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Cooperative Learning Technique for Teaching General Science at ECE Level: An Experimental Study

Hafiza Gulnaz Fatima[*]
Hina Akbar[**]
Ibtasam Thakur[***]

Abstract

The goal of the research was to create cooperative learning strategies for young ECE students to accelerate their learning. Pretest posttest research design was used for the present study. All ECE students in Punjab Province were the population of the research. From three distinct schools, 120 first-graders were chosen, with 40 from each school were containing the research sample. Three types of research rural, suburban, and urban were chosen for the schools using the random sample technique. Experimental group was instructed through cooperative learning, whereas the control group received instruction using the traditional approach. All the groups, both experimental and control, pre- and post-testing. The study discovered that cooperative learning has an important impact on pupils' academic progress. The study has implications for the application of cooperative learning techniques to improve the academic performance of first-graders.

Keywords: *Academic Success, Cooperative Learning, and Learning Acceleration*

[*] Lecturer, Lahore College for Women University, Lahore.
Email: gulnazfatima59@yahoo.com
[**] Lecturer, Lahore College for Women University, Lahore.
Email: hinaakbar45@yahoo.com
[***] Assistant Professor, Lahore College for Women University, Lahore.
Email: ibtesam.thakur@lcwu.edu.pk

Introduction

An instructional approach using cooperative learning boosts academic achievement with use of small groups of students to assist themselves as well as each other (Fernández et all, 2023) Cooperative learning teaching strategy is intentionally implemented by educationists to prepare learners to learn from each other. The combined benefits of small teams comprising of learners with varying levels of ability and strengths perform commendably in educational activities. The cooperative learning approach since the 1960s has combined the advantage of academic and social practices that make learning experiences successful and ongoing. Team work with a resolution to achieve a common goal has mutual advantages in counseling each individual to complete the assigned job in order to contribute to the success of the group. Additionally, other group members keep a watch out for their participants. This methodology is suited for all subjects across all academic years, but it is especially useful in Grades 2nd till 12th (Benson, 2016, Morgan, 2019).

Group and team work facilitates academic success since cooperative learning encourages learners to observe and learn from peers and share opinions and innovative ideas. Additionally, resources are more effectively utilized when learners judge each other and comment on and assess team members' performance (Nuriyanti, 2023). The standard individual performance assessment drives a competitive edge in learning with each member keen on individual excellence rather than the success of all the team. Cooperative teaching strategies are recommended since this approach structures positive interdependence in groups working collaboratively to achieve a common goal (Shimazoe & Aldrich, 2010). This study recorded the benefits of collaborative team work for successful all-inclusive cooperative learning with each member of the group a participant in forming positive interdependence. The experimental group of students were introduced to activities which presented an opportunity for them to become inspired.

Cooperative learning assesses team members in higher order cognitive skills of intellectuality, creativity, receptivity, patience, and sincerity in interdependence learning. (Limbong,2023). The novelty of cooperative learning lies in the students' struggle with habituated individual instructional practices. Routine classroom teaching does not develop skills of working as part of a group or benefiting from peer support. Teachers abreast of the current developments in teaching methodologies often assume learners are prepared and ready for team

work prematurely. Educators possibly become falsely convinced that their students are gaining from opportunities to learn from team members when in fact, learners resent this change, are anxious and disturbed and their team work lacks quality since learners did not invest energy in their efforts (Naested & Waldron, 2004) Team work and group work inevitably is not successful if team members are not prepared with developmental and behavioral therapy. The value of cooperative learning lies in enhanced academic achievement, tolerance, and preparedness for democratic citizenship (Tan et al. ,2022).

The Brain based learning model (BBL) supported the view that students need to be trained to acknowledge individuality of each team member, and value each members' strengths. Technology use in classrooms by professional teachers facilitates team work with access to a wealth of online educational resource material for groups, cater to differential learner needs, make high academic grades achievable. Education technology using brain-based intervention highlighted technology assisted classroom environment within the neighborhood of public schools. The imperceptible benefits of technology use in group and team work lie in the development of a sense of responsibility, persistence, hard work, assertiveness, and self-assurance in learners as team members. Group tasks stimulate good mental health and well-being, also extend problem solving and investigative learning (Brown & Ciuffetelli, 2009, Connell, 2018)

Jensen (2005) explained the merits of cooperative learning as meaningful opportunities of learning that result in deeper, more permanent retention of learning and greater comprehension compared to individual instruction routines. Furthermore, cooperative learning prepares learners for workplace requirements of their career of choice. Team work offers research based investigative learning opportunities which extend conceptual clarity of concepts, and prepares self-reliant, encouraging, and accountable team members.

Beginnings of Cooperative Learning

Researchers Allport, Watson, Shaw and Mead suggested the rewards of collaborative team work over individual pieces of submission before the advent of WWII. These researchers claimed better quality of group work as an advantage (Pappas, 2014) Cooperative learning was developed to increase shared educational experiences for learners who felt isolated. Individual work was found to be limited in building cooperation, sense of belonging, and spirit of

lifelong learning. Since individual tasks drive the competitive spirit, they could not motivate team members to recognize their strengths, or develop patience and tolerance for opposing, differing points of view, cooperative work consequently, became highly valued. The foremost requirement of team work is an attentive teacher. Team work cannot be successful in an environment wherein learners have not been prepared to respect each other. A cooperative culture in learning environment in schools is designed with access to technical, administrative, and financial support. Group and team work projects reflect evidence of divergent thinking styles of team members tied on a similar program (Vcsmr & Rao, 2013). A cooperative learning task provide teachers and schools an opportunity for identifying aggressive and resistant learners who find it difficult to relate to others, are emotionally detached and aloof with team members. The identification of such team members involves counselling and guidance providers who give coaching in communication skills (Azizbek & Sabokhat, 2021).

Teacher as a facilitator

Modern methodologies of teaching such as projects, discussions, and field trips are effective only when the teacher is an active, and enthusiastic part of the learning experience. Teachers' acceptance of learners' diversity creates space for self-directed, independent learning. When a teacher assesses learners in higher order cognitive skills, it develops logical thinking, problem solving, and metacognition. Challenging assessments drive greater commitment towards academic success and train learners for real life experiences when they will have to overcome differences, and work collectively to achieve a target. Teachers keep learners on track, engaged and motivated and involve learners in establishing a checklist for evaluation of their work. Thus, autonomous learners feel greater responsibility for completion of their task while it saves time and energy that would be wasted in quarrels (Khan & Ahmad, 2014).

Limitations of Cooperative Learning

Social interdependence is an important element of cooperative learning. Learners resent facing consequences of delays causd by their team members, since this inevitably leads to a wait for teachers' review, censure and loss of grades. Genc (2016) suggested the benefits of social

interdependence as being a source of inspiration to team members to complete a task on time, work hard mutually to achieve a goal, and invest energy, time and effort jointly to achieve the intended objectives of the assignment. The drawback of social interdependence lies in learners opting out from team work and turning in an individual piece of work. Confrontations, quarrels, disagreements and heated arguments indicate under currents of hostility, animosity and distrust within group members and indicate the failiure of cooperative work since individual self esteem is much higher than the standing of the team in the eyes of the team members (Siltala, Suomala, Taatila, & Keskinen, 2007). Cooperative learning opportunities are trying for slow, struggling learners who feel disoriented without a teacher' s strong presence in their classroom routine (Brown and Ciuffetelli, 2009). Teachers may find it difficult to change their teaching routines and accept a change. Some valid reasons that teachers have are their observations of shyness in some leaners who fear ridicule and negative peer feedback, and observations of lack of confidence in others who feel pressurized to change their research findings to please the majority of group members. Learners also often complain to teachers of lack of rewards for their efforts and a trumped experience (Tsay& Brady, 2010). Cooperative learning is thus limited in application and an eclectic methodology may be the best option for teachers.

The professional teaching environment of today's technology driven era acknowledges the following guidelines of a collaborative learning environment. These are 1) answerability of each team member before the group, 2) teachers' vigilance in planning and designing sociable interactions among team members, 3) frequent unplanned exchanges, 4) developing prospects for amiable exchanges in representative situations, 5) and finally the teachers' decision in finalizing teams ready for exercise of social interdependence ((Johnson & Johnson, 1994, Khan & Ahmad, 2014). Marzano, Pickering, & Pollock (2001) recommended teachers' personal discretion in applying cooperative learning tasks. Researchers feel manageable groups of compliant learners should be arranged in a transient order to avoid permanent membership in any one group. Teachers must take responsibility for providing learning materials for all groups and use teaching material to introduce a dialogue amongst their groups. Teachers' mediatory role in discussions is crucial for the success of this action. (Gregory & Kuzmich,2005).

Team members have healthy peer interaction, develop respect and trust, enjoy the company of each other, read and hold discussions, are keen on individual and group academic success, and for that reason,

apply themselves willingly. Autonomous team members have self-confidence, resolve, and flexibility and once immersed in collaborative learning, willingly explain concepts to peers who stay away (Seifertet al., 2009, Tsay& Brady, 2010).

Cooperative learning context of the study

Brown & Ciuffetelli (2009) identified the common features of successful teams resulting from their application of the principles of cooperative learning . Cooperative learners are codependent, effective team members, capable of directing others, and capable of transmitting scholarship to their class fellows. Learners willingly provide peer support and theoretical understanding (Siltala, 2010). Students demonstrate abstract learning individually as well as in group situations, assuming accountability of their own learning (Johnson &Johnson, 2009) Learners of varied assets have the opportunity of insightful deep mental processing of information with forming of connections and associations between prior learning and new learning for efficient recall and retrieval individually as well as in group situations (Shimazoe & Aldrich,2010).

Strategies for Successful Cooperative learning

Cooperative learning strategies are helpful in formal institutes of learning since they facilitate information retrieval. In a formal learning environment, cooperative learning is particularly devised for classroom use and this activity is applied to a vast range of disciplines because of its strengths. Strategies used by educators are: 1) No more than 4-5 students in each group, 2) Fun activity Round Robin, 3) Discussion, Think Pair Share, 4) Completing the Jigsaw, 5) Assembling the reverse jigsaw, and 6) finally, reciprocal teaching.

Think Pair Share

Learners are left to deliberate and examine a problem in depth while arguing with team members. Jensen (2005) highlighted mind maps as an illustrative way of recording salient points of thinking together, building partnerships, and brain storming as a team to the rest of the class (Tufekçi & Dimerel, 2009).

Jigsaw Working partnerships

In the formal learning environment of the school, teachers introduce the jigsaw activity in two groups of even numbered learners. The two groups are labelled as the expert and the home group. Homegroups are an assorted group of team members, each one assigned a novel topic by their teacher. Homegroup members work on individual topics, with each member put in charge of sharing and discussing their individual topic with the rest of the group. The learners who are earnest in sharing in depth knowledge on the subject with others in class are the expert group. When expert group rejoins the home group, they inform them as well (Sabbah, 2016).

Jigsaw II

Jigsaw II is a variation of the jigsaw working partnership. The teacher highlights a content area for all learners. Each member is assigned a unit to prepare, so that each member will work likewise proportionately and be in charge of sharing learning material correctly with the others. Slavin (1996) remarked preparation of content leads learners to acquire proficiency over content.

Reverse Jigsaw

Reverse Jigsaw is a group task with the teacher dividing the class equally to create expert and home groups. Reverse jigsaw expert group does not consider instructing the home group. The expert jigsaw group takes charge of the class as a whole. The expert group students in reverse jigsaw educate their entire class fellows (Heeden, 2003).

Inside-Outside Circle

This inquiry based, problem solving technique is feasible as the teacher divides the class into two equal groups of inside - outside circles. Learners' activities are brainstorming and sharing views with others. Listening attentively, students have a question answer session with the teacher and discussion with the other group member they face since the teacher assigns unique topics to the inside and outside circles (Pearcy& Duplass, 2011).

Reciprocal Teaching

Metacognitive strategies are developed by teachers who assign pairs of students an enlightening text to read and ponder over. Students acquire

a variety of meta-cognitive skills for example, identifying the gist, outlining, illuminating veiled specifics, foreseeing the possible outcome of the story, and empathizing with the central characters they read about (Brown & Ciuffetelli ,2009).

Rally Table

This group activity is used by observant, watchful teachers to highlight a question, followed by students transcribing their thoughts on a piece of paper keeping the time limit in mind. All students gain from the exercise. (Siltala, 2010).

TGT (Team Game Tournament)

TGT is an activity to prepare learners for addressing pressing issues of the day. Learners are introduced to a collaborative activity for developing conceptual clarity with intensive reading. While TGT is a friendly challenge, it is not competitive and does not condemn slow learners. Teachers are satisfied with the activity since the objectives of the lesson are observable, and measurable (Jenson, 2008). TGT is recommended as this game places the responsibility of dispensation of the content on the learners who might use technological aids and learner designed materials to present before the class (Heeden, 2003). Students relate the new learning with their prior learning, and with academic success, students' develop as individuals as well as responsible team members **(**Banchonhattakit et al, 2015, Gregory &Kuzmich, 2005). Collaborative and cooperative peer learning helps students acquire academic mastery, as well as group partnership skill. (Allen, 2006). Self-directed learners are regular in attendance, buoyed up by peer approval, and good time management.

The Brain Based Learning Model recommends cooperative learning strategies for intellectual success, and communicative competency (Shimazoe & Aldrich, 2010). Elementary level students benefit more from communicative acts and exchanges compared to knowledge of subject matter Kagan (1989). Pearcy& Duplass (2011) were of the opinion that collaborative learning refines learners' self-respect, and determination to persevere while presenting ideas before group members. Cooperative learning helps learners overcome the dread of peer evaluation. Nevertheless, group work is successful only if students work under the watchful and observant gaze of the teacher. Teachers' arbitration keeps students' presentations on track. In groupings, the

teacher is vigilant to ensure that learners from varied backgrounds with unique strengths are positively engaged and no one member feels marginalized. Heterogeneous groups bring forth novel ideas which spice up discussions. Although grades and marks drive learners towards greater efforts, the satisfaction and achievement of a task that is appreciated by all is immense while grooming for leadership is an important element of education. Social interdependence familiarizes learners with ethics of group and team work.

Statement of the Problem

In contrast to conceptual learning and critical thinking, Pakistan's educational system currently emphasizes memorization and rote learning. There is a need to alter our teaching methods and educational framework by implementing activities that support efficient and fulfilling learning and improve students' cognitive abilities. The study looks into how cooperative learning affects students' academic performance at the ECE level (grade 1).

Objectives of the study

i) To measure the effectiveness of cooperative learning on the achievement of ECE students in the subject of General Science.
ii) To assess Learning Acceleration (LA) through the academic achievement in the General Science subject taught with cooperative learning at ECE level.

Hypothesis

H_o1: There is no significant effect of cooperative learning strategies on student's academic achievement in rural area public school
H_o2: There is no significant effect of cooperative learning on student's academic achievement in suburban area public school
H_o3: There is no significant effect of cooperative learning on student's academic achievement in urban area public school

Methodology

It was an experimental study, like the current quantitative study. Six groups (three experimental and three control intact groups) were used in the quasi-experimental research design. In this study, experimental groups

received instruction using cooperative learning activities in addition to learn the activities.

Population

The students of grade 1 (4 to 5) years from urban, suburban and rural areas was considered as the population of the study.

Sample

Using the random sampling technique, the researcher was selected 120 students as the sample of the study. These students were selected from three different schools located in different areas (urban, suburban and rural area). Researcher selected 40 students from each schools in which 20 was considered control group and 20 as experimental group.

Table No. 1.1
The sample of the study

Schools	Control Group	Experimental group	Total Sample
Urban public School	20	20	40
Rural public School	20	20	40
Suburban public School	20	20	40
Total Sample	60	60	120

Instrument

The researcher was required to instruct first-grade students at three public schools (rural, urban, and suburban). The general science text book of the Punjab Text Book Board for first grader was taught using a cooperative learning module that was designed by researchers. The researchers were prepared pre and posttest using the general science textbook's syllabus. The same achievement exam was used to evaluate students both after and before the intervention (instruction with the strategies of cooperative learning). The achievement test were made from general science book of grade 1, it was validate through table of specification and expert opinion.

Data collection

The researcher was conduct pre and posttest for both the control and experimental group after and before intervention. The control group was received instructions with traditional method and experimental group instructed with the strategies of cooperative learning.

Results

Table No. 1

Independent sample T test to compare the gain score of control and experimental group in rural public school.

		Levene's test for Equality of variances F	Sig.	t	t-test for Equality of means df	Sig. (2 tailed)
Rural Public school	Equal variances assumed	2.785	.101	6.397	38	.000
	Equal variances not assumed			6.397	36.200	.000

The Table No. 1 shows a "significant difference in the gain score of students (control and experimental group) of rural public school conditions; t (38) =6.397, p=.000" where the calculated p-value is less than alpha 0.05. So, it rejects the null hypothesis that, "there is no significant effect of cooperative learning on student's achievement in science subject in rural public school". So, it is concluded that students in experimental group achieved greater score then the students of control group and cooperative learning strategy has significant impact on students' academic achievement.

Table No. 2
Independent sample t-test to compare the gain scores between the experimental group and the control group within suburban Public School

		Levene's test for Equality of variances F	Sig.	t	t-test for Equality of means df	Sig. (2 tailed)
suburban public school	Equal variances assumed	.258	.613	7.777	38	.000
	Equal variances not assumed			7.777	37.987	.000

A "significant difference between the gain score of the control and experimental group of suburban public school conditions; t (38) =7.777, p=.000" is displayed in Table No. 2 of the study.The estimated p-value is less than 0.05, the alpha. The statement "There is not a substantial impact of cooperative learning on student achievement in science subject in suburban public school" is rejected as the null hypothesis. Cooperative learning strategies help suburban public school pupils study more effectively.

Table No. 3
Independent sample t test to compare the gain score of control and experimental group in urban area public school

		Levene's test for Equality of variances F	Sig.	T	t-test for Equality of means df	Sig. (2 tailed)
urban public school	Equal variances assumed	4.100	.047	14.081	38	.000
	Equal variances			14.081	33.792	.000

	not assumed

The table displays a "significant difference in the gain score of students of the control and experimental group in urban public school conditions; t (38) =14.081, p=.000". The statement "There is no significant effect of cooperative learning on student achievement in science subject in urban public school" is rejected as the null hypothesis. Additionally, it shows that students in the study group who received cooperative learning instruction score higher on the posttest than students in the control group.

Findings

The major findings of the study are:

In a public school serving a rural area, pupils in the experimental group (taught using cooperative learning methodologies) score better than those in the control group (taught using the best option. According to the study, cooperative learning strategies are particularly beneficial for pupils attending public schools in rural areas.

The statistically significant difference demonstrates that students in the experimental group who received cooperative learning instruction outperformed those in the control group who received traditional instruction. The outcomes showed that cooperative learning had a big impact on students' academic success and it is effective in all three settings: urban, suburban and rural area public schools.

Conclusion

Education must advance pupils' conceptual understanding and critical thinking, not only impart knowledge to them. Learning innovations are needed in education for both students and teachers to encourage lifelong learning. The purpose of the current study is to determine whether cooperative learning techniques may speed up student learning.

The study's other result is that higher order thinking skills provide the possibility for autonomous learning. For this reason, effective material presentation is essential. Cooperative learning activities and strategies are said to improve first-graders' learning.

Discussion

Cooperative learning is an instructional approach where students work together in small groups to achieve a common goal. This approach has been widely studied and implemented in various educational settings, including early childhood education (ECE). Let's discuss the effectiveness of cooperative learning at the ECE level.

However, it is important to note that the effectiveness of cooperative learning in ECE depends on various factors, such as the teacher's facilitation skills, group dynamics, and suitable tasks and materials. Proper planning, clear instructions, and ongoing monitoring and assessment are essential for successful implementation.

A meta-analysis by Roseth, Johnson, & Johnson (2008) found that cooperative learning had a positive impact on academic achievement in early childhood. Collaborative activities and discussions allowed children to deepen their understanding of concepts and improve their problem-solving skills. Cooperative learning has been found to enhance social skills in young children. A study by Vygotsky (1978) emphasized the importance of social interaction and peer collaboration in promoting cognitive and social development. Cooperative learning provides opportunities for children to practice communication, empathy, and teamwork.

Cooperative learning promotes the development of higher-order thinking skills, such as critical thinking and problem-solving. A study by Johnson & Johnson (1999) showed that children engaged in cooperative learning activities demonstrated higher levels of cognitive development compared to those in traditional instruction.

Overall, previous studies support the results of current study cooperative learning in early childhood education. The research suggests that cooperative learning enhances academic achievement at ECE level and provide a strong foundation for implementing cooperative learning strategies in ECE settings.

Recommendations

Based on study findings, following recommendations are presented:

1. Curriculum should be based on a variety of activities that promote diversity, movement, learning challenges and curiosity to enhance the students thinking skills.
2. Teacher should involve students and shift the learning responsibility to them rather than transit the content in passive, static and silent classrooms. Teacher encourage students to think and come up with a number of solution to learning challenges.

3. Policy makers and curriculum designers design the text books in an engaging way for long-term concepts, lifelong and effective learning which they can utilize in their real life.
4. Cooperative learning strategies must be operated within madrassas, public and private schools.
5. Teacher should be trained for teaching the students through cooperativelearning strategies.

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