 4.76.
4.17 TABLE

Factor-6: Resource interdependence (School-1, Experimental group Pre & post attitude):

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-21: When we work together in small group, -we cannot complete an assignment unless everyone contributes.</td>
<td></td>
<td>2.64</td>
<td>4.42</td>
</tr>
<tr>
<td>Q-22: When we work together in small group, -the teacher divided up the materials so that everyone has a part and everyone has to share.</td>
<td></td>
<td>2.24</td>
<td>4.4</td>
</tr>
<tr>
<td>Q-23: When we work together in small group, -we have to share the materials in order to complete the assignment.</td>
<td></td>
<td>2.53</td>
<td>4.72</td>
</tr>
<tr>
<td>Q-24: Every one’s ideas are needed in order to be successful, -when we work together in small groups.</td>
<td></td>
<td>2.28</td>
<td>4.94</td>
</tr>
</tbody>
</table>

The responses of the students in table 4.17 clearly showed that the students were quite helpful in resource sharing with their students’ fellows during the treatment of the Jigsaw cooperative learning. The responses were before the treatment of JCL it were 2.53 and after the treatment it were 4.72 showing the apparent differences. They distributed the worksheet of the Jigsaw cooperative learning quite smoothly with one another.
### 4.18 TABLE

**Factor-7: Cooperation**: *(School-1, Experimental group Pre & post attitude):*

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-25: In this class we learn more when we work with others.</td>
<td>2.39</td>
<td>4.24</td>
<td></td>
</tr>
<tr>
<td>Q-38: In this class I can learn important things from other students.</td>
<td>2.578</td>
<td>4.95</td>
<td></td>
</tr>
<tr>
<td>Q-39: In this class I like to help other students learn.</td>
<td>3.178</td>
<td>4.97</td>
<td></td>
</tr>
<tr>
<td>Q-40: Other students in this class like to help me learn.</td>
<td>3.044</td>
<td>4.92</td>
<td></td>
</tr>
<tr>
<td>Q-42: When we work together in small group, I show better performance.</td>
<td>2.04</td>
<td>4.49</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.18 favored students’ inclination towards cooperation. Their responses showed that working in small group they showed better performances (before JCL the responses of students were 2.04 and 4.99 were the responses of students after JCL).

### 4.19 TABLE

**Factor-8: Alienation**: *(School-1, Experimental group Pre & post attitude):*

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-26: I am not doing as well in school as I would like to.</td>
<td>3.16</td>
<td>2.37</td>
<td></td>
</tr>
<tr>
<td>Q-27: I find it hard to speak my thoughts clearly in class.</td>
<td>3.72</td>
<td>2.375</td>
<td></td>
</tr>
<tr>
<td>Q-28: School work is fairly easy for me.</td>
<td>2.2</td>
<td>4.16</td>
<td></td>
</tr>
<tr>
<td>Q-29: Whenever I take a test I am afraid I will fail.</td>
<td>3.64</td>
<td>2.21</td>
<td></td>
</tr>
<tr>
<td>Q-30: I often get discouraged in school.</td>
<td>4.00</td>
<td>2.07</td>
<td></td>
</tr>
<tr>
<td>Q-31: I have a lot of Questions I never get a chance to ask in the class.</td>
<td>3.11</td>
<td>2.14</td>
<td></td>
</tr>
<tr>
<td>Q-33: I am a good student.</td>
<td>3.18</td>
<td>4.275</td>
<td></td>
</tr>
<tr>
<td>Q-35: I feel upset in school.</td>
<td>2.94</td>
<td>1.59</td>
<td></td>
</tr>
</tbody>
</table>
Students strongly rejected the notion of being upset in the school in table 4.19. The scores of the students of the statement of being upset in the school were 2.94 before JCL, and after JCL it was 1.59. In addition the students were also firm to reject the notion of difficulty in expressing their thought clearly in their class rooms (before JCL 3.72 and after JCL 2.375).

4.20 TABLE

**Factor-9 Fairness of grading (School-1, Experimental group Pre & post attitude)**

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-34: If a student works hard he can definitely succeed in this class.</td>
<td>2.77</td>
</tr>
<tr>
<td></td>
<td>4.8</td>
</tr>
</tbody>
</table>

Table 4.22 showed that students were satisfied from the statement that they will succeed if they work hard. The students’ responses were showed before and after the experiment in the attitude scale of Class room life instrument, (before JCL 2.77 and after JCL4.8).
4.23 TABLE

**Factor: 10: Academic self esteem:** *(School-1, Experimental group Pre & post attitude):*

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-26: I am not doing as well as I would like to.</td>
<td>3.16</td>
<td>2.37</td>
<td></td>
</tr>
<tr>
<td>Q-28: School work is fairly easy for me.</td>
<td>3.2</td>
<td>4.14</td>
<td></td>
</tr>
<tr>
<td>Q-29: whenever I take a test I am afraid I will fail.</td>
<td>3.64</td>
<td>2.21</td>
<td></td>
</tr>
<tr>
<td>Q-33: I am a good student</td>
<td>3.18</td>
<td>4.275</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.21 showed that students have negative responses towards the statement that they are not doing as well as they would like to be i.e. before JCL (3.16), and after JCL (2.37). The responses (pre JCL score 3.2 and post JCL score 4.14) showed that the school work is fairly easy for them and they opined that they are good students (pre JCL 3.18 and post JCL 4.275).
4.22 TABLE

Factor -11: Cohesion: (*School-1, Experimental group Pre & post attitude*)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-37: Everyone in this class is a friend.</td>
<td>3.19</td>
</tr>
<tr>
<td></td>
<td>4.95</td>
</tr>
</tbody>
</table>

The responses 3.19 (Pre JCL) and 4.95 (Post JCL) of the students clearly mentioned that there were increases in students reply towards the friendly attitude of their fellows in table 4.24.

TABLE 4.23

Factor-12: Individualistic Learning: (*School-1, Experimental group, Pre & post attitude)*:

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-36: I do better work when I work alone.</td>
<td>3.31</td>
</tr>
<tr>
<td></td>
<td>2.24</td>
</tr>
</tbody>
</table>

In table 4.23 students felt that they work better if they work alone. The responses before JCL 3.31, and post JCL 2.24, of the student showed major differences before and after the treatment of Jigsaw cooperative learning.
Pre-treatment & Post-treatment Analysis of Classroom life Instrument of School-2, (Experimental group):

4.24 TABLE

Factor -1: Teacher academic support: *(School-2, Experimental group, Pre & post attitude)*:

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-1: My teacher cares about how much I learn.</td>
<td>3.27</td>
<td>4.65</td>
<td></td>
</tr>
<tr>
<td>Q-2: My teacher likes to see my work.</td>
<td>2.38</td>
<td>4.93</td>
<td></td>
</tr>
<tr>
<td>Q-3: My teacher likes to help me learn.</td>
<td>2.55</td>
<td>4.55</td>
<td></td>
</tr>
<tr>
<td>Q-4: My teacher wants me to do my best in school work.</td>
<td>2.66</td>
<td>4.51</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.24 clearly showed that before and after treatment students’ attitude towards teacher academic support is maximized in the experimental group of GHSS Cantt-2. Caring of students by the teacher showed a momentous increased in the table 3.27 was the mean score of the students before the treatment of JCL and 4.65 was the mean score of the students after the treatment of JCL.
4.25 TABLE

Factors- 2 Teacher personnel support: (*School-2, Experimental group, Pre & post attitude*)

<table>
<thead>
<tr>
<th>Statements:</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-5: My teacher likes me as much as he likes other students.</td>
<td>2.36</td>
</tr>
<tr>
<td>Q-6: My teacher cares about my feelings.</td>
<td>2.91</td>
</tr>
<tr>
<td>Q-7: My teacher really cares about me.</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Table 4.25 represented student’s positive attitude towards the teacher personal support. The reply of the students in the statement like my teacher like me as much as he likes other students has increased from 2.36 to 4.55 due to the treatment of JCL. The mean score of the statement about the caring of teacher about the feeling of students before the treatment of JCL 2.91, and after the treatment it was 4.68.

4.26 TABLE

Factor-3: Student academic support: (*School-2, Experimental group, Pre & post attitude*)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-8: Other students in this class want me to do my best school work.</td>
<td>2.70</td>
</tr>
<tr>
<td>Q-9: In this class other students care about how much I learn.</td>
<td>3.00</td>
</tr>
<tr>
<td>Q-10: Other students in this class want me to come to class on regular basis.</td>
<td>2.65</td>
</tr>
</tbody>
</table>
Students’ academic support in table 4.28 showed a positive response of the students. The responses of the students about the caring of students towards the learning of fellow students were apparently increased from 3.00 to 4.39.

4.27 TABLE

Factor-4: Students personal support: (School-2, Experimental group, Pre & post attitude)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-12: In this class other students like me the way I am.</td>
<td>2.96</td>
</tr>
<tr>
<td>Q-13: Other students in this class really care about me.</td>
<td>3.5</td>
</tr>
<tr>
<td>Q-14: In this class other students really care about my feelings.</td>
<td>3.0</td>
</tr>
<tr>
<td>Q-15: Other students in this class like me as much as they like other students.</td>
<td>3.43</td>
</tr>
</tbody>
</table>

Students’ personal support in the responses of the students in table 4.27 showed a difference. There was a difference between the responses of students of experimental group of School-2 before and after the experiment, like the likeness of students towards their fellows students in the class were enhanced from 3.43 to 4.65.
4.28 TABLE

**Factor-5: Goal Interdependence:** *(School-2, Experimental group, Pre & post attitude)*

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-16: When we work together in small groups,</td>
<td>2.52</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>We try to make sure that everyone in the groups learns the assign materials.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q-17: We work together in small groups,</td>
<td>2.55</td>
<td>4.88</td>
<td></td>
</tr>
<tr>
<td>Our job is not done until everyone in the group has completed the assignment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q-18: We work together in small group; we all receive the same grade.</td>
<td>3</td>
<td>4.58</td>
<td></td>
</tr>
<tr>
<td>Q-19: When we work together in small group, our grade depends on how much all members learn.</td>
<td>3</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Q-20: When we work together in small group, I have to make sure that the other members learn if I want to do well on the assignment.</td>
<td>3.1</td>
<td>4.8</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.28 showed that students’ responses were quite positive about the goal interdependence. There was an increase in students’ responses about the statement that when they work in small group they receive the same grade from 3.00 to 4.58. Students felt that if they want to do well on their assignment they try to make all students learn, as was evident from the score of the students before treatment of JCL 3.1, and after the treatment of JCL 4.8.
4.29 TABLE

Factor-6: Resource interdependence: (School-2, Experimental group, Pre & post attitude)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-21: When we work together in small group, we cannot complete an assignment unless everyone contributes.</td>
<td>3.02</td>
<td>4.34</td>
<td></td>
</tr>
<tr>
<td>Q-22: When we work together in small group, the teacher divided up the materials so that everyone has a part and everyone has to share.</td>
<td>3.12</td>
<td>4.58</td>
<td></td>
</tr>
<tr>
<td>Q-23: When we work together in small group, we have to share the materials in order to complete the assignment.</td>
<td>2.6</td>
<td>4.27</td>
<td></td>
</tr>
<tr>
<td>Q-24: Every one’s ideas are needed in order to be successful, when we work together in small groups.</td>
<td>2.71</td>
<td>4.79</td>
<td></td>
</tr>
</tbody>
</table>

Resource sharing was presented in table 4.29. The students’ responses about the resources sharing to complete the assignment before and after the treatment were noteworthy i.e. pre treatment the mean score of the students were 2.6, and post-treatment the mean score of the students were 4.27. Students’ attitude about the statement that students’ ideas are needed for success clearly presented an increase in their responses from 2.71 and 4.79. Similarly students contribution were highly appreciated as presented in the table i.e 3.02 (pre-treatment score) and 4.34 (post-
treatment score), by the students during the course of implementation of Jigsaw cooperative learning.

4.30 TABLE

Factor-7: Cooperation: *(School-2, Experimental group, Pre & post attitude)*

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-</td>
</tr>
<tr>
<td></td>
<td>post</td>
</tr>
<tr>
<td>Q-25: In this class we learn more when we work with others.</td>
<td>3.08</td>
</tr>
<tr>
<td>Q-38: In this class I can learn important things from other students.</td>
<td>3.13</td>
</tr>
<tr>
<td>Q-39: In this class I like to help other students learn.</td>
<td>2.86</td>
</tr>
<tr>
<td>Q-40: Other students in this class like to help me learn.</td>
<td>2.8</td>
</tr>
<tr>
<td>Q-42: When we work together in small group, I show better performance.</td>
<td>2.68</td>
</tr>
<tr>
<td></td>
<td>4.92</td>
</tr>
</tbody>
</table>

Experimental group of School-2 were described in table 4.32. The table showed that students’ responses about the cooperation of students’ fellows were quite remarkable. The students reply showed an increase (from 2.68 to 4.92) about the statement that when they work in group in small group they show better performances. As the responses of the students showed (pre-treatment 3.08 and post treatment 4.66) that students felt that they performed better when they worked together.
4.31 TABLE

Factor-8: Alienation: (School-2, Experimental group, Pre & post attitude)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean Pre</th>
<th>Mean post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-26: I am not doing as well in school as I would like to.</td>
<td>3.83</td>
<td>3.02</td>
</tr>
<tr>
<td>Q-27: I find it hard to speak my thoughts clearly in class.</td>
<td>2.6</td>
<td>2.71</td>
</tr>
<tr>
<td>Q-28: School work is fairly easy for me.</td>
<td>2.65</td>
<td>4.46</td>
</tr>
<tr>
<td>Q-29: Whenever I take a test I am afraid I will fail.</td>
<td>3.89</td>
<td>2.28</td>
</tr>
<tr>
<td>Q-30: I often get discouraged in school.</td>
<td>3.12</td>
<td>2.35</td>
</tr>
<tr>
<td>Q-31: I have a lot of Questions I never get a chance to ask in the class.</td>
<td>3.75</td>
<td>2.41</td>
</tr>
<tr>
<td>Q-33: I am a good student.</td>
<td>3.56</td>
<td>4.68</td>
</tr>
<tr>
<td>Q-35: I feel upset in school.</td>
<td>2.83</td>
<td>2.35</td>
</tr>
</tbody>
</table>

Table 4.31 rejected the statement of feeling upset in the school (responses of the students decreased from 2.83 to 2.35). Similarly students strongly favored the statement of good student i.e. students responses increased from 3.56 to 4.68. The students’ responses about expressing their thoughts clearly in class were from 2.6 pre-treatment to post-treatment 2.71. This showed that they have rejected the statement of difficulty in expressing their thoughts in the class.
4.32 TABLE

Factor-9 Fairness of grading: (School-2, Experimental group, Pre & post attitude)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-34: If a student works hard he can definitely succeed in this class.</td>
<td>3.64</td>
</tr>
<tr>
<td></td>
<td>4.68</td>
</tr>
</tbody>
</table>

Table 4.32 mentioned an increase in the students’ responses from 3.64 to 4.68 of the experimental group in School-2 about the fairness of grading. Students had positive inclination about the equal grading if they worked hard.

4.33 TABLE

Factor: 10: Academic self esteem: (School-2, Experimental group, Pre & post attitude)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-</td>
<td>post</td>
</tr>
<tr>
<td>Q-26: I am not doing as well as I would like to.</td>
<td>3.83</td>
</tr>
<tr>
<td>Q-28: School work is fairly easy for me.</td>
<td>2.65</td>
</tr>
<tr>
<td>Q-29: Whenever I take a test I am afraid I will fail.</td>
<td>3.89</td>
</tr>
<tr>
<td>Q-33: I am a good student.</td>
<td>3.56</td>
</tr>
<tr>
<td></td>
<td>4.68</td>
</tr>
</tbody>
</table>

Table 4.33 showed students responses about the academic self esteem. The responses of students that they are good students were quite noteworthy, i.e 3.56 before treatment of JCL and 4.68 after the treatment of JCL. Students views about the failing of test whenever they took test were decreased from 3.89 before JCL and after JCL it were 2.28
4.34 TABLE

Factor-11: Cohesion: (School-2, 9 Experimental group, Pre & post attitude)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-37: Everyone in this class is a friend.</td>
<td>3</td>
<td>4.51</td>
<td></td>
</tr>
</tbody>
</table>

In the table 4.34 students took a positive stance about the friendliness nature about their fellows. The students of the experimental group of School-2 responded to the statement that everyone in this class is a friend. Their views were increased from 3.00 to 4.51.

4.35 TABLE

Factor-12: Individualistic Learning: (School-2, Experimental group, Pre & post attitude)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Pre-</th>
<th>post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-36: I do better work when I work alone.</td>
<td>4.33</td>
<td>2.27</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.37 showed a negative attitude of the students about the statement of doing work in alone than in groups. The responses of the students were decreased from 4.33 to 2.27.
Chapter-5

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The study used Jigsaw technique of cooperative learning as independent variable and academic achievement, self esteem and students’ attitude were measured as dependent variables. The following questions were the main focus of the study as mentioned in chapter 1.

1: Were there any differences in academic performances (achievement) in chemistry subject between the experimental group and the control group?

2: Were there any differences in the attitude of the students towards academic activities?

3: What were the differences in students’ self esteem before and after treatment of Jigsaw technique of cooperative learning in the experimental group?

Similarly in addition to research questions stated above the objective of the proposed study was to examine the effect of Jigsaw technique of cooperative learning on the performance of chemistry students at secondary level. The major objectives of the study were to:

A: Evaluate the effectiveness of Jigsaw technique of cooperative learning on the academic achievement of chemistry students at secondary level.

B: Assess the change in attitude of students

C: Explore the enhancement of self esteem of the students at secondary level.

The minor objectives of the proposed investigation will be to:

1: Compare the academic achievement of the two groups i.e. experimental and control groups based on pre-test.

2: Analyze the academic achievement of the two groups’ i.e. control and experimental groups on the basis of post test.
3: Explore the students’ attitude towards teacher.

4: Investigate peer support in Jigsaw technique of cooperative learning group.

5: Scrutinize students’ attitude towards group learning.

6: Examine students’ academic self-esteem in the class.

7: Inspect the students’ overall analysis about self esteem of students.

The hypotheses for the study were:

Ho: There was no significant difference between the control and experimental groups in academic achievement.

Ha: There were a significant difference in academic achievement between control and experimental groups.

Ho: There was no significant difference in attitude of the students in the experimental groups.

Ha: There was a major difference in attitude of the students of the experimental group.

Ho: There were no main differences in the self esteem of the students before and after the treatment of the Jigsaw technique of cooperative learning technique.

Ha: There were main differences in the self esteem of the students before and after the treatment of the Jigsaw technique of cooperative learning technique.

5.1- Findings:

The findings of the study were described separately under the headings of Academic achievement and JCL, self esteem and JCL and class room life instrument (Attitude) and JCL.

5.1.1: Academic achievement and Jigsaw technique of cooperative learning:

Table 4.2 showed the correlation between the pre-test and post test of the experimental group and control group of School-2. The table 4.2 covered minor
objective-1 of the study. The correlation between the pre-test and post-test of school-2 in the experimental group was 0.451. Similarly in the control group correlation between the pre test and post test was 0.454. The correlation significant value for Experimental group in School-2 in both pre and post test is 0.003. Since the value is smaller than 0.005. In contrast to experimental group, in control group the significant value is 0.006 greater than 0.005 for control group in School-2.

Table 4.3 showed the T-test result of experimental group of School-2. The t-test result for experimental group is -11.23 and the significant value is 0.000. The T-test result for control group is -4.530 and the significant value is 0.000. The table revealed that there was a significant difference between the pre-academic test and post-academic test. The T-test comparison for control group of School-2 also exposed that there was a marked difference between the pre-academic and post-academic test as evident by table 4.3.

Table 4.4 showed the correlation and t-test comparison of School-1. In case of experimental group the correlation between the pre-test and posttest is 0.228 and the significant value is 0.168. For control group is the correlation value between pre-test and post-test is 0.460 and significant value is 0.004.

Table-4.5 showed the t-test comparison between pre-test and post test of experimental and control group of School-1. for experimental group the t-test value between pre-test and post-test is -8.715 and the significant value is 0.000 and for the control group, the t-test value is -7.772 and significant value is 0.000.

When the post-academic test of both the control and experimental groups of School-2 were compared in table 4.6, it was discovered that the correlation value is -117 with the significant value of .503. The table 4.6 covered the minor objective-2 of the study.
Similarly for School-1 the correlation in posttest between control and experimental group is -0.097 and its significant value is 0.567.

The T-test significant value for School-1 in the control and experimental group for posttest is 0.003 lower than 0.005 as shown table 4.6. Similarly the significant value for posttest for School-2 in the control and experimental group is 0.000 lower than 0.05, showing that there are marked differences between the control group and experimental group in the posttest. Therefore the Null hypothesis that, “There is no significant difference between the control and experimental group in the academic achievement for both the schools” was rejected.

5.1.2 Jigsaw technique of cooperative learning and Self esteem:

The tables 4.9 & 4.10 covered minor objective 7 of the study. The table revealed the correlation comparison between pre-test self esteem and post-test self esteem of experimental groups of School-1. The correlation value between pre-self esteem and post self esteem is 0.284 and significant value is 0.080. The Table 4.10 showed the comparisons in correlation of experimental group of School -2. The correlation value is 0.337 and the significant value is 0.034. Table 4.11 showed the t-test comparisons of experimental group in self esteem of School-1 & 2. The t-test value for experimental group of School-1 is -3.3220 with a significant value are 0.003. The t-test value for School-2 for experimental group is -3.381 with a significant value are 0.002. T-test result for self esteem showed that increase in the self esteem did occur for the experimental group of School-2 &1, before and after the treatment of Jigsaw technique of cooperative learning.

Therefore the null hypothesis, “There is no significant difference between the score of self esteem before and after the experiment of the experimental group for both the schools” was rejected.
5.1.3 Jigsaw technique of cooperative learning and Class room life instrument:

All the factors of class room life instrument were discussed in the subsequent headings:

5.1.3.1- Students’ responses about teacher’s Academic support:

Tables 4.12, 4.13, 4.24 & 4.25 showed the mean scores of the students about the teacher’s academic support of the two schools. These two tables covered objective 3 of the proposed study. The table revealed that there was a major increase in the students’ responses about teacher’s academic support. Students appreciated the effort of teacher to see the work of the students as represented by the mean score of the students before treatment of JCL (2.53), and after the treatment of JCL (4.26). Similarly the responses of the students about the statement that my teacher likes to help me learn, increased from 2.55 (pre-treatment) to 4.55 (post-treatment) of School-2 students, when JCL were treated to the students.

Teacher personal supports were shown in tables 4.13 and 4.25 for the two schools. Students of both the schools endorsed the statement of justice in the class room. Students showed marked differences in the mean score of the statement “my teacher likes as much as he likes other students”. The score regarding this statement were before JCL 2.467 and after JCL 4.23 for School-1. The mean score students of Cantt-2 about the above mentioned statement were 2.36 (pre-treatment of JCL) and 4.55 (post-treatment of JCL). Students of both the schools showed an increased in the mean score about the statement “my teacher really cares about me”. The pre-treatment mean score of School-2 were 2.9 and post-treatment mean score were 4.6. Likewise the mean score of students of School-1 regarding the above statement were 3.2 (pre-treatment) and 4.00 (post-treatment).
5.2.3.2-Students Academic Support in Jigsaw technique of cooperative learning:
Minor objective 4 was covered in tables 4.14, 4.15, 4.26 & 4.27. This objective is about the students peer support. Students’ academic support of the class room life instrument of the experimental groups for the two schools was shown in tables 4.16 and 4.28. Students of the two schools valued the statements “other students in this class want me to do my best school work”. The mean score of the students regarding this statement were 2.35 pre-treatment and 3.91 post-treatment for experimental group of School-1. The mean score students of cantt-2 about the above statement were 2.65 (pre-treatment) and 4.85 (post-treatment).

Tables 4.15 & 4.27 are about the responses of students of both the school regarding students’ personal support. Students reply to the statement “Other students in this class like me as much as they like other students” increased from pre-treatment, 2.77 to post-treatment 4.53 of School-1. In the same way Students of experimental group of School-2 react to above statement improved as was evident from the mean score shown in the table 4.29 i.e. pre-treatment 3.43 and post-treatment 4.65.

5.2.3.3-Goal interdependence and Jigsaw technique of cooperative learning:
The responses of students about goal interdependence covered objective 5 of the study. This objective is about the students’ attitude about group learning. Students of experimental group of School-2 reply about the goal interdependence were shown table 4.28. Working together in small group ensured same grade received by all students in the same group. The opinion of students about the above mentioned statement showed a change in their score e.g. before JCL 3.00 and after JCL 4.58. On the other hand table 4.16 present the mean score of goal interdependence of the students of School-1. The pre-treatment and post-treatment score about the above statement were 3.24 and 4.66. In addition the statement like “When we work together
in small group, I have to make sure that the other members learn if I want to do well on the assignment”, the students of experimental group School-1 mean score enhanced from 2.95 to 4.45. Students of Experimental group of School-2 & School-1 believed that their success depends on the performances of other members in the group. Every member tried to help those individual who was weak in the learning processes. Their group goal depends on the success of all the individuals.

5.2.3.4-Resource Interdependence and Jigsaw technique of cooperative learning:
Table 4.17 presented the students views about the resource interdependence of experimental group of School-1. The students’ views about the sharing of resources were enhanced before and after the treatment of JCL. Students’ stance about the statement “When we work together in small group, we have to share the materials in order to complete the assignment”, improved from 2.53 to 4.72, of School-1. Moreover the students of School-2 have positive opinion about the resource sharing and on the above statement. Their responses before treatment 2.6 and after treatment are 4.27 as shown in table 4.30. Experimental group of School-2 also responded that resource haring is important for the completion of the assignment. Resource sharing in experimental group of School-1 was more appreciated as was evident from the mean scores comparison of responses of the students.

5.2.3.5: Cooperation and Jigsaw technique of cooperative learning:
Tables 4.18 & 4.29 are about students, opinions of the experimental groups of two schools regarding cooperation of the class room life instrument. The statement “In this class we learn more when we work with others” was responded sound by the students of the two schools. The responses of the students enhanced from 2.39 to 4.24 of experimental group of School-1. Similarly the students of experimental group of School-2 retort to the above statement also changed from 3.08 to 4.66 as shown table
4.30. Students of School-2 also replied positively to the statement, “When we work together in small group, I show better performance”. Their mean score increased from 2.68 (pre-treatment) to 4.92 (post-treatment). The students of experimental group of School-1 responded from negative (2.09) to positive (4.49) to the above statement. Cooperation of students in the experiment was necessary and was appreciated among the students of experimental group of School-2 and School-1.

5.2.3.6 Alienation and Jigsaw technique of cooperative learning:

One of the factors of the 12th factors of classroom life instrument was alienation. Students mean score in front of each statement were presented in tables 4.19 and 4.31. Students of both the schools scored high in the post-treatment of JCL (School-1 “4.16”, and School-2 “4.46”) than the pre-treatment of JCL (School-1 “2.2”, School-2 “2.65”) to the statement “school work is fairly easy for me”. Both the school’s students of experimental group rejected the statement of being discouraged in the school. The score of cantt-2 decreased from 3.12 to 2.35, and the mean score of experimental group of School-1 changed from 4.00 to 2.07 the statement of being discouraged in the school. The students of experimental group of School-1 score enhanced from 3.18 to 4.275 to the statement “I am a good student”

5.2.3.7-Fairness of Grading and Jigsaw technique of cooperative learning:

Tables 4.20 and 4.32 are about fairness of grading. The statement “If a student works hard he can definitely succeed in this class”, was scored high by the students of both the schools. Students of School-1 mean score enhanced from 2.77 to 4.8 due to the treatment of JCL. Likewise students of experimental group of School-2 also scored high to the above statement. Their score changed from 3.64 to 4.68.
5.2.3.8-Academic Self esteem and Jigsaw technique of cooperative learning:
Academic self esteem of class life instrument of the students of both the schools was represented in Tables 4.21 and 4.33. These two tables covered minor objective of study. Students of experimental group of School-1 mean scored decreased from 3.16 to 2.37 to the statement “I am not doing as well as I would like to”. The responses of the students of experimental group of School-2 decreased from 3.83 to 3.03. The statement “whenever I take a test I am afraid I will fail”, were negatively responded by the students of experimental group of School-1. Their mean score decreased from 3.64 to 2.21. Reply of the students of School-2 to the above statement minimized from 3.89 to 2.28. Students’ responses of School-1 also increased from 3.2 to 4.14 to the statement “School work is fairly easy for me”. Similarly students of experimental group of School-2 reply to the fore mentioned statement increased from 2.65 to 4.46.

5.2.3.9 Cohesion and Jigsaw technique of cooperative learning:
Tables 4.22 & 4.34 are about student’s reply to the factor cohesion of class room life instrument of both the schools. The mean score of students of experimental group of School-1 and School-2 increased from 3 to 4.51(School-2) and 3.19 to 4.95 (School-1) to the statement “Everyone in this class is a friend”.

5.2.3.10-Individual learning and Jigsaw technique of cooperative learning:
Students’ opinions about individual learning were expressed in table 4.23 and 4.35. Students of both the schools negatively responded to the statement “I do better work when I work alone”. The mean score of the students of experimental group of School-1 decreased from 3.31 to 2.24. Similarly the students reply to the above statement of experimental group of School-2 changed from 4.33 to 2.27.
5.3: Discussion:

The investigator visited several schools for the conduction of the proposed study. Most of the teachers and principals showed their reluctant attitude by giving different reservations. However in the last the investigator was able to convince two of the principals for the study as Dar (2013) argued that, besides inadequate of funding, scarcity of availability of resources and lack of expertise, one of the overriding causes of the poor state of research in our country is our attitude that has put research on the backseat. In addition, Mustafa, (2014), rightly argued that the attitude of non-cooperative towards research might be due to lack of research culture in country like Pakistan. As pointed out by Rasheeed (2012), that there are poor research culture at college and post graduate level. The poor research environment can also be judged by the number of publications reported by Junaidi (2011). The report mentioned that the total numbers of research documents published by Pakistani in 2010 were 6987 according to worldwide Scientific Journal Ranking (SJR). According to Jaffary (2014), Pakistan low level of scientific research is due to the culture, which discouraged independent and critical thinking.

The effectiveness of Jigsaw technique of cooperative learning in the increased of academic achievement of the students in experimental groups of both the schools are in closed agreement with the study conducted by Doymus (2008), teaching chemical bond through Jigsaw technique of cooperative learning. The findings of the study revealed that Jigsaw technique of cooperative learning is more effective than traditional teaching. Mostly teacher complaint about the delay in completion of course contents in Jigsaw technique of cooperative learning as compared to the traditional method. However the study revealed that in Jigsaw technique of cooperative learning the completion of course contents take place quickly than traditional method.
It was find out that the method should be applied to those schools where familiarity of the investigator is the highest so that Students are first familiarized with the Jigsaw technique of cooperative learning. Although at the onset of the Jigsaw technique of cooperative learning the students were told about the Jigsaw technique of cooperative learning, yet they were little know how to the students about the true spirit of Jigsaw technique of cooperative learning.

These findings are in consistent with the study conducted by Doymus and others (2010), titled “Effects of Jigsaw technique of cooperative learning and animation techniques on students understanding of concepts and subjects in electrochemistry”. The result of the study indicated that Jigsaw technique of cooperative learning and animation techniques group is more effective than control group. Doymus (2007), further revealed in the “Teaching chemical equilibrium with Jigsaw technique of Cooperative Learning”. The outcomes of the study revealed that Jigsaw technique of cooperative learning is more powerful in students’ achievement than individual learning. Doymus in 2007 exposed a study Effects of cooperative learning strategy on teaching and learning phases of matter and one component phase diagram. The findings showed that Jigsaw technique of cooperative learning and teaching were found to be more effective in term of academic achievement than the traditional teaching and learning. Similarly the result of the study is also in close agreement with the study conducted by Naomi and Githua (2013). Their study was on 17 years old mathematics secondary students in the subject of mathematics. Their findings contend that students taught mathematics with Jigsaw technique of cooperative learning strategy performed significantly better than those students who were taught through the conventional or traditional teaching method.
Findings of the present study revealed that Students of the Experimental groups showed positive outcomes for the two schools regarding the class room life instrument. Their positive attitude developed during treatment of JCL as is evident from their pre-treatment and post-treatment score. Students of the experimental groups for both school-1 and school-2 appreciated teacher personal and academic support, valued the spirit of cooperation among the fellow student and strongly rejected the statement of being upset in the school. These findings are re-enforced by Johnson and Johnson (1975). They argued that students working with other students in a cooperative relationship show more positive attitude towards science. The findings of the present study are validated by Gunderson and Johnson (1980). They were of the opinion that the use of cooperative learning can promote more favorable attitude towards science. The supportive arguments to the students reply about the cooperative learning in the present study were provided by Tran & Lewis (2012). They argued that students taught by Jigsaw technique of cooperative learning have positive attitude towards their own learning and to this kind of learning. It was also pointed out by Johnson & Johnson (2005), that cooperative learning result in more positive attitudes toward learning. Thus the finding of the present study in the enhancement of learning is completely supported by the study of Johnson and Johnson.

Attitude is an important role in the learning of students Ormerod and Duckworth (1975) said that sometimes students’ attitude towards science is more important than their understanding of science, since it is their attitude that determine how well the students use their knowledge. Johnson & Johnson (1978) indicated that attitude and achievement are related. If the students have favorable attitude towards that subject area, and increased motivation then the students are more likely to show
greater achievement. Talton and Simpson (1987) investigated the relationship of attitude towards science, the classroom environment and achievement in science among 10th grade biology students. They found that 8-18% of the variance in achievement was accounted for both attitudes towards science and classroom environment.

The findings of the study revealed that treatment of the Jigsaw technique of cooperative learning have obvious change in the self esteem of the students of both the schools in Experimental groups before and after the treatment. This is because that many people has assumed that self esteem is relatively stable attribute of a person and that school can do very little to changed it. However some psychologist and educators claimed that self esteem can rose considerably. Maslow (1968) believed that self esteem was relatively stable and could be changed by positive experiences over a period of time. Coppersmith (1967) argued that self esteem is being formed during the entire life process while Robins and Trzesnieski (2005) reported that self esteem develops across the individual life span and can change or fluctuate during the course of life.

The prevailing aggressive behavior and anti social attitude also contribute to the low self esteem. Ghazi (2003) reported that contribution of cooperative learning to school alienation and students’ academic self esteem is not much effective. It was mentioned by Moffit and Caspi (2005) that correlations exist between low self esteem and aggression, delinquency and anti social behavior. Taylor, Davis-Kean and Malanchuk (2007) reported a correlation between low self esteem and school violence in young adults. Therefore improving self esteem in specific domain such as social self esteem and academic self esteem can potentially reduce school violence and increase students’ sense of worth. The study was conducted in the month of April. It was the
starts of the session in our educational institution and new students were inducted on daily basis. The weather was hot and the temperature range from 40-45° C, accompanied by another major problem faced by our countrymen was power break down. Another problem faced by the investigator is students’ absenteeism. It was observed that usually 10-15 students were absent on daily basis. Students’ absentee can be controlled by continuously reporting the absentee students to school administration. Koppenhaver (2006) argued that class absenteeism is one of the most important problem adversely affects students academic achievement. Chan, Shun and Wright (1997) reported students’ regular attendance has significant effects on the score of students’ achievement.

Provide complete information to the students about solving/ticking/filling of class room life instrument, achievement test and self esteem scale of Rosenberg. In the study the researcher took only pictures of the students taking part in Jigsaw technique of cooperative learning; however for complete information about the Jigsaw technique of cooperative learning, it is suggested that videos should also be made in this regard to validate the study.

5.4: Conclusion:

The study investigated the effect of Jigsaw technique of cooperative learning on the performances of secondary school students. The investigator conducted the study using Jigsaw technique of cooperative learning as independent variable and academic achievement, self esteem and class room life instrument as dependent variables. In the light of findings the following conclusions have been drawn:

It was concluded that Jigsaw technique of cooperative learning is the effective technique of learning in the subject of chemistry in our culture. It increased students’
academic performance, increased self esteem of students, change students attitude towards teacher, fellow students, school, etc.

1: The result of hypothesis about academic achievement in the light of findings of the study is as under:

Null hypothesis that there is no significant difference between the control and experimental group in the academic achievement for both the schools is “rejected”, and the alternate hypothesis that there is a significant difference between the control and experimental group in the academic achievement for the two schools is “accepted”.

2: Students of the experimental groups for school-1 and school-2 have praised the support of teacher both personally and academically. Students of the experimental groups in school-1 and school-2 have positive responses about students’ personal and academic support. They conceded that for achieving high standard goal interdependence (everyone has to achieve the goal) is indispensable. Learners of the experimental groups of school-1 and school-2 have valued the spirit of resource sharing among their fellow students. They rejected the negative statement of being upset in the school and get is discouraged in the school. Students of the experimental groups of school-1 and school-2 give maximum support to the statements regarding cooperation among the learners and academic self esteem.

3: The result of hypothesis about the self esteem for the experimental group of the school-1 and school-2 is discussed as:

“The null hypothesis, that there is no significant difference between the score of self esteem before and after the experiment of the experimental group for both the schools is rejected and the alternate hypothesis, that there is a significant difference between
control and experimental group in the score of self esteem before and after JCL in the experimental group for both the schools is accepted”.

5.5 Suggestions and recommendation:

In the light of the study the following suggestions and recommendation were made.

1: Jigsaw technique of cooperative learning is the effective method for the development of students. As the findings of the study showed that it enhances the academic achievement of student. So it is suggested that in order to increased the academic achievement of students Jigsaw technique of cooperative learning may be introduced in our class room environment.

2: The findings of the study revealed that Jigsaw technique of cooperative learning also changed the attitude of students towards subject, fellow students, teachers and school etc. So it is recommended that in order to change the overall attitude of students’ Jigsaw technique of cooperative learning may be incorporated in our Academic discipline.

2: Jigsaw technique of cooperative learning can change the attitude of students towards teachers. Students praised the academic and personal support of teachers in the experiment group. So it is recommended for teacher to implement the Jigsaw technique of cooperative learning their class room environment.

3: The result of the study further revealed that students have positive opinions and have highly regarded the cooperation of fellow students, so it is recommended that all the students in the group learning should be provided an equal leveling field for learning. The only method which provides these opportunities to students is the jigsaw technique of cooperative learning.

4: Students in the group perform better as the outcomes of the study revealed. Students have good and enhanced responses about the spirit of Jigsaw technique of
cooperative learning as is evident from their reaction in the class room life instrument. It is recommended that resource sharing may be made easy by the use of jigsaw cooperative learning.

5: The findings of the study exposed that Jigsaw technique of cooperative learning increased the self esteem of student. Students are exposed to new situation, hold accountable to their responsibilities and face to face interaction is promoted. This will over all increased the self worth of students. Therefore it is recommended that class room activities may be adopted as such where all these elements are present. The only method which ensures all these elements is cooperative learning and Jigsaw technique of cooperative learning.

6: The result of the study showed that the academic self esteem is increased from their replies in class room life instrument. So it is suggested that in order to made easy the school work for students and increased their worth, Jigsaw cooperative learning may be introduced in the school environment.

7: The study was started in the month of April, which is the beginning of academic calendar in educational institutions in the province of Khyber Pakhtunkhwa (Pakistan), resulting the influx of students in the duration of the whole study. It is recommended that future study may conduct in the middle of the calendar year. The seasonal temperature will also be reducing in the middle of the calendar year, as in the month of June the seasonal temperature rise up and the weather is hot.

8: For future study it is recommended that further research studies may be done to wide varieties of grades and subjects. In order to completely implement cooperative learning in our class room environment this method should be tried again and again in our culture. By constantly repeating the experiment of cooperative learning and especially Jigsaw technique of cooperative learning new problems will be arise that
needs to be addressed so that Jigsaw technique of cooperative learning is universally implemented in our class room environment. As Vygotsky (1978) argued that learning is a social process that happens through interpersonal interaction in cooperative environment. Because cooperative learning is the need of the day having many applications like increased academic achievement, develop positive attitude and increased self esteem of students. Therefore it is imperative that we should understand the full benefits of cooperative learning and use it in all level of education.
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Appendix-1

Rosenberg Self-Esteem Scale (Rosenberg, 1965)

1. On the whole, I am satisfied with myself. SA A D SD
2.* At times, I think I am no good at all. SA A D SD
3. I feel that I have a number of good qualities. SA A D SD
4. I am able to do things as well as most other people. SA A D SD
5.* I feel I do not have much to be proud of. SA A D SD
6.* I certainly feel useless at times. SA A D SD
7. I feel that I’m a person of worth, at least on an equal plane with others. SA A D SD
8.* I wish I could have more respect for myself. SA A D SD
9.* All in all, I am inclined to feel that I am a failure. SA A D SD
10. I take a positive attitude toward myself. SA A D SD

Scoring: SA=3, A=2, D=1, SD=0. Items with an asterisk are reverse scored, that is, SA=0, A=1, D=2, SD=3. Sum the scores for the 10 items. The higher the score, the higher the self esteem.

The scale may be used without explicit permission. The author's family, however, would like to be kept informed of its use:

The Morris Rosenberg Foundation

c/o Department of Sociology

University of Maryland

/Soc Building College Park,

MD 20742-131
APPENDIX-2

Chemistry Test Class 9th

School name: Section:

Name of student: Date of birth:

Section A

Fill in the blanks with suitable words.

1: The basic unit of element is ………..(ion, atom, nucleus, molecule)

2: The atomic number of Hydrogen is……….(1,2,3,4)

3: Total number of naturally occurring elements are…………(82,92,102,118)

4: Alpha particles have…………………….charge(double positive, positive, negative, double negative)

5: The molecular formula of glucose is…………… (C₂H₄O₂, C₃H₆O₃, C₆H₁₂O₆, C₄H₈O₄)

6: Total number of protons in the nucleus of an atom is called………….(Atomic volume, atomic mass, mass number, atomic number)

7: The total number of neutrons in 47Ag107………………. (40, 50, 60, 55)

8: There are……………isotopes of chlorine. (5, 4, 3, 2)

9: The symbol of carbon is……..(C, Co, Cr, Ca)

10: The positive charge particles in an atom are called……….. (Photon, proton, neutron, electron)

11: According to 2n2 formula of Bohr Atomic Model, the total number of electrons in the 3rd orbit are………………………..(2,8,18,32)

12: The molar mass of chlorine gas (Cl₂) is……………..(41,51,61,71,)
Mendeleev arranged the then elements on the basis of atomic number, atomic mass, atomic density, atomic volume.

The number of proton in the nucleus of Hydrogen atom is 1.

Total number of periods in the modern periodic table is 7.

Maximum number of electrons in the K-shell is 2.

The smallest particle of universe that exists independently is called atom.

According to Dalton atomic theory, atom is an indivisible particle.

The first element of the modern periodic table is Hydrogen.

Alkali metals are the elements of Group IA.

The mass number of the isotope of Hydrogen Deuterium is 2.

Which one of these can be converted into simpler components? Water.

Rutherford passed Alpha particles through gold foil.

Law of triad was presented by Mendeleev.

The branch of chemistry that deals with the study of organic compounds is called organic.

Isotope is due to different number of neutrons, protons, electrons, or positrons.

As long as electrons are in the orbit, their energy is fixed.

As long as electrons are in the orbit, their energy is fixed.

An atom is used as the standard to measure the average relative atomic mass.
29: The chemical combination of two or more than two different elements forms……..

(Mixture, Element, Compound, Molecule)

30: 1H\(^1\), 1H\(^2\), 1H\(^3\) are …………of the hydrogen element. (Allotropy, Isobar, Isotone, Isotope)

**Section-B**

Write short note (3 to 5 lines)

1: Element

2: Analytical chemistry

3: Electronic configuration

4: Structure of atom

5: Electro negativity

6: Mole

7: Formula

8: Atom is a neutral particle, why?

9: Isotope

10: Modern periodic law
APPENDIX-4

Class room life Instrument

Name: …………… Date:…………………

School:………………. Class:……………….

Please write the number in front of each statement, that indicate your level of agreement with the statement below.

Please write 1 if the statement is completely false
Please write 2 if the statement is mostly false
Please write 3 if the statement is difficult to decide
Please write 4 if the statement is completely true
Please write 5 if the statement is mostly true

1-My teacher cares about how much I learn
2-My teacher likes to see my work.
3-My teacher likes to help me learn.
4-My teacher wants me to do my best in school work
5-My teacher likes me as much as he likes other students.
6-My teacher cares about my feelings
7-My teacher really cares about me.
8-Other students in this class want me to do my best school work
9-In this class other students care about how much I learn.
10-Other students in this class want me to come to class on regular basis.
11-In this class other students like me the way I am.
12-Other students in this class really care about me.
13-In this class other students really care about my feelings.
14-Other students in this class like me as much as they like other students.

15-When we work together in small groups, we try to make sure that everyone in the groups learns the assignment materials.

16-We work together in small groups, our job is not done until everyone in the group has completed the assignment.

17-We work together in small groups; we all receive the same grade.

18-When we work together in small group, our grade depends on how much all members learn.

19-When we work together in small group, I have to make sure that the other members learn if I want to do well on the assignment.

20-When we work together in small group; we cannot complete an assignment unless everyone contributes.

21-When we work together in small group, the teacher divided up the materials so that everyone has a part and everyone has to share.

22-When we work together in small group, we have to share the materials in order to complete the assignment.

23-Everyone’s ideas are needed in order to be successful, when we work together in small groups.

24-In this class we learn more when we work with others.

25-I am not doing as well in school as I would like to.

26-I find it hard to speak my thoughts clearly in class.

27-School work is fairly easy for me.

28-Whenever I take a test I am afraid I will fail.

29-I often get discouraged in school.

30-I have a lot of Questions I never get a chance to ask in the class.
31-When we work together in small group, I show better performance.

32-I am a good student.

33-If a student works hard he can definitely succeed in this class.

34-I do better work when I work alone.

35-In this class I can learn important things from other students.

36-In this class I like to help other students learn.

37-Other students in this class like to help me learn.

38-I am not doing as well as I would like to.

39-Everyone in this class is a friend.

40-I am doing as well in school as I would like to.
APPENDIX-5

The Director

Institute of Education & Research

UNIVERSITY OF PESHAWAR

March 8, 2013

CERTIFICATE

This is to certify that Mr. Gul Nazir Khan had been enrolled in the PhD program at this institute. The advanced studies & research board of this university in its meeting held on 04-12-2012 has accepted his research proposal “Effect of Jigsaw on the performance of secondary school students”.

Since he has started his research work and data collection from educational institutions of the Khyber Pakhtunkhwa, therefore it is requested that maximum help/support may be provided to him.

Director,
Institute of Education & Research
University of Peshawar
APPENDIX-6

Permission Letter

I ……… Father/guardian of…………..give permission to my son to participate in the PhD project by Gul Nazir Khan. It will give me immense pleasure to see my child in the participation of various activities like group work, discussion, resource sharing and taking of photographs of the students etc.

Thanks

Name of father/guardian: …………………………………………..

Signature: ……………………………………………………………

Relation: ……………………………………………………………

Address: ……………………………………………………………

Date: ……………………………………………………………
Hi sir hopefully this mail will find you good in health. Sir I have prepared a research proposal for my PhD project titled “EFFECT OF STAD A COOPERATIVE LEARNING ON SECONDARY STUDENTS ACHIEVEMENTS”s. Kindly if you have the concerned person in this regards so that i may check it my proposal and research design. Kindly guide me in this regards. Thanks.

On 9/13/11, Roger Johnson <johns009@umn.edu> wrote:

We have a Classroom Life Instrument that includes a number of factors (clusters of items). I have attached it here. See if it would be useful.

We never use the whole instrument, but pick the factors that we want to measure. Good luck.

Roger T. Johnson
On Tue, Sep 13, 2011 at 4:47 AM, Gul Nazir Khan
<gulnazir515198@gmail.com> wrote:

thank you sir for your positive feedback ... can you please guide me on the effect of student team achievement division a cooperative learning on students attitude and self esteem. I mean if you have self esteem scale and attitude scale, please share it with me ... I will be very obliged.

On 9/12/11, Roger Johnson <johns009@umn.edu> wrote:

Gul Nazir Khan,

I will see what we have on cooperative learning at the High School level. We are doing a large meta-analysis right now. Meanwhile, there is a college level meta-analysis review at the University/College level focused on Sciences, Mathematics, Engineering, and Technology that will give you a start. Search for: “EFFECTS OF SMALL-GROUP LEARNING ON UNDERGRADUATES IN SCIENCE, MATHEMATICS, ENGINEERING, AND TECHNOLOGY: A META-ANALYSIS, Springer, M.E, Stanne, S.S.Donovan, Review of Educational Research, Spring1999, Vol.69, No.1, pp21-51”.

Good luck with your work.

Roger T. Johnson

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