



Cooperative learning approach to Science Education: An innovative practice

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Abstract: With increasing awareness about merits of cooperative learning, National curriculum framework of India 2005 advocates use of cooperative learning in formal academic learning. Teacher education should be more sensitive to the emerging demands and should develop appropriate competencies in the student teachers. Considering this it was thought appropriate to implement cooperative learning approach in curriculum transaction of Science education and study its effect on student teachers' perception about cooperative learning and teaching performance by using qualitative data and triangulation. Researcher found that student teachers incorporated various activities using cooperative approach in their lesson plans due to the approach applied in curriculum transaction. Student teachers also had clear perception about the techniques to be used for cooperative learning but they could not understand aspect of positive interdependence. It was concluded that cooperative learning approach can be successfully implemented in curriculum transaction of teacher education.

Key Words: Co-operative Learning and Science Education

- 1. Introduction:** Over the past thirty years key researchers such as Robert Slavin, Spencer Kagan and many other researchers have researched and put into

practice cooperative learning. With increasing awareness about merits of cooperative learning, National curriculum framework of India 2005 advocates use of cooperative learning in formal academic learning. While emphasizing the value of interactions the report suggests, “Group learning tasks, taking responsibility and contributing to a task on hand are all important facets of not only acquiring knowledge but also in learning crafts and art.” (National Curriculum Framework 2005, page 18). Teacher education should be more sensitive to the emerging demands and should develop appropriate competencies in the student teachers. Considering this suggestion it was thought appropriate to implement these principles in curriculum transaction of Science education and study its effect.

Present paper elaborates the systematic efforts done regarding training to student teachers about cooperative learning and the effect on student teachers’ perception about cooperative learning and teaching performance. Norman Denzin (1989) introduced the term "triangulation". He defined the term as a combination of methodologies for researching the same phenomenon. Triangulation was used to study perception and planning of student teachers, by involving two experts and three tools of research.

- 2. Cooperative learning:** According to Jolliffe, “Cooperative learning requires pupils to work together in small groups to support each other to improve their own learning and that of others.”(Jolliffe W. 2007, page 3)

Traditionally sometimes teachers organize students to sit in groups and work or discuss. But to become cooperative learners groups must work to accomplish shared goals. The benefits of cooperative learning are well documented by research. Educational studies consistently suggest that participation and interaction, essential elements of cooperative learning, play a fundamental role in learning (Vygotsky 1978; Cohen 2004).

The following five elements are essential and these are known by acronym ‘PIGSF’

- Positive interdependence- Students must feel that they need each other and in order to complete the group task they will work together.

- Individual accountability- Individual accountability requires that every teammate is accountable for completing a particular part of work. It is important that students know that their contribution to teamwork can be individually identified and assessed.
- Group processing- Giving the students time and procedure to analyze how well their groups are functioning.
- Small group and interpersonal skills-students need to learn and practice appropriate communication, trust building, decision making skills and conflict resolution.
- Face-to-face interactions-physical proximity needed for effective communication and more active involvement with the task and discussion.

3. Implementation of cooperative learning approach to Science Education:

3.1 Objectives:

1. To plan and implement cooperative learning approach to Science education on student teachers offering Science education
2. To study the effect of cooperative learning approach on student teachers' perception and planning

3.2 Planning and Implementation: The cooperative learning approach was incorporated in overall curriculum transaction throughout the year, by providing student teachers opportunity to pair and share, express views, interacting with each other and providing positive suggestions for improvement to each other from time to time. They were also given opportunity to prepare mind maps collaboratively. The systematic effort was done through co-curricular activities to train student teachers in cooperative principles, combined with training in multiple intelligences, through the organization of a special game event which expected student teachers to understand each other's capabilities and work collaboratively.

Eight units from syllabus of Science Education were selected for group activities. Activities and assignments were planned following various cooperative learning principles. Student teachers were provided guidance and were

encouraged to use cooperative learning approach while planning and conducting activities in their practice teaching.

The activities of cooperative learning were conducted on 30 student teachers from Science education group. Special activity sheets were prepared for group work. The groups were given following instructions:

- You have to involve every group member in activity, discussions and preparing for presentations
- Your groups will be scored on the basis of individual performance of group members.
- Try to assess performance of every group member and provide positive feedback and render help to increase participation and to improve performance.

3.3 cooperative learning activities during curriculum transaction of Science education

Unit from syllabus	Tasks assigned
1.Bloom's taxonomy	Categorize given list of specifications according to domains and hierarchies in pairs and then share answers
2.Establishing Correlation within and among subjects	Discuss, refer to books and prepare note for presentation Group1: Correlation within subject Group 2: Correlation of Science with languages Group 3: Correlation of Science with social sciences Group 4: Correlation of Science with life
3.Inductive thinking model, concept attainment model and Inquiry training	Complete the outline worksheets in pairs 1. Observe demonstrations lessons of models and analyze steps followed. 2.Prepare list of five topics from Science suitable for using these models

	3.
4. Discussion method	<p>Group 1: Find Meaning of and List all the possible causes of superstitions</p> <p>Group 2: List all the mental, social, economic consequences</p> <p>Group 3: Think of efforts to be done for eradication of superstitions at all levels</p> <p>Group 4: Observe the process in all the groups and prepare note on discussion method</p>
5. Use of media	Watch the power point slide show and solve the quiz individually. Group scores to be calculated
6. Devices of teaching	<p>Group 1: science fair</p> <p>Group 2: science exhibition</p> <p>Group 3: Museum</p> <p>Group 4: Projects</p> <p>Group 5: excursions/field trips</p>
7. Catering to special needs	<p>Group 1: Teaching science to blind</p> <p>Group 2: Teaching science to hearing impaired</p> <p>Group 3: Teaching science to gifted and creative students</p> <p>Group 4: Teaching science to students lagging behind</p>
8. Year plan/unit plan content analysis, evaluation of text books	Groups asked to complete all the assignments by dividing the task in all the group members

3.4 Efforts done during lesson guidance: Student teachers were encouraged to

- Use group activities
- Group games
- Group discussions
- Group problem solving
- Activity sheets to be completed in pairs

- Opportunities to express themselves for developing communication skills

4. Effect on student teachers: Effect of implementation of cooperative approach was not measured quantitatively, but was studied qualitatively.

4.1 Effect on student teachers' performance: Lesson plans of student teachers were analyzed to study the effect on planning skill. Student teachers were also asked to write down the various efforts done by them by a questionnaire. The responses on questionnaire were analyzed by an expert (Dr. Leena Deshpande then Principal of college) to obtain reliable data.

Findings: Student teachers deliberately used various group activities in their lesson plans.

- They planned to use group discussions on natural resources, pollution, diet, prevention of diseases
- Group problem solving was planned for preparing and applying formula of pressure
- Pair and share was used to solve many word puzzles, activity sheets and for numerical problems in physics
- They provided opportunity to the student teachers to communicate and express themselves through activities such as making concept maps, preparing slogans sentence completion etc.

It was observed that they could not involve aspect of positive interdependence in planning lessons of Science.

4.2 Effect on perception: Perception was studied by a questionnaire and interviews. Dr. Lalita Agashe, expert of cooperative learning and research expert interviewed the student teachers for obtaining oral and spontaneous feedback regarding perception of the efforts done by staff during teaching learning process and during lesson guidance. This was done for triangulation of data. Interviews covered following main points:

- Students' concept of CL in teaching- learning and its application

- CL practices experienced during compulsory subject classes, method classes, and co-curricular/extracurricular sessions and during practice teaching
- Peculiar method was used for taking feedback of the students. Students were interviewed in group. Initially each member of the group wrote individual responses to open ended questions pertaining to essential features of Cooperative Learning. The students responded freely to the questions.

Findings:

Most of the students mentioned (i) many important features of CL like group work, helping each other, opportunity for expressing individual opinions, positive interactions, and lack of domination by one student (ii) some CL techniques like group discussions, group debates, group projects CL methods and techniques used in method classes such as variety of pair share and its extension techniques, jigsaw, group discussion, group problem solving. Yet it was found that students' concept of CL was somewhat vague- mainly lack of mention of positive interdependence (only five students mentioned positive interdependence). Many students were not aware of the potential benefit of regular CL in classrooms. Five student teachers were quite familiar with pair-share work but not aware that it is a valuable CL technique.

5. Conclusions:

- Student teachers incorporated various activities using cooperative approach in their lesson plans due to the approach applied by teacher educator.
- Student teachers had clear perception about the techniques to be used for cooperative learning but they could not understand aspect of positive interdependence.
- The cooperative learning approach can be successfully implemented in curriculum transaction of teacher education.

6. Educational implications:

- Special training should be given to student teachers regarding cooperative learning through a workshop in the beginning of the academic year.

- For becoming sure that all the students have understood the key aspects of cooperative learning, the teacher educators themselves should use the Cooperative learning techniques in class more often and help students reflect on the key aspects of the technique used.
- Teacher educators should insist on using Cooperative learning techniques during practice teaching.

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