

“TO STUDY THE IMPACT OF COLLABORATIVE LEARNING STRATEGY ON META COGNITION AND CRITICAL THINKING SKILL OF XI STANDARD STUDENTS IN BIOLOGY”

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ABSTRACT: *Effective teaching learning process in a classroom is the result of the different strategies used by the teacher to teach a particular concept in a particular subject to a particular class. In this Research an experimental study was carried out with the objectives in view (i) to study the effect of learning XI std Biology through collaborative learning on Metacognition (ii) To study the relative effectiveness of Collaborative learning strategy in Biology on Critical thinking. For the study the researcher constituted two groups from two different colleges of Bangalore south One considered to be the Control group who will be taught by traditional or conventional method and the other Experimental group with collaborative learning strategy which involved the active learning strategies, like think pair share, Jig saw and Fish bowl activity. The Experiment/ Intervention was carried out for a period of 90 days at the rate of 90 minutes per day in the afternoon sessions and selected units from Biology XI standard NCERT syllabus prescribed by the Pre University Board was taught through Collaborative learning strategy. The control group was taught by the conventional method during the same time period.*

The findings of the study show that there are statistical differences in mean scores of students who were taught by Collaborative learning strategy and conventional method which shows that CLS was more effective than the conventional method in teaching & learning of Biology at college level and it has enabled the students to improve in their metacognition and critical thinking to a considerable extent.

Key Words: METACOGNITION, COLLABORATIVE LEARNING STRATEGY, CRITICAL THINKING

METACOGNITION: Meta-cognition is defined most simply as “thinking about thinking”. Awareness of one’s own thinking, awareness of the content of one’s conceptions, an active monitoring of one’s cognitive processes, an attempt to regulate one’s cognitive processes in relationship to further learning”(Hennessey, 1999)

COLLABORATIVE LEARNING STRATEGY: Collaborative learning strategy is a teaching learning strategy in which the students mutually engage in a coordinated manner to a solve the problem or learn a concept under the guidance of a facilitator. (Collaboration: collaboration is a mutual engagement of participants in a coordinated effort to solve a problem together - Roschelle&Tenseley)

INTRODUCTION

CONCEPT OF “COLLABORATIVE LEARNING STRATEGY”

“Collaborative learning “is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. Collaborative learning activities vary widely, but most center on student’s exploration or application of the course material, not simply the teacher’s presentation or explication of it.

According to Vygotsky (1978), Students are capable of performing at higher intellectual levels when asked to work in collaborative situations than when asked to work individually. Group diversity in terms of knowledge and experience contributes positively to the learning process. **Bruner(1985)** contends that cooperative learning methods improve problem-solving strategies because the students are confronted with different interpretations of the given situation. The peer support system makes it possible for the learner to internalize both external knowledge and critical thinking skills and convert them into tools for intellectual functioning.

According to Johnson and Johnson(1986), there is a persuasive evidence that cooperative teams achieve at higher levels of thought and retain information longer than students who work quietly as individuals. The shared learning gives students an opportunity to engage in discussion, take responsibility for their own learning, and thus become critical thinkers(**Totten, Sills, Digby& Russ,1991**)

Bonk & Smith (1998) identify a number of classroom activities that build on the potential for collaboration to enhance learning. These activities include think-pair-share, round-robin discussions, Student interviews round tables, gallery walks, and Jig sawing.

There are a variety of ways to structure Collaborative learning activities, for example Palinscar (1987) describes reciprocal teaching as “an interactive teaching teachers and students take turns assuming “Leader” and “Respondent” roles with the leader employing several strategies to direct discussions, asking questions summaries responses and clarifying misunderstanding.

Collaborative learning represents a significant shift away from the typical teacher-centered milieu in classrooms. In collaborative classrooms, the lecturing/listening/Note-taking processes are in student’s discussion and active work with the course material. In collaborative learning environments, the teachers tend to think of themselves less as expert transmitters of knowledge to students, and more as expert designers of intellectual experiences for students as coaches or mid-wives of a more emergent learning process.

Collaborative learning is an instructional method in which student’s team together on an Assignment. In this method students can produce the individual parts of a larger assignment individually and then “assemble” the final work together, as a team. Whether for a semester-long project with several outcomes or a single question during class, collaborative learning can vary greatly in scope and objectives. Cooperative learning, which is described as a method where students work together in small groups on a structured activity is sometimes confused with collaborative learning. Students are individually accountable for their work but also for the work of the group as a whole, and both products are assessed.

Collaborative learning environments can range from a one-minute writing exercise shared with partner during lecture to a semester-long group project culminating in a final team presentation to the entire class.

In spite of these advantages, most of the research studies on collaborative learning have been done at the primary and secondary levels. As yet, there is little empirical evidence on its effectiveness at the college level. However, the need for noncompetitive, collaborative group work is emphasized in much of the higher education literature. Also majority of the research in collaborative learning has been done in non-technical disciplines.

The theoretical support for collaborative learning is also found in the works of Vygotsky. Collaboration affords students the opportunity to share thoughts and interact with peers, facilitators and experts in a defined area. Collaborative learning strategy promotes critical thinking skills, through socialization and sharing of ideas.

Collaborative learning strategies used by the researcher was very much beneficial to their learning students could seek out the required help from the facilitator as this strategy is unlike the conventional teaching where it is teacher centered and the concept is taught by lecture method where the student gets rare chance or no chance to interact with the teacher. Where as in the Collaborative Learning Strategy the researcher here is the facilitator where she provides personalized learning and makes the student responsible for their own learning which would not be possible in a regular class room teaching. Students have embraced the collaborative learning strategies and perceive benefits from the same.

Collaborative learning strategy can provide a valuable experience for the faculty as well as for the students and potentially increase the student satisfaction as a result of a perception of increased support.

Being able to address more students questions, in the learning space may increase positive feelings associated with the course and subject matter experience and ultimately improve student learning. The collaborative learning strategies used by the researcher are as follows;

THINK PAIR SHARE

(Think-Pair-Share) Strategy is one of group discussion strategies falling within curved structural and it is a method of diverse, method of learning collaborative.

This method was developed by Kagan (1991) through provide the teacher flexible ways to implement cooperative learning especially after Kagan made a repertoire of free content activities as the teacher works to choose appropriate content, and it is the whole lesson preparation and formulation of cognitive objectives, the cooperative which form the basis, fall into this way (Think-Pair-Share)strategy which in turn will help learners to think by giving them time to think, then involved with another colleague and look at the different point of view, they may be more willing and less apprehensive about sharing with a larger group, and it gives them time to change their response if needed and reduce the fear of giving the wrong answer and is encouraging them to participate cooperative, mutual learning between individuals, and ensure that the contribution of each student’s work.

(Think-Pair-Share) strategy is one of the active cooperative learning strategies where they are used to activate the students' previous knowledge, so that the new concepts can be understood in the light of the previous knowledge.

JIGSAW

This is one of the learning strategies under cooperative learning in which, just like in a jigsaw puzzle, the content of the lesson is subdivided into different parts of information and then given to groups of students who would later explain to each other their parts and results in the whole jigsaw puzzle to be completed (Aronson & Patnoe, 1997). The jigsaw instructional procedure is a highly structured cooperative learning method, which was originally created by Aronson (see Aronson, 2005; Aronson & Patnoe, 1997 ; Heden, 2003). In the application of the Jigsaw method, the teacher introduces a topic and its subtopics. The students are then divided into 'home' groups where they are each given a different subtopic in the group. The next step requires the students to break out of their 'home' groups to form the 'expert' groups where these students focus on one subtopic, researching and discussing it. Therefore, the students become experts on the subtopic that they have been assigned to. Following their discussion, the students from all of the 'expert' groups must return to the 'home' groups and teach their peers based on their findings and discussions. Eventually, all the members of the 'home' groups will have learnt from each expert group discussion and will have benefitted from each other.

FISH BOWL

Fishbowl is an engaging and student-centered strategy that builds comprehension while developing group discussion skills. The fishbowl structure lends itself well to discussions. By providing all students both a speaking and listening role and a stake in the discussion, a fishbowl sets up students to be both consumers and producers of ideas and to find a balance in how they "speak up" and "step back." The observation aspect of the activity gives students a forum for establishing appropriate ways to participate in discussions. If used on a consistent basis, fishbowl discussions can establish boundaries and norms critical for effective conversations. Research supports the use of fishbowls as a particularly effective way to engage students with a range of abilities and in multiple settings.

OBJECTIVES:

1. To study the effects of Collaborative learning strategy on
 - Metacognition
 - Critical thinking
2. To study the relative effectiveness of Collaborative learning Strategy in Biology in terms of
 - Gender

HYPOTHESIS

1. There is a significant effect of CLS on the scores in metacognition among the students of XI std.
2. There is a significant difference in the scores of post test in critical thinking among the students of XI std.
3. There is a significant difference between male and female with respect to metacognition among students of XI std.
4. There is a significant difference between male & female in the post test scores of critical thinking among the students of XI std.

METHODOLOGY OF THE STUDY

The effectiveness of teaching learning process in any subject depends mainly on the use of teaching learning strategy by the teacher in the class room whether it is teacher centered passive learning or child centered-Active learning. There is a growing need for the innovative teaching strategy in our schools & colleges today to be on par with the students globally. The days have gone where the student use to listen to the teacher's lecture write down the notes, memorise the concepts & reproduce the same from the rote memory without having understanding the concepts. Now its time for the teachers to become more innovative & make the students involve actively in the teaching learning process & make them responsible for their own learning in the classroom as well as outside.

SAMPLE FOR THE STUDY.

This is an experimental study and the experiment was conducted by using two groups design with XI std students of Bangalore south. Students of Vijaya Bifurcated Pre-University College R.V.Road Bangalore is considered as a control group. The size of the sample is 50 and B.E.S Pre-University College Jayanagar Bangalore. As Experimental group and the size of the sample is 50.

TOOLS USED FOR THE STUDY

Following tools used in this study.

1. Metacognitive Awareness Inventory-Schraw,G.&Dennison, R.S.(1994) Assessing met cognitive awareness. Contemporary Educational Psychology,19,460-475.& adopted to measure the metacognition among the Students of XI std. It consists of 52 items in which the statements are related to various aspects of Metacognition With true/false statements, true statement carry one mark and false statements get zero
2. Watson - Glaser Critical Thinking Appraisal™form S Goodwin B. Watson Edward M.Glaser it consists of 40 items for which 4 options were given student has to think critically and select one option. Metacognitive awareness Inventory and WGCTA are the standardized tools used for the study

STATISTICAL TECHNIQUES USED IN THE STUDY:

The data thus obtained were then analysed by using appropriate statistical techniques such as mean, Standard deviation and t-test.

TABLE-1
SUMMARY OF T-TEST FOR COMPARING THE EFFECTIVENESS OF CLS ON METACOGNITION.

GROUP	NUMBER OF STUDENTS	MEAN	STANDARD DEVIATION	t-VALUE
EXPERIMENTAL GROUP B.E.S Pre-University College Jayanagar Bangalore.	50	43.98	5.343	3.497
CONTROL GROUP Vijaya BIFR Pre-University College R.V Road Bangalore.	50	39.90	6.722	

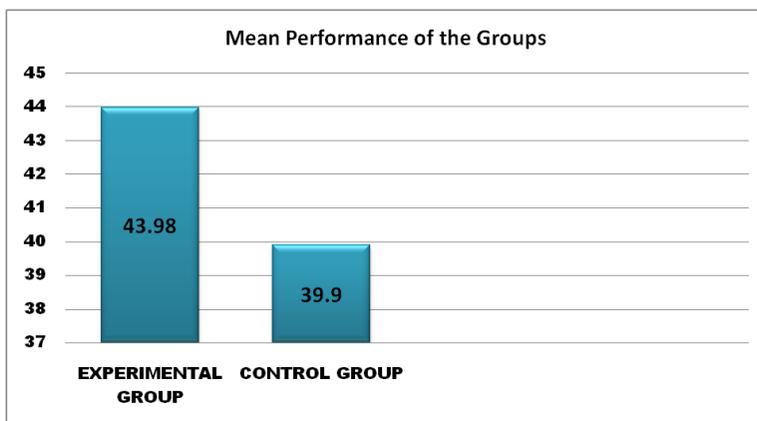


FIGURE-1

HYPOTHESIS -1

There is a significant effect of CLS on Metacognition. The above hypothesis is tested by using t-test. The summary of the result shown in table 1 and figure-1.

The t-test was carried out to evaluate the significant influence of CLS on Metacognition among the students of Experimental group & Control group. From the table-1. It clearly indicates that Metacognition of B.E.S College /Experimental group is significantly higher than the Achievement of Vijaya Bifurcated Pre-University College /Control group Bangalore. This is due to the experimental Intervention. It means that there is a significant Influence of CLS on Metacognition among the students of B.E.S College Bangalore/Experimental Group.

HYPOTHESIS -2

There is a significant difference in the post test scores in Critical thinking among the students of XI std after the Intervention in the Experimental group that is B.E.S Pre-University college students. The above hypothesis is tested by using t-test. The summary of test results is given in table 2 and figure-2.

It is revealed from table-2 that the mean value of Critical thinking scores are higher for the Experimental group when compared to the control group. Hence the influence of CLS has the effect on Critical thinking of students in the experimental group.

TABLE-2

SHOWING SUMMARY OF t-TEST RESULTS FOR THE DIFFERENCES IN CRITICAL THINKING IN EXPERIMENTAL AND CONTROL GROUP.

GROUP	NUMBER OF STUDENTS	MEAN	STANDARD DEVIATION	t-VALUE
EXPERIMENTAL GROUP B.E.S Pre-University College Jayanagar Bangalore.	50	23.36	3.306	5.220
CONTROL GROUP Vijaya BIFR Pre-University College R.V Road Bangalore.	50	19.80	3.511	

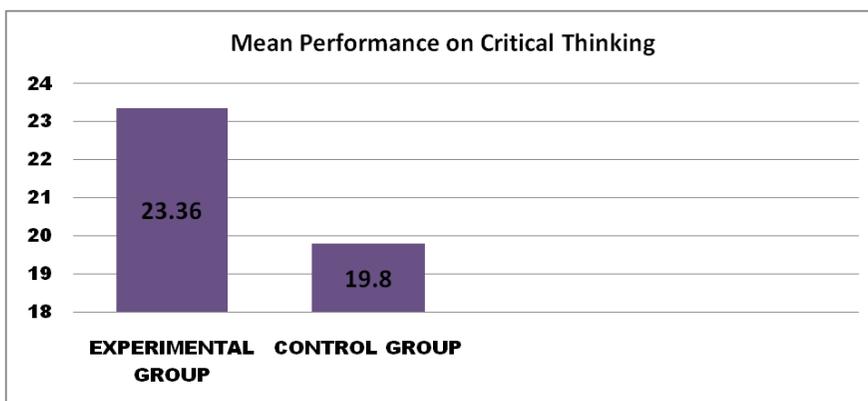


FIGURE-2

HYPOTHESIS -3

There is a significant difference between the male & female students with respect to metacognition among the students of XI std in B.E.S Pre-University College Bangalore, as the 't' value is $3.497 > 1.96$

The above Hypothesis is tested by using t-test. The summary of test results is given in Table-3 & Figure-3.

It is clearly indicated from table -3 that the mean value of female students in metacognition is greater than that of the male students. From the results; it is clear that the CLS has equal effect on female than that of male on metacognition.

TABLE-3

SHOWING SUMMARY OF t-TEST RESULT FOR THE DIFFERENCES OF MEAN IN METACOGNITION FOR MALE AND FEMALE STUDENTS OF B.E.S PRE-UNIVERSITY COLLEGE BANGALORE.

GENDER	NUMBER OF STUDENTS	MEAN	STANDARD DEVIATION	t-VALUE
MALE	22	42.18	5.360	2.170
FEMALE	28	45.39	4.977	

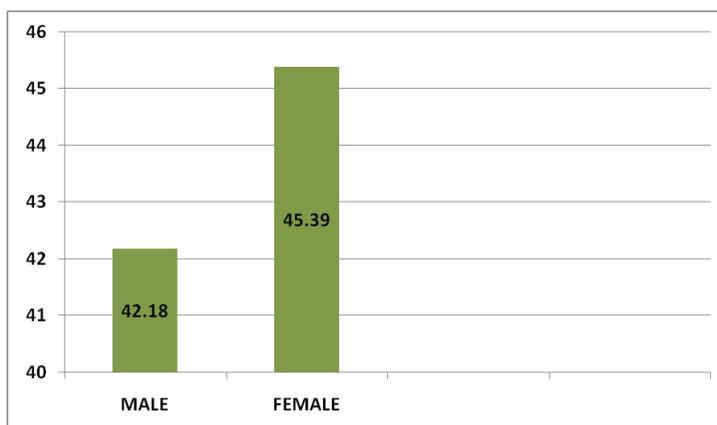


FIGURE-3

HYPOTHESIS -4

There is no significant difference between the male and female with respect to Critical thinking in B.E.S Pre-University College Bangalore. As the 't' value is $1.676 < 1.96$

The above hypothesis is tested by using t-test. The summary of test results is given in table-4 and figure 4. It is clearly shown from the table -4 that the mean value of Critical thinking of male students is not much greater than the female students of B.E.S Pre-University College Bangalore. From the result it is very clear that the CLS has equal effect on male and female students on critical thinking of B. E. S Pre University College Jaynagar Bangalore.

TABLE-4
SHOWS SUMMARY OF t-TEST RESULTS FOR THE DIFFERENCE OF MEAN VALUE OF CRITICAL THINKING BY MALE AND FEMALE STUDENTS OF B.E.S PRE-UNIVERSITY COLLEGE BANGALORE.

GENDER	NUMBER OF STUDENTS	MEAN	STANDARD DEVIATION	t-VALUE
MALE	28	24.23	3.236	1.676
FEMALE	22	22.68	3.255	

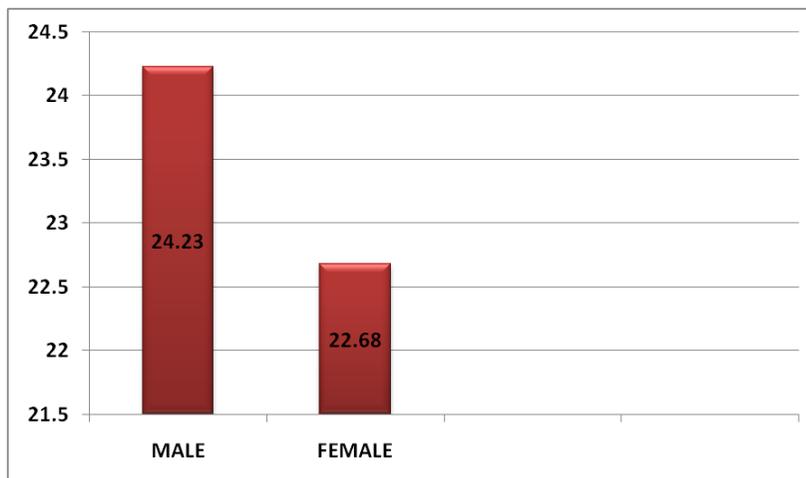


FIGURE-4

DISCUSSION OF RESULTS

1. There is a significant difference between the pretest and the posttest mean scores of the Experimental group which was taught by CLS when compared to the control group which was taught by conventional method with respect to metacognition.
2. The CLS are significantly Influence on critical thinking in students of XI standard .
3. There is a significant difference between the scores of male and female students with respect to metacognition.
4. There is no much significant difference between the mean scores of male and female students with respect to Critical thinking.

The present study was carried out to find out the effect of collaborative learning strategy on metacognition and critical thinking among XI std students. It has clearly demonstrated that the CLS has provided ample scope for the learner to improve in metacognition and critical thinking . It is recommended that this technique should be employed in the real classrooms for the other subjects for all categories of learners. Collaborative learning as an instructional strategy ensures to develop cognitive and social skills for students that are needed in today's school education system. This system benefits at the individual level and it has provided a sense of positive interdependence between students, improves interpersonal social skills and accountability. The study results represent that collaborative learning strategy is a paradigm ant it assures that every member in the group has learnt something which is expected by him. There is indeed a wider scope that collaborative learning can substantially contribute towards achieving the national goal of inclusive growth and development.

Kishore (2012) explains that in CL when a child hears contradictory or challenging statements in the group, his/her equilibrium is upset and then their efforts to search answers enable to achieve a new and higher equilibrium. Working in groups also helps students develop positive attitude towards one another.

The feeling of competing and outdoing one another as in individualistic learning is replaced with the feeling of oneness and concern for one another. They identify themselves with the group and start encouraging and motivating each other to learn and achieve.

Rutherford & Ahlgren (1990) have stated that the collaborative nature of scientific and technological work should be strongly reinforced by frequent group activity in the classroom. Apart from this the present finding also leads to the point that CL produces positive results for all types of students in a class. Every student in the class benefits through CL, irrespective of being high, average and low achievers. This supports the report of **Slavin (1991)** which identified seventy studies that evaluated various CL methods for periods of four week or longer and concluded that effects of CL were equally positive for high, average and low achievers. The significant improvement of science achievement of all students in the experimental group is an indicator of the same. Similar results were also obtained by **Singhanayok & Hooper (1998)**.

Their study investigated the effects of studying alone or in CL groups on the performance of high and low achievers of sixth grade students in Ecology and it was revealed that both high and low achievers in cooperative treatment performed better. CL gives low achievers a platform to mingle with the high achievers. It gives them an opportunity to share and discuss ideas and doubts with the high achievers, thereby leading to a better understanding and learning of 116 concepts.

Rajkumar (2010) conducted a study to analyse the role of metacognitive skills involved in the process of problem solving in physics among higher secondary students. The results of the study revealed that there was continuous and steady increase in the mean scores of the experiment group students in pre-test, post-test1 and post-test2 in all metacognitive skills. This showed that changing the learning environments; conducting group discussions and laboratory activities enhance the problem solving skills in physics among higher secondary students.

Rahman et al (2011) conducted a study on the impact of some students' related factors on their metacognitive awareness. Results of the study revealed that metacognitive awareness was significantly correlated with internet use and library habits. Further the study revealed that children of highly educated parents were highly metacognitive aware than the children of less educated parents. Results further indicated that there was no significant difference in the metacognitive awareness of male and female students.

Salman (2015) this research aims to know the effectiveness of strategies in each "active learning role playing, strategy (think-pair-share) in collecting pupils grade 5 in Arabic grammar material " researcher has formulated that there is statistically significant difference at the level indication (0.05) between average pupils first pilot group who studied strategy role – playing, and the average and rewarded the researcher groups search, and use appropriate statistical methods, the researcher found the effectiveness of strategy role-playing in grade 5 pupils collection of Arabic grammar, and their impact on the left to choose the role of pupils and strengthened language abilities and self-confidence. The effectiveness of the strategy (think-pair-share) in improving the collection of the pupils and retaining them and instilled in their minds through individual reflection and sharing with others.

RECOMMENDATIONS.

- CLS can be used as an effective Teaching learning technique Elementary schools as well in college classes in different subjects.
- CLS can be used an active learning strategy in the regular class room teaching in place of conventional teaching as it promotes metacognition and higher order thinking skills.
- CLS helps the teachers to identify the hidden talents of the students like creativity, innovations and qualities like leadership, understanding, cooperation and execution of the activities.
- CLS can provide a conducive learning environment in the classroom which has impact on their learning.

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