HOW DOES COOPERATIVE LEARNING HELP TO INCREASE COMMUNICATION AMONG STUDENTS IN LEARNING SCIENCE?

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INTRODUCTION

More educators and psychologists value the benefits of cooperative learning strategies over those of a traditional teacher-centered classroom. Psychologists often speak about understanding joint construction. Piaget emphasized social interaction, more specifically peer interaction, from the perspective of its specific role in the development of logical reasoning (Hornby 2008).

According to the National Evaluation and Testing Service (NETS, 2010), the number of students in the science stream is less than the other streams in Grade 12 and 13 because achievements in the science and mathematics subjects are at a lower level at the Grade 11 General Certificate of Education for Ordinary Level (G.C.E O/L) examination. Even though several projects have been introduced at national, provincial and zonal levels, the achievements for science have not reached the expected level during recent years. According to my personal experience, the grade 7 class is an important level to create an interest in learning science.

This research was designed to explore whether and how cooperative learning supports the improvement of learning science of grade 7 students. A mixed methods approach was used, and the research question that was posed was "How does cooperative learning help to increase communication among the students in learning science?"

The Null Hypothesis (H_0)$\rightarrow$ The mean value of communication skills for learning science before implementing the cooperative learning approach (μ_1) is not less than the mean value of communication skills for learning science after implementing the cooperative learning approach (μ_2)($\mu_1 \geq \mu_2$)

Alternative Hypothesis (H_1)$\rightarrow$The mean value of communication skills for learning science before implementing the cooperative learning approach (μ_1) is less than the mean value of communication skills for learning science after implementing the cooperative learning approach (μ_2)($\mu_1 < \mu_2$)

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MATERIALS AND METHODS

Based on the ease of access, 21 students from grade seven in one of the 1AB schools in the Kandy district were selected for this experimental study. We used a mixed methods approach to answer the posed research question. Firstly, a questionnaire was administered to assess the students' existing communication strategies for learning science. Subsequently, five lessons were designed based on the Student Team Achievement Method (STAD)under the cooperative learning approach for the 5th unit (properties, uses and interactions of substances) of a grade7 science class. During the implementation of the five lessons, data was gathered as observations.

The collected data was analyzed using Excel 2007 where a paired t-test was conducted to analyze the data of the questionnaire to compare the development of communication prior to the lessons and after the implementation of the lessons that used a cooperative learning approach. Further, observational data was also analyzed using the thematic analysis technique and an assertion was also derived.

Sample and research instruments

21 students (8 males and 13 females) studying in Grade 7, at a 1AB Tamil medium school in the Kandy district, were selected for the study by using the purposive sampling method. A survey questionnaire was used to collect quantitative data. Teacher monitoring sheets, students' reflection forms, semi structured interview schedules and field notes were used to collect qualitative data.

Data collection

The survey questionnaires, developed for the purpose of assessing students' communication skills, were first administered to the students before starting the cooperative learning activities for science learning. During the implementation of the five lessons, students were made to engage in practical activities and were asked to complete activity sheets individually according to the teachers' instructions. Throughout the study, the author was an unobtrusive observer while the teacher conducted the lessons using the cooperative learning approach. During its implementation, the teacher assessed the students' communication skills using the teacher's monitoring sheet. Further, at the end of each lesson, the students' reflection forms, which consisted of the responses "none", "some", and "a lot" were given to the students to be completed, were collected. Field notes, which were maintained for each cooperative lesson activity and photographs, were also scrutinized.

After completing the five lessons, the same survey questionnaire was administered to the same students in order to find out any differences in their answers. Later, semi structured interviews were conducted for10 students and 2 teachers. These interviews were audio recorded.

Data analysis

In the analysis of data, both qualitative and quantitative techniques were used. Quantitatively, the responses to the questionnaire were analyzed under the Likert scale. A t-test was run using Excel2007 to determine whether a statistically significant difference existed between the means. The percentage values for the observed criteria and the unobserved criteria in the "teacher monitoring sheet" were determined. The frequency for each response and each criterion in the students' reflection form was calculated as a percentage. The recorded interview data was transcribed and an assertion was formulated.

RESULTS

Results from survey data analysis

The p-values for questions 9, 12, 15, 16, 18, 19, 20 and 22 were less than the significance value of0.1. Therefore, the null hypothesis was rejected. Hence, it can be inferred that the communication skills for learning that existed before the implementation of the cooperative learning approach are less than the communication skills for learning that were acquired after the implementation of the cooperative learning approach.

Results from observational data analysis

During the present research study, several instruments were used to observe how cooperative learning activities impact on students' communication skills for learning science. Field notes and interview transcripts were used to formulate the assertion. The percentage responses for each item in the students' reflection form and the percentage of entries in the teacher monitoring sheet were also considered to provide evidence for the formulated assertion, which was "Cooperative learning motivates students' interaction for learning Science".

Assertion

Cooperative learning motivates students' interaction for learning Science

It was clearly observed that the students' interactions increased in the classroom when the five science lessons, which were developed based on the cooperative learning approach, were implemented. During the cooperative learning activities, students' improved interaction was the key observation that was noted as most of the time they were provided with opportunities to argue with others to demonstrate their points of view. Students discussed and argued with the teacher, as well as with other students, and clarified their doubts, which demonstrated that cooperative learning resulted in giving a good opportunity for fruitful interactions.

Lesson 1 (physical states of substances) consisted of material to find out properties such as hardness, fixed volume, definite shape, and compressibility by external force of given materials. At this juncture, students' interaction activities were noted after the experiment as follows:

> *....After that teacher asked them to pour the same water into the 250 ml beaker. Later the teacher asked them how much volume of water was in the 250 ml beaker, and whether there was any difference in the volume of water in the beaker. Students replied that there is only 50 ml of water in the 250 ml beaker. Then one of the students of this group asked the other students "is coconut oil a fixed volume or not?" The other students said that coconut oil is also a liquid substance like water so there is no variation, and that it is also a fixed volume.*(Field notes dated 14.05.2012)

During the semi structured interview, the two teachers too emphasized on the impact of cooperative learning on the improvement on the learning of science by students. For instance, when interviewed, one of the teachers who observed the activity said that

> *"... [t]his method is really good because students are doing the tasks on their own. They compare and differentiate their problems with the participation of the whole group and at the end come to the conclusion unanimously. This is the most appropriate way for correct learning. It was observed that during the student's individual work their thinking prowess developed and during the group work their attitudes developed"*. (Voicerecord – 17, Lesson-4, 17/05/2012)

During the interview, the teacher said that students' abilities were different from each other. Each group consisted of clever and weak students. During cooperative participation for a given task, weak students were guided by the cleverer students, through these interactions, in order to achieve the expected level of knowledge.

Furthermore, the observations that were obtained through teacher monitoring sheets and students' reflection forms during the student's cooperative learning activities also revealed the improvement of students' interaction. These evidences reveal that students like to learn science through interactions and that cooperative learning activities provide an ideal environment to achieve it.

DISCUSSION OF FINDINGS AND CONCLUSION

This study explored the impact of cooperative learning on science learning in grade seven students. The improvement of students' communication skills for learning was obvious through both the survey and observational results. Students' communication skills, such as sharing ideas, working together, peaceful communication, and lower frustration and anxiety, were improved during cooperative learning. In addition, the findings from the analysis of the teacher monitoring sheets, as described in results, assured that the students' communication skills were improved in science learning under the cooperative learning approach. The analysis of the Student reflection form also revealed the improvement of students' attitude of respecting others' ideas. The expressionsof the students and teachers during their interview also revealed that the students' communication skills were developed through the cooperative learning activities.

CONCLUSION

The results of the present study indicated that students favored to communicate with others and were motivated to learn science under the cooperative learning approach. This outcome agrees with the Bently and Watts (1989) statement that "students can increase each other's learning by the cooperative learning approach under the group discussion method". Furthermore, students express desirable attitudes to working together and say they feel confident of their learning under the cooperative learning approach.

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