

The Application of Cooperative Learning Method Supported by Multiple Intelligence Theory on Mathematics Course: An Investigation of the Students' Opinions

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Abstract: In the present experimental study, the effects of cooperative learning method supported by multiple intelligence theory (CLMI) on elementary school fourth grade students' opinions about the application process were reported.

The study lasted twelve consecutive weeks. The participants of the study were 72 students who were divided in two groups. The group which was taught by using CLMI in the previous academic year was chosen as the first group (CLMI_experienced). The other group (CLMI_beginner) was randomly selected among other classes of the school. For the purpose of this study, both of the groups were instructed using the cooperative learning method supported by multiple intelligence theory (CLMI). "Teale Inventory of Multiple Intelligences (TIMI)", "Personal Information Form (PIF)" and "Semi-structured Interview Form" were used as the measurement instruments of the study. Furthermore, prior to the study TIMI and PIF (for getting personal information about students) were administered to all of the participants. They also were used in order to constitute the cooperative learning teams in the groups.

Results of interview, all of student (20) mentioned that *a) they liked being taught through this method, b) they liked the group work*. In addition, the participant students said the group work helped them *a) to improve their friendship, b) to know more about a friend who he had not known very well before, c) to establish support, d) to develop mutual assistance, e) to learn how to share, f) to learn to support each other in the group work, g) to be effective in group work*. Though all students were happy with group work activities. Also they added that less classroom materials were used before the CLMI method was introduced to them in their mathematics course.

Key words: Cooperative learning, Mathematics teaching, Multiple intelligence theory.

Purpose of the Study

In this study, the application of cooperative learning method supported by multiple intelligence theory (CLMI) on mathematics course and elementary school fourth grade students' opinions about the application process were reported.

Method

Subjects

This research was conducted at a state elementary school -which mostly middle-socio economic class students attend- in the city center of Adana. The study was carried out in the academic year 2005-2006 with the fourth grade students from two different classes in the school. The groups were randomly chosen. The students in one of the groups were taught mathematics using the CLMI method during 9 weeks -before the experimentation took place.

In order to follow the procedure of the study easily, some abbreviations were preferred for the groups. For example, “CLMI _experienced” was used for the first group in which the CLMI was applied during nine weeks. “CLMI_beginner” was used for the second group in which the CLMI was applied for the first time.

The experimentation was done with 38 students in the CLMI_experienced group, with 34 students in the CLMI_beginner group. Totally, 72 students participated in the study. The duration of the research was 12 weeks in the all groups together.

Instruments

As data collection tools, the Personal Information Form (PIF), The Teele Inventory for Multiple Intelligences (TIMI) (2000) and semi-structured interview forms were used. The reliability and validity studies of the measurement tool mentioned were given in sub-titles below.

Personal Information Form (PIF). Before the experimentation process began, the personal information forms were given to the participants in order to obtain data about their socio-demographic background. The information received through these information forms was used in order to be informed about the students in the control and experimental groups. In addition, this data was used to organise the cooperative teams in the experimental groups.

The Teele Inventory of Multiple Intelligences (TIMI). Teele Inventory for Multiple Intelligences (TIMI) was developed by Teele in 1992. This inventory is specifically designed to examine the dominant intelligence(s) of students in all grades.

The TIMI is a forced choice pictorial inventory that contains 56 numbered pictures of panda bears representing characteristics of each of the seven intelligences and provides students twenty-eight opportunities to make their selections of two choices. The different intelligences are matched with one another and students have the chance to select each of the seven intelligences eight different times in the inventory. Students are asked to select one of the two choices that they feel is the most like them- there are no right or wrong answers in this inventory.

Each picture selected by the students represents a score for the intelligence associated with that picture and the answer sheets were coded in this way. The intelligence or intelligences that were more frequently selected yield the dominant intelligence of the students. The answer sheet enables the student and the teacher to determine the students’ most dominant intelligences as indicated by the highest scores. This test was used to identify the students’ intelligence types at the beginning of the treatment to determine the participants’ most dominant intelligences. This data was used to organise the cooperative teams in the experimental groups.

Semi-structured Interview Form. In this research, 20 student were involved by means of a semi-structured interview. “The Semi-structured Interview Form” was used to determine students feelings and opinions of the CLMI on mathematics course. Leder (1992) emphasizes that different measurement techniques should be used because attitude/behavior evaluation is multi-directional and broad (cited Doğan, 1999). In order to obtain productive data in this area, more than one technique should be applied.

Treatment

In this research, the cooperative learning method supported by multiple intelligence theory (CLMI) was used in the groups.

The Cooperative Learning Method Supported by Multiple Intelligence Theory (CLMI)

In the groups, the heterogeneous teams were prepared according to the results of the TIMI & PIF and the academic achievement variable. During 3 weeks, various activities focusing on 8 different intelligences were conducted in order to raise the students' awareness related to their intelligences. In addition to these awareness-raising activities, classroom tasks for developing the students' group identity were prepared. Before the experimentation, the team work guide booklets were given to the teams and read together, so the students were informed how the classes would go and how they would be assessed. After that, the mathematics courses were instructed following the steps in the plans based on the objectives and the CLMI during 9 weeks. The studies by Kagan (1992), Martin (1996), Gomleksiz (1997), Andrini (1998), Kagan and Kagan (1998), Iflazoglu (1999, 2003), Sonmez (2001) and Tarim (2003) were used as references to prepare the procedure of the classes based on the CLMI. The class activities in the framework of the Multiple Intelligence Theory revealing the individual differences and the cooperative learning techniques (brainstorming, roundrobin, numbered heads together, send a problem, formation, mix-freeze-group, pairs check, mix-pair-discuss, team stand-n-share,...etc.) and various tasks on different intelligence fields were used.

The classes started with an attention getting activity. Some questions about the topic of the class were asked and the students' ideas were gathered. The classroom activities prepared according to the multiple intelligences were used for this phase.

An exam about the topic taught was given when the topic was over. The students took part in the exam individually. Their teams, scores were based on individual scores. The successful teams and the teams that posed positive behaviours of the week were announced on a board prepared by the researcher in the class.

The achievement certificates were given to the successful teams and the positive behaviour certificates were given to the teams which showed these behaviours.

Data Analysis

For the analysis of the data obtained from the semi-structured interview form we used content analysis. In the analysis of the interview data, the data obtained from interviewees were transcribed to a word processing program. At the second stage for each question, all of the answers from every student were collected in columns. Thirdly, after reading the texts several times, the researcher evaluated them by a line-by-line reading technique and built the coding. "Drilling through literature" and "repetitive reading" procedures were repeated where necessary during the reading process. Afterwards, the proper categories were set up in accordance with the literature and coding. The results obtained from interview analysis were represented according to "the approach of categorized data expression," which was recommended by Miles and Huberman (1994).

Interview Results

In this part, the participants were asked a) whether they liked the CLMI method, b) about their comments about the course taught, c) about their point of views about group works, d) about the effects of this method on their friendship relationships, e) whether there was a change in the material use.

First, the students were asked about their opinions related to the course taught by means of the CLMI method. All of them (20) mentioned that *they liked being taught through this method*. Also, some of the participants told that *they were amused through this method and they acquired the item taught very well*. They added that *the activities were very good and they talked about the usefulness of this method*. Furthermore, they mentioned that *this method provided an opportunity for the group members to help each other for the items that they could not understand and this method helped them to develop their intelligence*. Through this method, *they could understand more easily and better*. 4 of them stated that *they improved their friendship relations and they learnt how to share*. Moreover, 3 students in the CLMI_experienced group told that *they were satisfied with the activities but they may have got bored of some tasks that were related to some topics*. 1 student in the CLMI_beginner group said that *although he liked the activities, he sometimes felt bored because of the disagreements within the group*.

Following that; the students were asked about their point of views related to group work. All of them mentioned that *they liked the group work* (20). In addition, the participant students said the group work helped them a) *to improve their friendship*, b) *to know more about a friend who he had not known very well before*, c) *to establish support*, d) *to develop mutual assistance*, e) *to learn how to share*, f) *to learn to support each other in the group work*, g) *to be effective in group work*). Though all students were happy with group work activities, 8 students told that they had some problems on their groups and they could not get establish good relationships with group members. Then, the students were asked about the causes of the problems in the group works. They responded a) they could not share the group materials, b) they had disagreements within the group, c) they had a cleaning problem within the group, d) they encountered some conflicts within the group.

Then, the students were asked how this method influenced their friendship relations. They all agreed on the positive contribution of this method on their links with their friends.

Next, the participants were asked whether they observed a difference in using materials during mathematics course. They were all aware of the difference and they added that less classroom materials were used before the CLMI method was introduced to them in their mathematics course. Especially 4 students told that they had only used pen and pencil in their maths course.

In the second part of the interviews, the students' awareness about intelligence areas were investigated. The students were asked about a) what intelligence area they mostly used, b) whether they used all intelligence areas in their previous maths course, c) what intelligence area were used in the maths course taught through the CLMI method. Below, we present these questions and the students' responses.

The students were asked what intelligence areas were mostly used in their previous mathematics course. The intelligence areas the students mentioned were given in Table 1.

Table 1. The students' responses about the intelligence areas they used in their previous maths courses

Students		F1	F2	F3	F4	F5	M1	M2	M3	M4	M5
Intelligence Area	G-1	M/L B/K	M/L L	M/L L V/S	M/L	M/L	M/L	M/L	M/L	M/L B/K	M/L
	G-2	M/L L	M/L	M/L	M/L B/K S I	M/L	M/L	M/L	M/L L	M/L	M/L L I

F: Female M: Male G-1: CLMI_experienced G-2: CLMI_beginner

The analysis of Table 1 indicated that the students listed the intelligence areas as (M/L) mathematical-logical (20), (L) linguistics (5), (B/K) bodily-kinesthetic (3), (I) intrapersonal (2), (S) socia/interpersonal (1) and (V/S) visual/spatial (1).

Then, the students were asked what intelligence they used in their maths course taught through the CLMI method. They all told that they used all intelligence areas. In addition, they were asked about the mostly used intelligence area in this maths course taught using the CLMI method. The intelligence areas the students mentioned were given in Table 2.

Table 2: The students' opinions about the intelligence area they mostly used

Students		F1	F2	F3	F4	F5	M1	M2	M3	M4	M5	
Intelligence Area	G-1	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	
		L	L	L	L	L	L	L	L	L	L	V/S
		V/S	V/S	V/S	V/S	V/S	V/S	B/K	V/S	V/S	V/S	M/R
		M/R	M/R	M/R	M/R	M/R	M/R	N	M/R	M/R	M/R	I
		B/K	S	B/K	B/K	N	S	B/K	B/K	B/K	B/K	N
		N	I	N	N	S	I	N	N	N	N	N
	G-2	S	S	S	S	I	S	S	S	S	S	S
		I	I	I	I	I	I	I	I	I	I	I
		M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L
		L	L	L	L	L	L	L	L	L	V/S	L
		V/S	V/S	V/S	V/S	V/S	B/K	V/S	V/S	V/S	M/R	V/S
		N	M/R	M/R	M/R	M/R	N	M/R	M/R	M/R	B/K	M/R
G-2	B/K	B/K	B/K	B/K	S	B/K	B/K	B/K	B/K	I	B/K	
	N	N	N	N	I	N	N	N	N	N	N	
	S	S	S	S	S	S	S	S	S	S	S	
	I	I	I	I	I	I	I	I	I	I	I	
	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	M/L	
	L	L	L	L	L	L	L	L	L	V/S	L	

F: Female M: Male G-1: CLMI_experienced G-2: CLMI_beginner

Table 2 pointed out the students' mostly used intelligence areas. They listed them as (M/L) mathematical/logical (20), (S) social/interpersonal (16), (M/R) musical/rhythmic (17), (N) nature (16), (B/K) bodily/kinesthetic (16), (V/S) visual/spatial (18), (I) intrapersonal (17) and (L) linguistic (18).

Last, the students were asked about what they thought about the integration of CLMI-based activities into the maths course. They said that they liked the way they were taught, they developed themselves, they learnt about the intelligence areas. They added that they developed their intelligence areas, they understood the maths better and they improved their achievement at maths.

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