Abstract

The objective of the present paper was to study the effectiveness of Cooperative Learning (Jigsaw strategy) on Critical thinking skills of secondary school students. Total 116 students of class 9th studying in a school affiliated to P.S.E.B were taken as sample. Data was collected by using Critical thinking skill test developed by Singh and Kumar 2012. By employing 2x2 factorial design of ANCOVA results showed that students taught through cooperative learning strategy (Jigsaw)(Mean=19.04, N=57) achieved significantly higher Critical thinking skills as compared to traditional method of teaching(Mean=16.07, N=59). Critical thinking skills were found to be independent of interaction between treatment and gender.

I. INTRODUCTION

As many other countries across the world, India is in a process of educational reform involving a change of paradigm of educational practices in general and school education in particular. Adapting the concept of life skills given by WHO, our schools have focused on development of life skills among would be citizens. These life skills are an integral part of evaluation scheme in Indian schools. Critical thinking is a major component of these skills.
The reviews related to Critical thinking give an insight on the status of Critical thinking in the present Educational Scenario. CT is a meta-cognitive process that should be inculcated from the early adolescent stage only (Alpay, 2003). Critical thinking is always considered as an integral part of school curriculum. Recently implemented Continuous Comprehensive Evaluation system has made it mandatory for students and teachers to understand the concept of critical thinking. Few training programs are launched by the CBSE to train the faculty, but still teachers are not fully aware about- how to develop CT among students and how to evaluate their process in CT. Teachers, students and administrators are in flux to find out a suitable method to develop critical thinking skills. Lee et. al.(2000) and Kawashima and Petrini (2004) have also concluded that CT is a desirable educational outcome; so to develop and practice CT, educators need to re-consider course content and curricular strategies used to develop CT.

We are witnessing a shift from a teacher dominated classroom to student centred classroom. No doubt, now a day it is a common belief that good learning is learner-centred. But still in our schools, education is perceived as a narrow repertoire of ritualised classroom behaviours and only two skills are developed: memorisation and repetition. Teacher is the center of classroom who absolutely empower the class management and usually emphasize a memorization method in teaching. This restricts the students from developing analytical skills, opinion sharing and self learning. NCF-SE (2005) emphasised that knowledge should be constructed and the approach should be learner-centred. For this, we have to move away from traditional teacher centred methods of teaching to student centred methods like cooperative learning. Cooperative learning is not new; it has been around since the early 1900's when it was used in one room school houses. Cooperative learning is one of the most remarkable and fertile areas of theory, research, and practice in education. Cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other’s learning. (Johnson, Johnson, & Holubec,1998). Although a number of Cooperative learning methods are applied in classroom teaching, a well-known and highly accepted method is Jigsaw, developed by Elliot Aronson. The jigsaw classroom is a cooperative learning technique with a three-decade track record of successfully reducing racial conflict and increasing positive educational outcomes. Just as in a jigsaw puzzle, each piece-each student's part - is essential for the completion and full understanding of the final product. If each student's part is essential, then each student is essential; and that is precisely what makes this strategy so effective (Elliot Aronson 2000-2013). In jigsaw, students of a normal-sized class are divided into groups of four to six students, each of which is given a list of subtopics to research. Individual members of each group then break off to work with the "experts" from other groups, researching a part of the material being studied, after which they return to their starting body in the role of instructor for their subcategory. The jigsaw strategy is a cooperative learning technique appropriate for students from 3rd to 12th grade. Aronson’s (2007) list of Jigsaw steps (with some modifications) explains the process in more detail:

1. Depending on the size of the class, assign a number to students to their jigsaw group.
2. Appoint leader, secretary, time keeper from each group.
3. Brief introduction of the topic by teacher to whole class
4. Divide the lesson into segments to match the number of people in each group.
5. Assign one member of each group to learn each lesson segment and provide them expert sheets.
6. Give students time to work on step 5.
7. Gather students into ‘Expert groups’. After one student from each jigsaw group joins other students assigned the same topic, again give them time to discuss their findings of step 5
8. Teacher will observe the whole process and move from group to group as a facilitator wherever needed. Oral questioning by teacher to assess accuracy of content in each expert group.
9. Bring the students back into their main groups. Once each presenter is ready, the jigsaw groups reassemble in their original Home Group and share what they’ve learnt in the expert group.
10. Each student will present a well-organized report to the Home Group. The expert in each group educates the group by teaching what they have learnt within the specialty group.
11. Secretary of the each group will present concluding report to the whole class.
12. At the end of the session, students are then tested through a quiz or a test
13. Teacher will conclude the lesson by re-teaching the material which he thinks has been misunderstood based on the individual assessment process.

Jigsaw technique, which is a greatly efficient teaching method, consists of challenging problems, participating student, and sharing their own opinions and ideas (Maritland, Latourelle, Valenti and Bookman, 2001). Review of literature reveals that CT can be taught effectively through various ways like guided discovery Learning (Smitha and Rao, 2000); inquiry based curriculum (Lampert, 2005); quality instruction with home based remediation (Malhotra, 2006); problem based learning (Sims,2008); collaborative activities (Synder and Synder, 2008) and Models of teaching (Robinson,1996). Some studies have reported that learning through cooperative learning methods had positive effect on CT skills (Rabow et al.,1994;Wesp and Montgomery,1998; Klimoviene et al.,2006; Riley and Anderson, 2006; Rumpagaporn and Darmawan,2007; Rashtchi,2007; Brooks, 2009; Raman , 2009; Guvenc , 2010). Cooperative learning has also shown significant effect on problem solving and higher order reasoning in meta analysis of 46 studies (Qin, 1995) and other higher order thinking skills (Johnson and Johnson,1989). Few Studies in which Small group activities were used also reported significant improvement in critical thinking skills (Gokhale, 1995; Elliott, 1996; Hamann et al., 2012;) Interactive environment improves critical thinking (Wang et al., 2009). Gillies (2012) reported that teaching students to ask and answer questions is critically important if they are to engage in reasoned argumentation, problem-solving, and learning. Only three
studies have reported that Cooperative learning had no effect on CT skills (Abdulgani, 2003; Bokeoglu, 2009; Goyak, 2009).

II. OBJECTIVE OF THE STUDY

- To study the effect of cooperative learning (strategy), gender and their interaction on Critical thinking skills by taking Critical thinking skills as covariate.

III. HYPOTHESES

- There is no significant difference in the adjusted mean scores of Critical thinking skills of experimental (Jigsaw strategy) and control groups (lecture/discussion method) when pre scores of Critical thinking skills are taken as covariate.
- There is no significant difference in the adjusted mean scores of Critical thinking skills of boys and girls when pre scores of Critical thinking skills are taken as covariate.
- There is no significant effect of interaction between treatment and gender on the adjusted mean scores of Critical thinking skills when pre scores of Critical thinking skills are taken as covariate.

IV. RESEARCH METHODOLOGY

i.) Sample: Random sampling technique was used to select the sample. The present study was conducted on 116 students of 9th class of Govt. high School Khasi Kalan, Ludhiana, affiliated to P.S.E.B Mohali. Both boys and girls were included in the sample for study.

ii.) Measure:

- Critical thinking skill test developed by Singh and Kumar (2012) was used to assess Critical thinking skills.
- Cooperative learning Modules based on Jigsaw strategy were also prepared by the investigator.

iii.) Experimental Design: The present study was experimental in nature. It was based on the lines of non equivalent Control group pre test-post test design.

iv.) Procedure: The study was designed to find the effectiveness of Cooperative learning (Jigsaw strategy) on Critical Thinking Disposition. Permission was taken from principal of the school for conducting the experiment. In the first step Critical thinking skill test was administered to 116 students as pre test. Two intact section of 9th class were taken and randomly one was selected as experimental group and another as control group. One group was assigned randomly to the treatment. This was termed as experimental group and the other was termed as control group. The experimental group was taught social science subject through jigsaw strategy (with modules prepared by investigator) for a period of Forty days at the rate of 60 min. per day. On the other hand control group was taught social science with the help of conventional (lecture/discussion) method for a period of Forty days at the rate of 60 min. per day. After completion of the treatment Critical thinking skill test was administered to both the groups. The extraneous variables like influence and motivation of the teacher was controlled by teaching both groups by the investigator himself.
V. RESULTS

5.1 Descriptive Analysis on Scores of Critical Thinking Skills

The Mean and S.D. were calculated for post test scores and have been placed in table 1. The means have also been depicted through bar graph.

Table 1: Group wise Mean, S.D. and N values of boys and girls on post test scores of Critical thinking skills

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>18.97</td>
<td>15.31</td>
<td>17.14</td>
</tr>
<tr>
<td>N</td>
<td>35</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>S.D</td>
<td>3.41</td>
<td>2.59</td>
<td>3.52</td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>19.14</td>
<td>17.17</td>
<td>18.11</td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td>24</td>
<td>46</td>
</tr>
<tr>
<td>S.D</td>
<td>3.85</td>
<td>4.03</td>
<td>4.02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>19.04</td>
<td>16.07</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>57</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>S.D</td>
<td>3.55</td>
<td>3.35</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Bar graph showing group wise means

From the table 1 and bar graph of the data, it was observed that mean score of the students of experimental group (N=57) was 19.04 with standard deviation 3.55 and mean score of the students of control group (N=59) was 16.07 with standard deviation 3.35. These values show that mean scores of students in experimental group were higher than that of students in control group. It may be noted from the table 1 that Mean score of Girls was 19.14, also higher than mean score of Boys 18.97.
5.2 Inferential Analysis

Before applying ANCOVA, Levene’s test was used to check that data meets the homogeneity of variance test.

Table 2: Levene’s Test of homogeneity of variance

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.173</td>
<td>3</td>
<td>112</td>
<td>.323</td>
</tr>
</tbody>
</table>

Table 2 reveals that the value of Levene’s statistic for test of homogeneity of variance is 1.173, which is not significant at .001 level with df 3/112. It indicates that there is no variance and groups are homogeneous. To study whether differences among means were statistically significant or not critical thinking skills scores were subjected to 2 x 2 ANCOVA. The results are given in Table 3

Table 3: Summary of 2x2 ANCOVA on adjusted mean scores of critical thinking skills

<table>
<thead>
<tr>
<th>Source of variance</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre_CT</td>
<td>488.082</td>
<td>1</td>
<td>488.082</td>
<td>66.202</td>
<td>.000</td>
</tr>
<tr>
<td>SSA (Group)</td>
<td>112.213</td>
<td>1</td>
<td>112.213</td>
<td>15.220</td>
<td>**.000</td>
</tr>
<tr>
<td>SSB (Gender)</td>
<td>20.303</td>
<td>1</td>
<td>20.303</td>
<td>2.754</td>
<td>.100</td>
</tr>
<tr>
<td>SS A*B</td>
<td>7.828</td>
<td>1</td>
<td>7.828</td>
<td>1.062</td>
<td>.305</td>
</tr>
<tr>
<td>SS Error</td>
<td>818.356</td>
<td>111</td>
<td>7.373</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>37241.000</td>
<td>116</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Significant at .01 level

It is evident from table 3 that reported F-value for adjusted mean scores of critical thinking skills is 15.22, which is significant at .01 level with df 1/111. It indicates that there is significant difference in adjusted mean scores of critical thinking skills between experimental and control group. Further, the adjusted mean score of experimental group taught by Jigsaw (M=19.04 ± 3.55) was significantly higher than control group taught by Traditional Method (M=16.07 ± 3.35). It may, therefore, be concluded that Jigsaw Method was significantly superior to Traditional Method in developing Critical thinking skills.

It is evident from the table 3 that reported F value for adjusted mean scores of critical thinking skills is 2.75, which is not significant even at .05 level. It means that there is no significant difference in adjusted mean scores of critical thinking skills between boys and girls students. It is evident from the table 3 that reported F value for interaction between group and gender is 1.06, which is not significant. It indicates that there is no significant difference in adjusted mean scores of critical thinking skills between boys and girls students belonging to both (experimental and control) groups.

VI. CONCLUSIONS

1. Critical thinking Skills of students taught by Jigsaw method of cooperative learning were significantly better than students taught with traditional method of teaching.
2. Gender differences were not found in Critical thinking Skills of students.
3. Critical thinking Skills of students were found independent of interaction between gender and group (teaching method).

VI. REFERENCES


FOR CITATION