# IMPACT OF STUDENT TEAMS ACHIEVEMENT DIVISION ON ACADEMIC PERFORMANCE AND EMOTIONAL INTELLIGENCE OF CHEMISTRY STUDENTS IN SECONDARY SCHOOLS IN PORT HARCOURT, RIVERS STATE, NIGERIA

**WISDOM J. OWO Ph.D., LONGINUS NWALA AND SOPURUCHI IHENKO**
Department of Integrated Science, Faculty of Natural and Applied Sciences, Ignatius Ajuru
University of Education Rumuolumeni, Rivers State, Nigeria

**Abstract**
This study determines the impact of instructions in STAD type of collaborative learning strategy on students' emotional intelligence and academic performance. Quasi- experimental design involving two non-equivalent study group samples receiving different treatment was adopted for the study. 158 SSI chemistry students from two arbitrarily selected Senior Secondary Schools in Port Harcourt Metropolis, Rivers State are the subjects in the study.
The subjects were not randomized instead their intact classes were randomly designated as experimental group (N=81) and comparison or control group (N=77). While the experimental group received treatment via STAD collaborative learning, the control group was taught as normal class without any cooperative activity. BarOn Emotional Quotient Inventory: Youth Version, BarOn EQ-i:YV (BarOn and BarOn Emotional Quotient Inventory: Youth Version, BarOn EQ-i:YV (BarOn and Parker, 2000) and Student's Achievement Test in Chemistry (SATIC) were used to collect the data. A pre-test was administered in the first week followed by six weeks of instruction then a post-test in the eight week. Analysis of data via mean and ANCOVA pointed out significant differences amid the control and experimental groups posttest mean scores of the students' emotional intelligence as well as in SATIC.
**Keywords:** Cooperative learning, Student Teams Achievement Division, Emotional intelligence, and Academic Achievement.

## 1.0 Introduction
There is no contradiction saying that education is quintessential to the development of any nation and her citizenry. And so, a functional education becomes very indispensable for the total reformation of the individual and also for the growth and transformation of a nation. The success of such an education system in addition to the social, academic, and emotional competences of learners depend largely on a number of issues of which the teacher factor is the most important in view of the fact that the teacher is the implementer of the curriculum and facilitator of learning. Instructional methods and strategies employed by teachers while teaching can influence (make or mar) students' active participation in the learning process (Akinola, 2006 cited in Aniodoh and Eze, 2014; Adesoji and Ogiri, 2012). The teaching method or strategy used in the class by a teacher or an instructor is one important variable that can make students to interact with each other while engaging in a learning task.
Teachers play very important roles in classroom teaching and learning as well as enhancing the development of a total person. Payton et al in Pasi (2001) had stated that instructions in

any course of study which only focus on academic aspect encourage students to be irresponsible, uncaring and incompetent learners. Thus, in the process of curriculum implementation, emphasis should not only be on the development of cognitive aspects but affective aspects as well. Therefore, to boost students' social, affective and cognitive development in addition to learning and understanding of school subjects, and as a consequence promote their achievement in school subjects, teachers must adopt active teaching methods that will make students to be more active in classroom and learning activities through appropriate interaction and sharing of knowledge with their colleagues and friends. Cooperative learning is one of the active methods of teaching (……………). To Webb, Troper, and Fall, 1995 in Zakaria, Solfitri, Daud, and Abidin (2013) cooperative learning inspires students to be active partners in the creation of their own knowledge. Melihan and Sirri (2011) found cooperative learning teaching techniques to be more effective in enriching the academic success of students than the traditional teaching methods. In cooperative learning classroom students tend to be in happiness with each other, tolerate one another, share, respect, and enjoy each other's view as well as motivating each other to learn. Literature have shown the superiority of Cooperative learning over competitive and individualistic learning techniques in promoting academic gains (Johnson etal., 2014; Pons etal., 2014; Ning and Hornby, 2014; Sears and Pai, 2012; Zakaria, Chin, and Daud ,2010; Ahmad and Mahmood, 2010; Sahin, 2010; Tanel and Erol , 2008;) and in the development of interpersonal skills along with social skills (Slavin, 2011; Johnson and Johnson, 2008 and 2006). However, on the word of Goleman (1998), 80% of one's success in life (academic success inclusive) is due to emotional intelligence whereas Intelligence Quotient accounts for only about 20%. According to Salami (2007) students who are emotionally intelligent are believed to be better able to place themselves in a positive state of mind, and are likely to understand and know how to avoid dysfunctional emotions, regulate their motions and use them in adaptive ways to ease feelings of academic frustrations. Emotional intelligence has been found to be positively and significantly correlated with academic performance ( Adetayo and Kiadese, 2011; Oyewunmi, Osibanjo and Adeniji, 2016; Ramesh, Samuel and Ramkumar, 2016).

In accordance with Yazici, Seyis and Altun (2011) emotional intelligence is one of the factors that is recently believed to affect academic achievement. But Salleh and Othman (2014) citing Brearley (2001) indicated that emotional intelligence can be learnt even if it cannot be taught. Again, according to Brackett, Rivers, Reyes and Salovey ( 2010), Mayer and Salovey (2004) students can be made to learn and develop emotional knowledge and skills by teaching them emotional intelligence. Goreyshi, Kargar, Noohi and Ajilchi (2013) also reported that students who received instructions following combined mastery-cooperative learning had a significant increase in emotional intelligence. This therefore suggest the need for teachers to creatively create classroom instructions that can incorporate strategies and activities or exercises that can give students ample opportunities of learning emotional intelligence or skills and as well improve their academic performance.

Though studies have disclosed the potentials of cooperative learning in enriching academic achievement and positive interrelationship among students, there is rarity of research into how Student Teams Achievement Division (STAD) type of cooperative learning influences both emotional intelligence and academic achievement of secondary school chemistry students, hence the call for this study.

## 1.2. Research Question (RQ)

**RQ1**: What is the mean level of students' perception of their emotional intelligence before and after instructions in both the experimental group (who received chemistry instruction through STAD- a cooperative learning technique) and control group (who received the instruction as a normal class)?

**RQ2**: What is the mean achievement score of the students who received chemistry instruction

through STAD- a cooperative learning technique (experimental group) and the students who received the instruction as a normal class (control group).

## 1.3. Hypotheses

The null hypotheses of this study are:

**Ho1:** The variation in the posttest mean scores in emotional intelligence between students who received chemistry instruction through STAD- a cooperative learning technique and the students who received the instruction as a normal class is insignificant.

**Ho2**: The mean posttest achievement score of students who received chemistry instruction through STAD- a cooperative learning technique did not differ significantly from that of the students who received the instruction in a normal class.

## 2.0 Review Of Literature

## 2.1 Meaning and characteristics of cooperative learning.

Cooperative learning encompasses those instructional methods in which teachers arrange or put students into small groups to work together and helping one another to learn academic contents (Slavin, 2011). It is a type of teaching and learning strategy where students who are carefully arranged into small groups socialize, learn, work together, and exchange ideas to accomplish a common learning task to the benefit of each and every member of the group.

Cooperative learning is usually identified or characterized by five basic elements. The first is *positive interdependence*. Positive interdependence denotes that students must work together as a group so as to achieve the group task. Positive interdependence enables students to contribute and share resources, have and perform complementary functions or tasks, and offer the necessary support to ensure the success of the group. The second is *face-to-face interaction*. This can be in the form of verbal or non-verbal interaction endows the group members with the prospect to promote and achieve group success by supporting each member's efforts (via teaching and assisting one another, encouraging and praising one another, and exchanging of ideas and opinions) in relation to the group learning task.

The third element is *individual accountability*. Individual responsibility implies that each student in the group is accountable for his and his group success or failure. The performance of the individual students in a group must be evaluated on individual basis and then collectively as a group. Therefore, it is very imperative that no student in the group is a loafer rather every one of them must have a hand in his or her success as well as the success of the group by partaking actively in his or her assigned roles or tasks and group activities. They must take learning seriously, contribute ideas, encourage and care for each other. The fourth factor is *interpersonal and social skills.* These skills counted in skills in decision making, conflict resolution, trust building, accepting and supporting each other, leadership, and communication (Johnson et al, 2006). Students need to be taught these skills to promote friendliness among them. According to Johnson et al., (2006 and 2008) students must possess these skills to enable them work congenially to achieve reciprocated goal or benefit. They asserted that students who are more socially skilled tend to have higher achievement in cooperative groups tends to be (Johnson et al., 2008). The fifth characterizing feature of cooperative learning technique is group processing. Group processing entails that members of the group must come together to discuss, evaluate and reflect on the success or failure of the group congruent with the group goals. Group processing enables the group members to ascertain what worked well and need to be maintained and what did not work that need to be either improved upon or shelve.

There are many types of cooperative learning of which Student Teams Achievement Division (STAD) is among. STAD as a type of cooperative learning method was advanced by Slavin and his colleagues. According to Slavin (1995), implementation of STAD requires five chief steps, namely: presentation of lesson to the entire class, team study i.e. dividing the class into small groups or team of four to five students of heterogeneous abilities to study the lesson exposed or presented to them, quizzes, improving individual student or group member scores,

and team recognition. It is a type of cooperative learning technique in which the teacher presents new lesson to students and allow them to read and take in the learning material(s) in their team of four to five students so that every member of the team learn and master the material(s), and take both individual and group tests (or quizzes) on the lesson, after which teams having good performance are recognized and rewarded by the teacher.

## 2.2 Concept of Emotional intelligence

Human intelligence which factually alludes to knowledgeability, reasoning, thinking, and learning can be adjudged as the ability of an individual to think abstractly or to learn and acquire certain knowledge, skills and attitude to solve problem or cope with something of novelty as well as adapting to changes in his/her environment. Psychologist like Sternberg (1985;2004) along with psychological theories on intelligence such as the theory of fluid and crystallized intelligence (Cattel, 1963) and that of multiple intelligences (Gardener,1993) consider intelligence to be of many facets, and consisting of general and many specific abilities, with general abilities (intelligences) higher in rank than the specific ones. A domain in the affective component of intelligence is emotional intelligence. Goleman (1998) noted emotional intelligence (EI) as one important component of intelligence that has much influence on students' academic success or performance when compared with intelligent Quotient (IQ). To him, IQ only accounts for 20% of one's entire success while Emotional Intelligence (EI) and social intelligence account for the rest. In like manner, Bilimoria (2009) found EI to be two times as important as the combination of IQ and technical expertise and four times as important as IQ for one's overall success.

Although the notion of emotional intelligence (EI) could be regarded to appear out of Thorndike (1920) concept of "social intelligence" which expresses the ability of a person to understand and muddle through other's emotions as well as the person's capacity to socialize and work with others, the univeralization of the concept was made possible following the publication of different models of EI by Goleman (1995 and 1998), Salovey and Mayer (1990), and Bar-On (1988).

Goleman (1995) describe EI as the capability of an individual to appreciate, manage, adjust and motivate self and others feelings. Again, Goleman (1998) stated that EI entails individual-awareness, individual- management, group awareness together with relationship management. To Bar-On (1988) emotional intelligence encompasses one's understanding, explanation and control of self-feelings, relationship with others, and solving individual and social problems. These elements of emotional intelligence pinpoint what Gardener (1993) referred to as intrapersonal and interpersonal intelligences which are two of the eight intelligences in Gardner (1993) model of multiple intelligences. Whereas interpersonal intelligence refers to the competency of an individual to comprehend and react properly to another individual's needs, motivation, frame of mind (such as attitude, temperament, mood) in conjunction with how to work and cooperate with others, intrapersonal intelligence implies one's prowess to realize and control his own desire, frame of mind, strengths and weaknesses in order to guide his behavior for a functional living. Accordingly, Salovey et al (1990) view EI as one's ability to perceive and examine his own and other's emotions, and use the knowledge obtained to direct his thinking and bahaviour or action. They also identify self-awareness, emotional management, self-motivation, and interpersonal skills as components of emotional intelligence.

EI is the capacity of an individual to be precisely knowledgeable of himself and others, establish and maintain cordial relationships with others as well as the capacity to effectually collaborate along and work harmoniously with others in achieving mutual results. And when used in the academic domain, EI has a lot to do with numerous influences that may affect or facilitate students' sentiments or emotion and academic success. Thus, students' emotional intelligence can be considered as students' recognition, monitoring and controlling of their personal as well as other's feelings, temperament and behaviour with the aim of advancing

their academic success.

## 2.3 Empirical Studies

### 2.3.1 Cooperative learning techniques and students' academic achievement

Researchers have reported the benefits and effects of different forms of cooperative learning technique or pedagogy on students' learning of course or subject contents alongside students' academic achievement. For example, in a study conducted by Joshi and Bhatnagar (2015) on 140 class VIII students to determine the effects of cooperative learning oriented instruction on the achievement of secondary school students, they pointed out that cooperative learning oriented instruction or teaching is significantly effective than the traditional teaching method in enriching the achievement of students in chemistry.

Tran (2013) investigated the effect of STAD type of cooperative learning on seventy four (74) 9th grade mathematics students academic achievement and attitude towards the subject in one of the high schools in Vietnam and the result recorded showed that after instructions students in the experimental group who were instructed using STAD had posttest score that is significantly higher than the score obtained by students in the control group who were instructed through lecture based method.

Tanel and Erol (2008) assesses the effectiveness of cooperative learning technique and conventional teaching method on achievement and retention in magnetism- a Physics course using students from a university in Turkey as participants, in which the experimental group received instructions on magnetism through jigsaw learning technique during which the control group obtained theirs through lecture method. At the end of the instructional/treatment period, a posttest was given to students followed with a delay-test after four weeks interval, and the results showed that both the posttest mean score and delay test mean score of the jigsaw group were significantly higher than those of the control group. Further scrutiny of the posttest scores and delay posttest scores of each group indicated that four weeks after the treatment, the experimental group students had an overall average of 98% retention of knowledge against the control group with about 80%.

Zakaria, Solfitri, Daud, and Abidin (2013) quasi-experimental study on 61 Form Three students in secondary school in Pekanbaru, Indonesia to examine the consequence of learning through cooperative learning method on mathematics students' achievement uncovered that students in the cooperative learning group had significant gain in their mean achievement score in mathematics, gained higher level of understanding of mathematics contents in addition to developing more motivation and self-confidence than their contemporaries in the control set.

Sahin (2010) utilize a pretest and posttest quasi-experimental plan to study the effects of Jigsaw III on achievement, and retention, of 71 Turkish sixth-grade students in a Turkish course. The study went on over an interval of 6-weeks. Results from the t-tests revealed that students in the jigsaw group had a better achievement score on the achievement test (p <.001) than those in the lecture learning group. The jigsaw produced a long-term effect on achievement as students in the group also had better achievement than the control group participants in the delayed test. Cheng (2006) undertook a comparative study on the effects of STAD and traditional lecture teaching on the academic performance of tertiary students in an English course in Taiwan and reported the students in the STAD to be superior as they perform significantly higher on posttest scores than students in the usual lecture group.

In a study in South Africa which lasted over 12 weeks, Wyk (2010) determined the effects of one form of cooperative learning called Teams-Games-Tournaments (TGT) on the achievement alongside knowledge retention of 110 economics education students and found out that students in the TGT had greater mean scores in both posttest and delay test than their contemporaries in the lecture teaching group.

The study by Hwang, Lui and Tong (2005) employed a 2 x 2 experimental design to explore the effect of cooperative learning on the learning outcomes of 172 accounting students in a

major Hong Kong university, and showed that students taught under the cooperative learning setting proved superior in performance as they were able to answer the questions that sought for indirect applications better than the students in the lecture group. In addition, the cooperative learning group students earned a significant higher posttest score than the control group.

Luu (2010) carried out a study which lasted over 7weeks to determine the effect of Learning Together on reading competence using a sample of 77 Vietnamese tertiary students, and discovered higher posttest scores in reading competence among the students in the cooperative learning (i.e. Learning Together) group against the comparison group.

Sachs, Candlin, Rose, and Shum (2003) examined Learner behavior and language acquisition through cooperative learning in the EFL/ESL secondary classroom; and the results revealed no significant difference in oral performance scores amid students in cooperative learning groups and in lecture teaching groups. In a quasi-experimental study which aimed at teaching students' performance and attitude, Zain, Subramaniam, Rashid, Shani (2009) utilized 61Malaysian tertiary students in an Economics course to investigate how STAD affects the achievement of students. The study lasted for a semester and the outcome showed that the posttest achievement scores of the STAD group do not differ significantly from that of the traditional teaching group.

A six week study carried out by Tan, Sharan, and Lee (2007) in Singapore compared GI method with the conventional teaching method in terms of their impacts on the achievement of Geography students in secondary school. Result revealed that students in the lecture-based instructional groups significantly outclass those in GI method groups. Regardless of the efficaciousness of cooperative learning and its seamless academic, social and psychological benefits, the impact of cooperative learning on emotional intelligence and academic achievement of students has not been clearly characterized, specifically in the area of science teaching and learning.

## 2.3.2 EI and academic achievement

On the effects of EI on students academic achievement, results of various investigators that have examined the effects of EI on (or its nexus with) academic achievement remain inconclusive. Singh, Singh & Singh (2009) investigate the influence of emotional intelligence and learning style on the academic achievement of students and registered a positive but significant relationship between EI and Grade Point Average, (GPA) and also amid learning styles and GPA. In the study, Singh, Singh & Singh take advantage of two instruments- the Visual, Aural, Read/Write, and Kinesthetic (VARK) for assessing learning styles and the Self-Report Emotional Intelligence Test (SREIT) for rating emotional intelligence which were administered on a stratified random sample of 389 university students. In one study in a University in South- Weat Nigeria, Oyewunmi et al (2016) adopted a survey design and a sample of 152 final year undergraduates to determine the link associating emotional intelligence with academic performance and found that each of the variables (i.e. intrapersonal relationship, interpersonal relationship, stress management, adaptability, and general mood) that constitute emotional intelligence significantly correlate with CGPA, the variable taken for academic performance.

Malik and Shahid (2016) examined how emotional intelligence relates with the academic performance of students in the business department of one of the largest universities in Pakistan, and reported that the relationship between the variables- emotional intelligence and academic performance was weak. Yet, there was considerable improvement in the link between the variables over the years as significant difference was observed in favour of the final year when the relationship existing between the variables in first year and that of final year was compared. In this study, data was obtained from 325 students (comprising 48 % first year and 52 % final year) in three of the five business-related departments using TEIQue SF (i.e.Trait Emotional Intelligence Questionnaire Short Form) to measure students' emotional

intelligence and GPA as measure of academic performance, and the data analyzed through Hierarchical regression method.

Ramesh et al (2016) carried out a review of several studies on the impact of EI on the academic achievements of students in general and college students in particular, and discovered that the correlation of EI with academic achievement among students was positive.

Hossein, Razieh , Abdolhamid, and Hamideh (2015) examined the relationship among EI, creativity and academic achievement of high school students in Nikshahr using all students in second period high school in the 2013-2014 academic session as the population of the study, from which a sample of 318 students was randomly selected.

In this study, the researchers made use of Mayer Salovey Caruso Emotional Intelligence Test (1995), Creativity Questionnaire (Sultani) were used to collect data while data on students' academic achievement were obtained from their GPAs in the 2013-2014 academic session. Using both descriptive (frequency table, frequency, and charts) and inferential statistics (independent t-test and Pearson correlation coefficient)in the analyses of data obtained, the results showed among other findings that EI and academic achievement were significantly correlated.

In one study to examine the EI and academic achievement of adolescents in Tirupati Town, Kalapriya and Anuradha (2015) used 100 college students made up of male and female in the ratio of 1:1 who responded to emotional intelligence scale devised by Mangal and Mangal (2014) and they divulge that the academic performance of students that are emotionally intelligent was better than that of the students who are not emotionally intelligent.

Banat and Rimawi (2014) studied the effect of EI on the academic achievement of 370 full time undergraduate students of Al-Quds University during the 2012/2013 academic year and found that 75.2% of the participants were emotionally intelligent. They also found that a positive relationship exist between EI and academic or scholastic achievement.

In contrast to the findings above, Jenaabadi (2014), Izaguirre (2008) reported no relationship between EI and academic achievement. In a study on the relation among EI, self esteem and educational achievement, Jenaabadi (2014) administered Bar-on's emotional intelligence questionnaire and Pop's self-esteem questionnaire on 300 M.A degree students (comprising females and males in the ratio of 1:1) that are randomly selected out of a population of 2000 M.A students in Kahnooj Payam-e Nour University. And from the results of analysis of data, the researcher conveyed that emotional intelligence and self esteem of students had no significant relationship with academic achievements.

Izaguirre (2008) reported no relationship between overall emotional intelligence and GPA (i.e student' academic achievement). However, he found a relationship existing amid academic achievement and EI subscales of social responsibility and problem solving. In the same vein, Meshkat (2011) obtained a weak relationship between emotional intelligence and academic success ($r = 0.161$ at $p < 0.05$) and assume the relationship existing among the variables to be non significant. Despite the disagreeing findings on the association between emotional intelligence and academic success the reviewed literature has shown that students' learning and academic success have a link with overall emotional intelligence or the subscales of emotional intelligence.

## 2.4 Theoretical Framework

The framework of this research works is based on the social cognitive theory proposed by Bandura (1986) and the theory of multiple intelligences proposed by Gardner (1983).

Social cognitive theory of learning as an extension of the social learning theory proposed by Albert Bandura (Bandura, 1977) viewed learning as a product of the interaction between social factors and active mental (or cognitive) processes or factors. By this theory one's belief, attitude, self-perception, expectations and knowledge can be enhanced through observation and modeling of others actions and consequences in a social setting including

school. This theory emphasizes the interaction between the social environment (such as physical setting, resources, consequences of actions and other people) and personal factors (such as self-perception, beliefs, attitude, knowledge and expectation) to bring about learning. Multiple intelligence peer theory is centered on the viewpoint that individuals have various abilities and aptitudes. Gardner (1983) categorized intelligence into intrapersonal intelligence and interpersonal intelligence. According to Gardner and Hatch (1989) an individual is intra-personally intelligent when he is able to understand, manage and guide his own feelings, desires, strength and weaknesses, while interpersonally intelligent person has the capacity to perceive and react adequately to the feelings, moods, temperaments, motivations, and desires of other people.

The two theories above give priority to learning via assisted learning and interaction such as cooperative or collaborative learning. Slavin (1987) posited that there are two theoretical views about cooperative learning. These are cognitive and motivational. The cognitive perspective of cooperative learning assumes that cooperative learning enhances critical thinking and development of metacognition i.e. indepth and complex levels of understanding while the motivational theory of cooperative learning emphasizes the students' incentives or need to do group academic work for the benefit of the group and the individual members. And so, this study assumed that because individuals have different abilities or intelligences, STAD type of cooperative learning will encourage interaction, socialization and motivation among students, and thus influence the motives, beliefs, modes, emotions, thinking and academic success of students as they (the students) learn from one another.

## 3.0 Methodology

### 3.1 Design

This research adopted both survey design and pretest posttest nonequivalent control group quasi-experimental design. The survey allows data to be collected at a particular point in time to describe the nature of current conditions of the subjects (participants). The survey was used to provide a quantitative picture of the participants and to determine the present status of the participants with respect to emotional intelligence under study.

Survey allows for the examination and expression of the needed attributes or characteristics of the participants so as to obtain the information about how the characteristics are distributed and interrelated. The pretest posttest nonequivalent control group quasi-experimental design allows the manipulation of independent variables as to determine the effect on dependent variables and it involves the experimental and the control groups.

### 3.2 Participants

The participants consisted of 158 students drawn from four intact classes in two randomly selected Senior Secondary Schools in Port Harcourt Metropolis, Rivers State. The participants were not randomized rather intact classes were randomly designated as experimental group (N=81) and comparison or control group (N=77).

### 3.3 Instruments

The instruments used for the study are:

(i) BarOn Emotional Quotient Inventory: Youth Version, BarOn EQ-i:YV (BarOn and Parker, 2000). BarOn EQ-i:YV is a self-reported instrument designed to assess the emotional and social intelligence of youths (children and adolescents) aged 7 to 18years. BarOn EQ-i:YV contains 60 items dispersed into 7 scales which includes: Total Emotional intelligence (interpersonal, intrapersonal, Adaptability and Stress management),General mood, Positive impression, and inconsistency index. It was developed on a 4-point Likert Scale format: Very Seldom True of me (1point), Seldom True of me (2points), Often True of me (3points), Very often True of me (4points).

(ii) Students' Achievement Test in Chemistry (SATIC): SATIC is a 50 item objective test questions consisting of 20 multiple choice test and 30 short answer / completion tests.

The questions were selected from the 2015, 2016 and 2017 Chemistry Paper 2 of the Senior School Certificate Examinations managed by the West African Examination Council (WAEC) and National Examination Council (NECO).

3.3.1 Reliability and validity of instruments

Although the BarOn EQ-i:YV is a standardized instrument, it was administered to 50 students who were not participants in the study and by using Cronbach's alpha technique, the reliability coefficient of BarOn EQ-i:YV was 0.73. Similarly, SATIC was trial tested on the same 50 students, and by the application of Kudder-Richardson Reliability formula 21 (KR-21) an overall internal consistency coefficient of SATIC was 0.80.

**3.4 Research Procedure**

In the first week of this study, the instruments, BarOn EQ-i:YV and SATIC were administered as pretest to students in the experimental and control groups. Students in the experimental unit or group were given introductory lessons on cooperative learning centered on the five basic elements or characteristics of cooperative learning- positive interdependence, promotive or face-to-face interaction, individual accountability, social skills and group processing as enunciated by Johnson et al (2008). Afterwards, the students in the experimental unit were allocated randomly into subgroups or teams of four or five students each and allowed to work as a team in their groups. From the second week, students in the experimental set as well as in the control set were taught the same subject matter (carbon compounds) by the same researchers. However, while the control group was taught as a whole or normal class using the traditional mode of instruction involving discussion and demonstration and were not allowed to engage in any form of cooperative learning activities, the experimental group engaged in cooperative learning activities via Students Achievement Division (STAD) type of cooperative learning technique as follows:

- Students were exposed to the lesson/topics via discussion, lecture and demonstration methods of teaching.
- At the close of every unit of instruction each team was presented with the learning material, assignment and worksheet, and every member of the team allowed to work cooperatively with one another by discussing, teaching one another, pair checking and exchanging their ideas to achieve the group goal.
- And, at the beginning of a new unit of instruction students were given short test (quiz) on the previous lesson (unit of instruction) for them to respond individually devoid of any help from their team or group members.
- The quiz scores of all members or participants in the team were summed to determine the average score of the team.
- Based on the average score of each team the best four groups were rewarded.

At the end of the eight weeks of instruction, posttest (comprising BarOn EQ-i:YV and SATIC) was administered to every individual students in the experimental plus the control groups.

**3.5 Method of Data collection and Analysis**

Data of this study were collected through the administration of BarOn EQ-i:YV and SATIC each as pre-test and post-test. Both Descriptive (mean and standard deviation) and inferential statistics (ANCOVA) were used in the analysis of data by utilizing IBM SPSS Statistics 20. The stated hypotheses were tested at $p < .05$.

**4.0 Results/Discussion**

**4.1 Results**

**Research Question 1**: What is the mean level of students' perception of their emotional intelligence before and after instructions in both the experimental and control group?
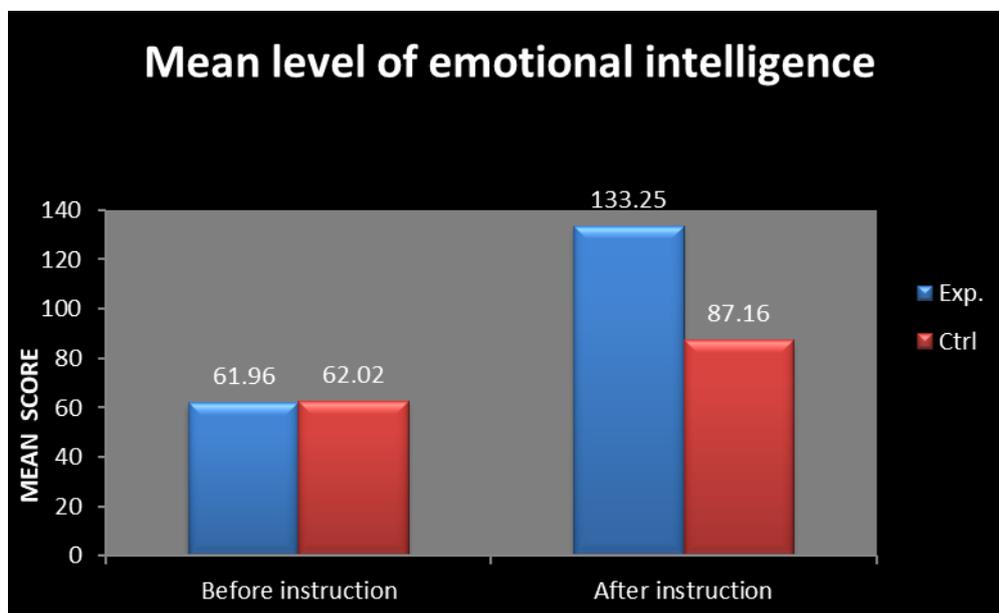
Fig.1: Mean level of students' emotional intelligence before and after chemistry instructions in both experimental and control groups.

**Research Question 2:** What is the mean achievement score of the experimental group and control group students in pre and post student achievement test in Chemistry?

**Table 1: Mean pretest, posttest and mean gain of SATIC scores**

| Instructional Groups | Experimental Group | | | Control Group | | |
|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | N | Mean | Std. Deviation | N |
| **Posttest** | 59.3086 | 6.90587 | 81 | 51.0390 | 2.69718 | 77 |
| **Pretest** | 42.2593 | 4.73228 | 81 | 43.1948 | 4.23345 | 77 |
| **Mean Gain** | 17.4521 | | | 7.8442 | | |

**Ho1:** The variation in the posttest mean scores in emotional intelligence between students who received chemistry instruction through STAD- a cooperative learning technique and the students who received the instruction as a normal class is insignificant.

**Table 2: Summary of ANCOVA of post EI test score by treatment groups**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| **Corrected Model** | 126476.269[a] | 2 | 63238.135 | 38.474 | .000 | .332 |
| **Intercept** | 72089.421 | 1 | 72089.421 | 43.859 | .000 | .221 |
| **PreEI** | 42048.724 | 1 | 42048.724 | 25.582 | .000 | .142 |
| **Groups** | 86511.911 | 1 | 86511.911 | 52.633 | .000 | .253 |
| **Error** | 254768.338 | 155 | 1643.667 | | | |
| **Total** | 2317764.000 | 158 | | | | |
| **Corrected Total** | 381244.608 | 157 | | | | |

**Ho2**: The mean posttest achievement score of students who received chemistry instruction through STAD- a cooperative learning technique did not differ significantly from that of the students who received the instruction in a normal class.

**Table 3: Summary of ANCOVA of post SATIC by treatment groups.**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| **Corrected Model** | 2752.866[a] | 2 | 1376.433 | 49.445 | .000 | .389 |
| **Intercept** | 4207.173 | 1 | 4207.173 | 151.131 | .000 | .494 |
| **Pretest** | 53.286 | 1 | 53.286 | 1.914 | .168 | .012 |
| **Groups** | 2749.439 | 1 | 2749.439 | 98.766 | .000 | .389 |
| **Error** | 4314.881 | 155 | 27.838 | | | |
| **Total** | 489870.000 | 158 | | | | |
| **Corrected Total** | 7067.747 | 157 | | | | |

a. R Squared = .389 (Adjusted R Squared = .382)

## 4.0 Findings/Discussion

The results are discussed under the following sub-headings

### 4.1 Emotional intelligence

Results presented in figure 1 showed that before the commencement of instructions, students in the experimental group and control group respectively had a mean of 61.96 and 62.02 levels of perception of their emotional intelligence indicating a mean difference of 0.06 to the benefit of the control group. However, after instructions, the experimental group had a mean of 133.25 while the Control group had a mean of 87.16. This gave a mean difference of 46.09 to the benefit of the experimental group. Meaning that after the instructions, students in the experimental group exposed to chemistry lessons using STAD technique had a higher mean level of awareness of their emotional intelligence than their colleagues in the control group. Again, results of ANCOVA of post emotional intelligence test scores presented in table 2 indicated a statistically significant difference $(F_{(1, 157)} = 52.633; p = .000)$ between the groups. This finding is in disagreement with the stated null hypothesis 1 which predicted no significant variation in the mean emotional intelligence test score between students who received chemistry instructions through STAD and the students who received the same instruction in a normal class. Hence the null hypothesis 1 is unacceptable. However, the finding is in congruence with the finding of earlier researches (Brearley, 2001 cited in Salleh et al, 2014; Yazici et al, 2011; Brackett et al, 2010, Mayer et al, 2004) who indicated that students can be taught or made to learn and develop emotional knowledge intelligence and skills. This result is not doubtful as students in the cooperative learning group were found to have more interactions, positive relationships, empathy and respect for each other and more prosocial behavior that enable them work harmoniously as a team to achieve their goal(s). These students have been recognized to be friendly and non-aggressive with their peers and colleagues (Brackett, Rivers, and Salovey, 2011). They freely associate, socialize and share ideas, academic behaviour and lifestyle with their classmates. This kind of association between peers contributes to their intellectual development leading to better academic performance.

## 4.2 Achievement

The results presented in table 2 indicated that the experimental cohort had a mean gain of 17.4521 between the pre SATIC mean score (42.2593) and post SATIC mean score (59.3086) which is higher than that of the control group whose mean gain between the pre SATIC mean score ( 43.1948) and post SATIC mean score (51.0390) is 7.8442.

The ANCOVA analysis presented in table 3 disclosed a statistically significant difference in post SATIC scores ($F (1, 157) = 98.766$; $p = .000$) between the experimental group and the control group. The results showed that the higher academic gain in the Students' Achievement Test in Chemistry, SATIC posttest scores of the experimental cohort (which had been taught through STAD type of cooperative learning technique) culminated into the significant difference in academic achievement between the experimental group and the control group and hence show the superiority of STAD-cooperative learning method of instruction on academic enhancement over the lecture based teaching. This finding is in disagreement with the stated null hypothesis 2 which predicted that the mean achievement score of students who received chemistry instruction through STAD did not vary significantly from that of the students who received the same instruction in a normal class. This result is harmonious with the findings of previous researches (Tran, 2013;Yamarik, 2007;Kilic, 2008; Doymus, 2008; Doymus et al., 2010; Sahin, 2010) indicating that cooperative learning results in higher academic achievement. The higher academic achievement of students in the cooperative learning group is believable because the students in this group were found to be supportive of one another, offering help to each other and encouraging each member to learn through active participation in group activities and in exchange of ideas. This support enables students to be enthusiastic about learning and thus promote academic success. In addition, cooperative learning provides an emotionally positive learning ambience as a foundation for both academic engagement and achievement (Reyes et al., 2010 cited in Brackett et al, 2011).

## 5.0 Conclusion

The present study has proven that cooperative learning method (STAD) does not only enhance academic success; but also encourage positive social relationships among members of the group and thereby warrant students' awareness, understanding and development of their emotional intelligence as well as their intrapersonal and interpersonal intelligence, emotions and needs.

## 6.0 Implications of the study

Ideal teaching and learning is a mutual and reversible transaction between the teacher, the learner, and the curriculum. Thus, the way the school or classroom environment supports learning and development depends upon the curriculum and how teachers and students perceive, integrate, understand and utilize or manage their individual along with other's emotions and feelings in relation to academic issues.

One unmistakable implication of this study in teaching and learning is that teachers can improve students' academic achievement as well as emotional intelligence and skills required to operate successfully in a society when they employ a good teaching strategy. And so, teachers should be ingenious in adopting or adapting teaching strategies that can facilitate the infusion of emotional intelligence in teaching and learning process.

Another implication of this study is the need for School curriculum planners in conjunction with curriculum designers to put in place a curriculum that will incorporate ways of developing and enhancing students' emotional intelligence in our educational institutions. Furthermore, this study has uncovers the fact that through improving and developing students' competencies such as interpersonal skills, teamwork, communication and problem solving skills, value will be added to their intellectual capabilities making them more employable (Spowart, 2009).

# References

Adesoji, F. A. & Ogini, A. M. (2012). Students' aptitude indices as predictor of learning outcomes in chemistry. *British Journal of Arts and Social Sciences, 8* (11), 174 – 182.

Adetayo, J. O. & Kiadese, A. L. (2011). Emotional intelligence and parental involvement as predictors of Academic Achievement in Financial Accounting. *American Journal of Social Science and Management Sciences, 2*(1), 21-25.

Akinsola, M.K. & Olowojaiye, F.B. (2008). Teacher instructional methods and student attitudes towards mathematics. International Electronic Journal of Mathematics Education, 3(1): 61-73

Ahmad, Z. & Mahmood, N. (2010). Effects of Cooperative Learning vs. Traditional Instruction on Prospective Teachers' Learning Experience and Achievement *Journal of Faculty of Educational Sciences, 43*(1), 151-164.

Aniodoh, H. C. O. & Eze, G. N. (2014).Achieving effectiveness in secondary school chemistry classroom using constructivist approach. A case study of physical and chemical changes. *Proceedings of the 55ᵗʰ Annual Conference of STAN,* pp. 247 – 252.

Banat, B. Y. I. & Rimawi, O. T. (July, 2014). The impact of emotional intelligence on academic achievement : Case study of Al-Quds university students. *International Humanities Studies, 1*(2), 12 – 39.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought and actions: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bar-on, R. (1988). *The development of an operational concept of psychological well-being:* Unpublished Doctoral Dissertation. Rhodes University: South Africa.

Brackett, M. A., Rivers, S. E., & Salovey, P. (2011). Emotional intelligence: Implications for personal, social, academic, and workplace success. *Social and Personality Psychology Campus, 5*(1), 88-103.

Brackett, M. A., Rivers, S. E., Reyes, M. R., & Salovey, P. (2010). Using emotional literacy to improve classroom social-emotional processes. Presented to WT Grant∕Spencer Grantees' Meeting. Washington, DC.

Bilimoria,D. (20009). Introduction to emotional intelligence: Power point lecture presented at Weather School of Management at Case Western University.

Cattel, R. B.(1971). Theory of fluid and crystallized intelligence: A critical experiment. *Journal of Educational Psychology, 54*, 1-22.

Cheng, H. (2006). A comparison between cooperative learning and traditional, whole-class methods-teaching English in a Junior College. *Academic Journal of Kang-Ning, 3*, 69-82.

Doymus, K. (2008). Teaching Chemical Equilibrium with Jigsaw Technique. *Res Sci Educ, 38*, 249-260. http://dx.doi.org/10.1007/s11165-007-9047-8

Doymus, K., Karacop, A. & Simsek, U. (2010). Effects of jigsaw and animation techniques on students' understanding of concepts and subjects in electrochemistry. *Education Tech Research Dev,* 58, 671-691. http://dx.doi.org/10.1007/s11423-010-9157-2

Gardner, H. (1993). *Frames of Mind. The Theory of Intelligence. 10ᵗʰ Anniversary Edition.* New York: Basic Books. .

Goleman, D. ( 1998). *Working with emotional intelligence*. New York: Bantam Books.

Goleman, D. (1995). *Emotional intelligence: Why It can matter more Than IQ?* New York: Bantam Books.

Goreyshi, M. K., Kargar, F. R., Noohi, S. & Ajilchi, B. (2013). Effect of combined mastery-cooperative learning on emotional intelligence, self-esteem and academic

achievement in grade skipping. *Procedia-social and Behavioural Sciences, 84,* 470-474.

Hossein, J., Razieh, S., Abdolhamid, E. & Hamideh, K.(2015).Examine the Relationship of Emotional Intelligence and Creativity with Academic Achievement of Second Period High School Students. *World Journal of Neuroscience, 5*, 275-281.

Hwang, N.-C.R., Lui, G., & Tong, M. Y. J. W. (2005). An Empirical Test of Cooperative Learning in a Passive Learning Environment. *Issues in Accounting Education, 20*(2), 151-165. http://dx.doi.org/10.2308/iace.2005.20.2.151

Izaguirre, R. (2008). The Relationship among Emotional Intelligence/Academic Achievement and Demographic Characteristics in First Year Community College Students. *Retrieved on 28/07/2012 from http://www.grin.com/en/doc/254986...*

Jenaabadi, H.(2014). Studying the relation between emotional intelligence and self-esteem with academic achievement. *Procedia - Social and Behavioral Science,114,* 203 – 206.

Jensen, M., Moore, R., & Hatch, J. (2002). Cooperative Learning - Part I: Cooperative Quizzes. *The American Biology Teacher, 64*(1), 29-34. http://dx.doi.org/10.1662/0002-7685(2002)064[0029:CLPICQ]2.0.CO;2

Johnson, D. W., & Johnson, R. (2006). *Joining Together: Group Theory and group skills.* (7th ed.). Boston: Allyn & Bacon.

Johnson, D. W., & Johnson, R. T. (2008). Social Interdependence Theory and Cooperative Learning: The Teacher's Role. In R. M. Gillies, A. Ashman & J. Terwel (Eds.), *Teacher's Role in Implementing Cooperative Learning in the Classroom* (pp. 9- 37).

New York, U.S.A: Springer. http://dx.doi.org/10.1007/978-0-387-70892- 8_1

Joshi, S. K., & Bhatnagar, S. (2015). Effects of cooperative learning oriented teaching on the academic achievement o f secondary level students. *Scholarly Research Journal for Interdisciplinary Studies,3*(17), 3015-3023.

Kalapriye, C. & Anuradha, K. (June, 2015). Emotional intelligence and academic achievement among adolescents . *International Journal of Advanced Research in Management and Social Sciences, 4*(1), 11 – 17.

Low, G. R., & Nelson, D. A. (2004). Emotional intelligence: Effectively bridging the gap between high school and college. *Taxas Study Magazine for Secondary Education Spring Edition.*

Luu, T. T. (2010). Infusing Cooperative Learning into an EFL Classroom. *English Language Teaching, 3*(2), 64-77. [Online] Available: http://www.ccsenet.org/journal/index.php/elt/article/view/6240/5012

Malik, S. Z and Shahid ,S (2016) Effect of emotional intelligence on academic performance among Business Students in Pakistan. *Bulletin of Education and Research,38*(1), 197-208.

Melihan, U., & Siri, A. (2011). The effect of cooperative learning method on the students' success and recall levels of the 8th grade students learning in permutation and probability subject. *Journal of Kirsechir Education Faculty, 12,* 1- 16.

Ning, H . & Hornby, G. (2014). The impact of Cooperative Learning on tertiary EFL Learner's Motivation. *Educational Review , 66*(1),108 – 124. Doi:10.1080/00131911.2013.853169

Oyewunmi, A. E ., Osibanjo, A. O . & Adeniji, A. A. (2016) Emotional Intelligence and Academic Performance of Undergraduates: Correlations, Implications and Interventions .*Mediterranean Journal of Social Sciences, 7( 1), 509-516.*

---

Pasi, R.J., 2001. Higher expectations: Promoting social emotional learning and academic achievement in your school. New York: Teachers College Press.

Pons, R., Prieto, M., Lomeli, C., Bermejo, M., & Bulut, S. (2014). Cooperative Learning in Mathematics: a Study on the Effects of the parameter of equality on academic performance. *Anales de Psicología*, *30*(3), 832-840. doi:10.6018/analesps.30.3.201231

Ramesh, S., Samuel, T. H. & Ramkumar, D. (2016) Impact of emotional intelligence on academic achievements of college students – a review. *International Journal of Business Management & Research (IJBMR), 6*(2), 25-30.

Sachs, G. T., Candlin, C., Rose, K. R., & Shum, S. (2003). Learner behavior and language acquisition project: Developing cooperative learning in the EFL/ESL secondary classroom. *RELC Journal, 34*(3), 338-369.

Sahin, A. (2010). Effects of Jigsaw III technique on achievement in written expression. *Asia Pacific Education Review,* 12(3), 427-435. http://dx.doi.org/10.1007/s12564- 010-9135-8

Salami, S. O. (2007). Relationship emotional intelligence and Job Performance of Secondary school Teachers in South Western Nigeria. *Journal of Sociology and Education in Nigeria, 6*(2), 19-37.

Salleh , Norila binti Md & Othman, Ikhsan bin (2014) The effects of integrating emotional intelligence on students' attitudes toward mathematics, International Journal of Asian Social Science, 2014, 4(9): 966-976.

Salovey, P. & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality, 9* (3), 195-211.

Singh, B., Singh, M., & Singh, K. (2009). The influence of emotional intelligence and learning style on student's academic achievement. Retrieved November 9, 2009, from http://www.scribd.com/doc/13414285/The-Influence-of-Emotional-Intelligence-and-Learning-Style- on-Students-Academic-Achievement

Slavin, R. E. (1995). Cooperative Learning: Theory, Research, and Practice, (2nd Ed.). Needham Heights, MA: Allyn and Bacon.

Slavin, R. E. (2011). Instruction Based on Cooperative Learning. In R. E. Mayer & P. A. Alexander (Eds.), *Handbook of Research on Learning and Instruction* (pp. 344-360). New York: Taylor & Francis.

Spowart, J. (2009): Hospitality Management Competencies: do Faculty and Students Concur on Employability Skills? *In Proceedings of: 16th World Association for Cooperative Education Conference, Vancouver, Canada.*

Sternberg, R. J. (2004). *Culture and intelligence. American Psychology,59,* 325 – 338.

Sternberg, R. J. (1985). *Beyond IQ:A triadic theory of human intelligence.* New York: Cambridge University press.

Tanel, Z., & Erol, M. (2008). Effects of Cooperative Learning on Instructing Magnetism: Analysis of an Experimental Teaching Sequence. *American Journal of Physics and Education, 2*(2), 124-136.

Thorndike, E. (1920). *Intelligence and Its Uses.* Harper's Magazine, *14*, 227-235.

Tran,V. D. (2013).Effects of Student Teams Achievement Division (STAD) on Academic Achievement, and Attitudes of Grade 9th Secondary School Students towards Mathematics. *International Journal of Sciences, 2*(April), 4 -15. http://www.ijSciences.com

Wyk, M., M. (2010). The effects of Teams-Games-Tournaments on Achievement, Retention, and Attitudes of Economics Education Students. *Journal of Social Sciences, 26*(3), 183-193.

Yamarik, S. (2007). Does cooperative learning improve student learning outcomes? *The Journal of Economic Education, 38*(3), 259-277. http://dx.doi.org/10.3200/JECE.38.3.259-277

Yazici, H., Seyis, S. & Altun, F. (2011). Emotional intelligence and self- efficacy beliefs as predictors of academic achievement among high school students. *Procedia Social and Behavioral Sciences, 15*, 2319-2323.

Zain, Z. M., Subramaniam, G., Rashid, A. A., & Ghani, E. K. (2009). Teaching Students' Performance and Attitude. *Canadian Social Science, 5*(6), 92-102.

Zakaria, E., Chin, L. C., & Daud, Y. (2010). The Effects of Cooperative Learning on Students' Mathematics Achievement and Attitude toward Mathematics. *Journal of Social Sciences, 6*(2), 272-275. *http://dx.doi.org/10.3844/*jssp.2010.272.275

Zakaria, E., Solffitri, T., Daud, Y., Abidin, Z. Z. (2013). Effect of cooperative learning on secondary school students' mathematics achievement. *Creative education,4(2),98-100.* *http://www.scirp.org/journal/ce;* *http://dx.doi.org/10.4236/ce.213.42014. May 10$^{th}$ 2014.*