

# The Impact of Cooperative Learning on Developing the Sixth Grade Students' Decision-Making Skill and Academic Achievement

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## Abstract

This study aimed at investigating the effect of the cooperative learning on developing the sixth graders' decision making skill and their academic achievement. The study sample, which was selected randomly, consisted of (46) students and divided into two groups: the experimental group which was exposed to the cooperative learning strategy and the control group that followed the traditional method. The students were taught the Geometry unit in mathematics from their mathematics book which required (16) lessons to finish. Then, an achievement and a decision making skill tests were administered. The validity and reliability of the tests were achieved by using suitable methods. The results of the study showed that there were significant statistical differences between the two groups concerning the students' skill in decision making and their results in the achievement test in favor of the experimental group.

**Keywords:** Cooperative learning, decision-making skill, academic achievement.

## 1. Background of the study

The third millennium has witnessed an exceptional progress in science, technology, economics and politics as well as the progress in the means of communications. As a result, the world has become a small village open to all these progresses which makes it essential for the educational institutions to positively prepare their individuals to deal with the requirements and complexity of this millennium by fostering the learner's competencies in solving problems and making decisions as important critical thinking skills.

The traditional way of teaching which is based on lecturing and dealing with the classroom problems or the educational situations using common standards, leads to only one correct answer which, in turn, makes the students unable to cope up with the different problems and situations that they face in their life because these situations demand different ways of decision making. In addition, this traditional way deprives students from acquiring the necessary knowledge that they are supposed to rely on later in their everyday life. Unfortunately, the drawbacks of such methods on the learners have increased lately and molded their personalities in a way that impede them from thinking logically and using the in-depth knowledge to get enlightened decisions in their lives (De bono, 2004). Doucet, Purdy, Kaufman & Langille (1998) stated, in their study, that by using the lecture method in teaching, the learner becomes a passive recipient in the learning process.

## 2. Significance of the study

The standards of the National Council of Teachers of Mathematics (NCTM) in 2000 issued by the mathematics teachers, focused on (a) employing the strategies that were based on thinking and reasoning, (b) communicating mathematical ideas effectively, (c) connecting the mathematical ideas with each other by relating them to the whole picture and using them as problem solving strategies, and (d) trying to employ them in their life as a response to the global evolution movement that reflects the society needs, economy and information technology. In accordance with these global needs, it must take into account all the aspects of growth. Thus, the importance of this study lies in the fact that:

- 1- It helps the teachers and the administrators develop more effective educational strategies that contribute to addressing some of the problems related to the development of the students' ability to think, communicate and connect mathematical ideas. This may reflect an improvement in the learning of mathematics.
- 2- It makes students more capable of recognizing the pros and cons of the alternatives they are provided with and improving their abilities to arrange them according to their importance and priority.
- 3- It offers a new theoretical importance to the educational literature as it sheds light on the consequence of the decision making skills on young learners. It should be noted that the subjects of the study were in sixth grade and they were only 12 years old which means that they were in their late childhood during which they go through a very critical stage on their school education.
- 4- It is designed to teach students how to deal with the information stored in their brains and benefit from the previous experiences and use them properly to make appropriate decisions whenever it is necessary.

### 3.Literature review

The issue of decision-making is generally regarded as the most important element in the lives of the individuals which has a great impact on them as a key factor for problem solving and as a way to help them adapt with their surrounding circumstances. Generally speaking, the individuals make daily many decisions varying in the degree of importance and the effort required to make them. The same applies to the educational institution as the decision-making process becomes more important, more serious and far-reaching; this is ascribed to the fact that the decision making is not about one person but it might influence or include several individuals or groups on several aspects that might have its effect on the economic and social situation as a whole (Ashcraft, 1994).

Recently, the decision-making as a subject of interest has paid the attention of many scholars and researchers, in various disciplines, who eventually came up with so many definitions of it. Hodgkinson (2003), for instance, defined the decision-making process as an interactive process between the 'Candidates alternatives' to resolve the problem and the 'Selectors' who nominate one of the these alternatives. Another definition was given by Chi (2001) who defined the decision-making process as an intellectual exercise designed to replace a set of alternatives to face a certain situation or a problem. On their hands, Eysenck & Keane (2000) identified the decision-making process as a mental process of a complex psychological behavior, which does not only demand facing multiple choices but also gathering as much information as possible regarding these choices and then selecting the most appropriate strategy to reach the desired goal. They pointed out that the difficulty lies in the individuals' ability to use their performance skills and their intellectual abilities in a harmonious way to develop distinct strategies and to come up with an innovation of multi-solutions. They added that these appropriate solutions should be in accordance with the individuals' desires and objectives, on one hand, and the requirements of their society along with its values and ethics, on the other hand. Thus, the decision is the point at which, the choice of the most important alternative is taken and which can be viewed as the moving point toward the commitment of scheduling the necessary action steps with the exclusion of other secondary important alternatives since that commitment makes the decision making more meaningful and valuable (Cavalier, 2002). The decision making is more than just choosing what to do since it involves a logical commitment no matter how that commitment is simple. In addition, it often demands making a commitment on behalf of others and, then, asking them to adhere to it.

As for the empirical studies concerning the decision-making skill, Sohail (2000) conducted a study that examined the effectiveness of a training program to develop the decision-making skill among a sample of 178 male and female students who were in the eleventh-grade in one of the official schools in Damascus. The sample was divided into two groups: the experimental group that was exposed to the training program of the decision-making skill and the control one which was exposed to the ordinary way. The results showed the superiority of the experimental group over the control group with no statistically significant differences between the male and female students who were trained on the decision-making skill.

Pedretti (1999) researched a sample of fifth- and sixth-graders in order to examine how science correlated with society in education. The results showed that the school and social environment enhanced the students' understanding of science through dialogue and decision making skills which help in connecting the students' school knowledge with their social life in the world in an early stage of their education.

As a result of the great impact of the positive teaching in raising the learners achievement and their mathematical thinking skills, the emphasis has been put on increasing the effort to detect more ways to develop the effective learning methods into their maximum levels. The results that Fennema, Carpenter, Frank, Levit, J-Acobs & Empson (1996) emphasized on related to the fact that the teachers should change their pedagogical knowledge in order to help students develop their cognitive thinking skills; otherwise, the teachers' negative performance will be reflected on the students' poor knowledge. Subsequently, the teachers should realize that they must focus on the depth of knowledge and adopt the teaching methods that aid in identifying the necessary concepts for the learners to support their way of thinking (Gilland & Billups, 2001). Thus, there is an urgent need to call for inviting the educated researchers to reconsider the traditional methods of teaching and the importance of getting benefit from the experiences of those who are supposed to be expert in teaching mathematics (Stigler, Gallimore & Hiebert, 2000). Accordingly, the teachers and students' questionable statements and reactions which depend on the classroom environment, should be based on respect and support (NCTM, 1989).

This brings the notion of the cooperative learning and its importance in the learning process. This, undoubtedly, is in contradiction with the traditional method of learning that is a mere reflection of lecturing as the teacher does most of the objectives in the learning process. Furtwangler (1992) asserted that although the cooperative learning is the outcome of the student's direct involvement in the learning process, the emphasis on the role of the learner is not less than the role of the teacher to achieve the objectives perfectly. He identified the roles of the teacher in the teaching process which are represented by his/her way of outlining the lesson plan, ensuring the classroom management, organizing the educational tasks and supervising the group

work participation. The educational research proved that the students can learn from their friends the same as their teachers and in some cases they can learn from the former more than the latter (Fitzgerald & Bouk, 1993; Atkins 2010).

Many empirical studies proved the positive impact of the cooperative learning on the learners' attitudes and social relations as well as their academic achievement. These studies were not only conducted on students in their elementary stage but also on students in their secondary and high school stages. For example, Miqdadi (2006) investigated two key aspects of using the cooperative learning strategy which were applied on students from the first elementary stages by trying to solve problems in geometry tasks. While the first aspect was associated with the advantages and the difficulties of the cooperative learning, the second was associated with investigating the common verbal communication patterns among the students who were working in cooperative learning groups. The results showed that the students pointed to the advantages of the cooperative learning rather than the problems accompanied with it. It, also, revealed that the students' common verbal patterns fell into two main domains: the first domain was connected with the patterns of communication which implied a positive learning and promoted active participation among students and the second domain was associated with the patterns of communication that reinforces the negative participation among them. But the average findings of the first domain was higher than the second one.

Furthermore, Mohammad's study (1984) that was conducted on the sixth graders from both sexes, proved that the students with higher social standards and economic levels outperformed their counterparts in their decision-making skill and taking responsibility. But the results showed that there were no statistically significant differences between males and females in that matter.

Other studies showed that the students from the higher stages of school can still benefit from the cooperative learning. This can be illustrated by the study conducted by Miller (1990). The rationale behind Miller's study was to examine the effect of the cooperative learning on the students' acquisition of the mathematical knowledge in the American high schools and to identify their attitudes toward it. The results proved that there was a great impact of the cooperative learning method on the students' attitudes and cognitive achievement.

There are some empirical studies that investigated the impact of using certain educational models to enhance the cooperative learning. One of them is Yusof's study (1998) that aimed to identify the effect of using two models of the cooperative learning in the achievement of the ninth-grade students and their attitudes toward them in math. The two models were the 'Jigsaw' Model and the model of 'Learning together'. The study sample was divided into: two experimental groups which used the cooperative learning and one control group that used the traditional method. The results demonstrated that there were significant statistical differences between the experimental groups and the control one in favor of the experimental ones due to using the models of the cooperative learning but there were no statistically significant differences between the two models regarding the students achievement or the students attitudes toward using these models of the cooperative learning in mathematics. Similarly, Shamasneh (2001) conducted a study on two groups: the experimental and control groups. It aimed to identify the impact of using the 'Jigsaw' method in teaching the unit of geometry for the sixth graders and comparing it with the traditional educational way of teaching the same unit. The results did not only show significant differences in the students achievement but it also revealed their preferences and attitudes towards mathematics in favor of the experimental one.

In contrast, Colliton's study (1997) came up with different perspectives. His results indicated that there were no statistically significant differences in the students achievement after using the same level of the cooperative learning with the fifth graders and the sixth graders. On the other hand, he found out that although there were statistically significant differences in the achievement of the sixth grade students who used the average level of the cooperative learning in mathematics, there were no further progress in the achievement of those who used high or low levels of cooperative learning.

#### **4. Problem of the study**

The problem of the study stemmed from the lack of the studies that handled the extent to which the decision-making skill aids students in developing their achievement in mathematics, particularly, in Jordan. It was also based on the researchers' feeling that the learners of different ages have virtually low abilities in making decisions. Accordingly, this study seeks to answer these two research questions:

- 1-What is the impact of the cooperative learning strategy on developing the decision-making skill of the basic sixth grade students?
- 2-What is the impact of the cooperative learning strategy on the sixth grade students academic achievement in math?

#### **5. Hypotheses of the study**

Based on the statement of the problem, two null hypotheses were formulated in light of the questions of the study and they were tested at the  $\alpha=0.05$  level:

H.1: There is no significant difference between the average performance of the experimental group that was exposed to the cooperative learning strategy and the control group that was taught with the traditional way to attain the decision-making skill.

H.2: There is no significant difference in the means of the academic achievement test between the experimental group taught with the cooperative learning strategy and the control group that followed the traditional method of teaching.

## **6. Limitations of the study**

The following limitations may affect the generalization of the results:

1-This study was limited to a sample of sixth grade students in one of the UNRWA schools . It had been selected in a deliberate manner as the school principle and the mathematics teacher expressed their interest in the study. Also, the control and experimental groups were taught by only one teacher.

2-This study encompassed Abu Latifa's (2006) Scale of the decision-making skill which was used to measure the psychometric characteristics. So the results of this study were associated with the reliability and validity of that scale.

3-The test administered to both groups in the unit, which preceded the geometry unit, was considered as the pre-achievement test and accredited as the monthly academic achievement exam of mathematics.

## **7. The methodology**

### **7.1 Sample of the study**

This study was conducted in one of the UNRWA primary schools in the second semester of the academic year 2015/2016. The subjects of the study consisted of 48 female six grade students whose ages ranged between 12 to 13 years. They were distributed randomly into two groups: one experimental group and one control group. The educational material was taught by only one teacher. The teacher was a holder of the EP (Educational Psychology) which is an obligatory course at the UNRWA for all of its teachers to make sure that they are qualified for teaching.

### **7.2 Educational material**

The educational material was based on the content of one unit from the sixth-grade math book which was about geometry. The content was from the public math curriculum and it was used to teach both the experimental group and the control group. The educational material was designed according to the cooperative learning strategy. The study plans included a description of the method of teaching and learning as well as advice, guidance and questions for discussion that the teacher might need.

The suitability of the material plan was verified by consulting a committee of experts consisted of (5) supervisors who were the holders of the doctoral degree or the masters degree in mathematics and teaching methods and had the experience and competence in that field. In light of the views and suggestions of the committee, the plans were modified to assure the reliability of the study.

### **7.3 Tools of the study**

The researchers utilized these tools:

- A questionnaire of the decision-making scale which consisted of 30 decision-making scales each was followed by four alternative choices. The students from both groups of the study were asked to choose only one alternative as an answer. These alternatives were classified in terms of four levels ranging from 1 to 4 as follows:

- 1-'No decision was made'
- 2-'The decision was made by others'
- 3-'The decision was made by the student herself' after consulting others'
- 4-'The decision was made by the student herself'

Consequently, the total score of the scale was (120).

-Achievement Test:

The achievement test was prepared and developed by the researchers of the study to measure the sixth grade students' performance and perception of the geometrical material after the treatment. The test was based on Bloom's taxonomy. It included questions that consisted of four multiple choices and written questions. The total score of the test was equal to (30) marks. The test was verified by experts and specialists in the field of teaching mathematics. To test the reliability of the test, they calculated the value of its coefficient of consistency using Cronbach's alpha which was highly reliable (0.83). The covariance values and the coefficient of difficulty values ranged from (0.24-0.91) and (0.32-0.85), respectively, for these paragraphs.

### **7.4 Design and variables of the study**

The variables of the study can be classified into two kinds:

1-The independent variables which were manifested by two teaching strategies: (A) the cooperative learning method and (B) the traditional method.

2-Two dependent variables which were:(A) the decision-making skill and (B) the academic achievement.

These variables can be represented by this design:

G1: O1 X O1 O2

G2: O1 Y O1 O2

Key:

G1: experimental group, G2: the control group

X: cooperative learning strategy , Y: No treatment

O1: measure of decision-making, O2: achievement test.

### 7.5 Procedures of the study

The following procedures were carried out:

- the mathematics achievement test was carried out on a pilot sample of 26 students outside the study in order to:

(a) make appropriate adjustments

(b) determine the time needed for the academic achievement test of the current study

(c) calculate the value of coefficient of consistency covariance and difficulty

-The researchers held regular meetings with the teacher before and during the experiment and after submitting her study plans. The aim behind the meetings was to discuss the plans which adopted the cooperative learning style with the experimental group and the most important characteristics of this strategy and their conditions of use.

-the teacher taught the control group the unit of geometry following the traditional way as stated in the school guidance textbook for teachers and the researchers were provided with the plans.

-the experiment took (4) weeks during which the teacher spent four lessons per week for each group in the same time period to teach the educational material.

-The decision-making scale and the achievement tests were applied on both groups directly after the completion of the experiment and at the same time in order to measure the students' performance in the achievement test in math and their skill in decision-making. The researchers supervised how the tests were conducted.

-After administering the post-achievement test, the teacher corrected the test sheets and the marks were distributed evenly in that each item was given one mark. Each item was given the mark "1" in case the answer was correct and "zero" if it was wrong. The maximum mark of the test was 30 and the lowest mark was zero. The results of the test were accredited as the monthly academic achievement exam of mathematics.

## 8. Results and Discussion

This section consists of two parts. The first aimed to measure the effectiveness of the cooperative learning strategy on the two dependent variables which are:

(A) the decision-making skill and (B) the academic achievement.

The second includes the observation of the mathematics teacher while teaching the experimental and control groups of the study.

### 8.1 The descriptive statistics of the dependent variables

To examine the first null hypothesis, the means and standard deviations of the two groups' performance in the decision-making skill before and after the experiment, were calculated and presented in table (1).

*Table 1: Sample means (M) and standard deviations (STD) of the two groups pre-test and post-test performance in the decision-making skill.*

Group	N	Pre-M	STD	Post-M	Post-STD	Adjusted M	Standard error
Experimental	24	57.50	13.51	69.83	11.68	69.12	0.94
Control	24	55.88	13.28	59.33	13.59	60.05	0.94

The descriptive statistics in table (1) yielded statistically significant differences between the mean scores of the experimental group taught with the cooperative learning method and the control group followed the traditional method. To determine where precisely the significance lays, the source of variance (ANCOVA) between the scores of the experimental group and the control group was calculated.

Table 2. ANCOVA results and descriptive statistics of the experimental group and the control group's regarding the decision making skill.

Source of variances	Sum of squares	degrees of freedom (df).	Mean square	F	P-value
Pre	6427.507	1	6427.507	302.816	0.000
Group	982.553	1	982.553	*46.291	0.000
Error	955.160	45	21.226	302.816	0.000
Total	8705.667	47			

**\*Statistically significant ( $\alpha = 0.05$ )**

Table (2) displays that there were statistically significant differences at the p-value ( $\alpha = 0.05$ ) between the experimental and control groups regarding the decision making skill. By reference to the adjusted means in Table (1), it is clear that the differences were in favor of the experimental group as compared with the control group which means that the cooperative learning strategy played an important role in the development of the students' decision making skill. Consequently, the first null hypothesis was rejected.

To examine the second hypothesis, the means, adjusted means and standard deviations of the academic achievement tests of the experimental group and the control group before and after the experiment were calculated as shown in table (3).

Table (3). The means (M), adjusted means and standard deviations (STD) of the pre- and post- academic achievement tests of the experimental group and the control group.

Group	N	M	STD	Post-M	Post-STD	Adjusted M	St.Error
Experimental Group	24	12.42	5.06	18.21	6.41	17.80	0.80
Control Group	24	11.67	4.83	13.38	6.83	13.78	0.80

As represented in Table (3), the experimental group exposed to treatment had a higher mean than the control group. To determine where the statistical difference exists in the scores of the academic achievement test in mathematics, one-way ANCOVA was used and the results were tabulated in table (4).

Table 4. ANCOVA results and descriptive statistics between the means scores of the achievement test of the experimental group and the control group.

Source of variances	Sum of squares	Degrees of freedom (df).	Mean square	F	P-value
Pre	6427.507	1	1326.986	86.468	0.000
Group	982.553	1	192.657	12.554	0.001
	955.160	45	15.347	86.468	
Total	8705.667	47			

**\*Statistically significant ( $\alpha = 0.05$ )**

As revealed from Table (4), the findings showed statistically significant differences in the achievement means at the p-value ( $\alpha = 0.05$ ) between the experimental and control groups and by reference to the adjusted means in Table (3), it is clear that the differences were in favor of the experimental group as compared with the control one which means that the cooperative learning strategy played an important role in the development of the students performance in the achievement test. Therefore, the second null hypothesis was rejected.

**8.2 Teacher's observation**

In contrast with the control group, the teacher came up with the following observations after making sure that the students from the experimental group became aware of their roles and tasks while working in groups:

- The students started to listen attentively to each other and respect the views of others.
- The feedback they got from each other in the same group and the members from the other groups led them to come up with better decisions while solving other mathematical tasks.
- letting the students work with their colleagues encourage them to do more effort as it ignited their spirit of competence and responsibility which, in turn, provided them with enthusiasm.
- It enabled the students to get the necessary attention from their teacher because they saved her time as a result of their participation in the learning and teaching process.
- It affected the students' motivation in a positive way which was manifested in their classroom performance and participation as each member in the group realized that she had a significant role.
- In spite of their modest participation, weak and shy students became more active and confident. Thus, the cooperative learning seemed to suit not only the high-ability students but also the low-ability ones (Johnson & Johnson 1994).

**9. Conclusion**

The results of this study revealed the positive impact of the interaction and cooperation among students on enhancing their decision-making skill in order to achieve their common goals. The decision-making skill is one of the necessary individual skills needed to help the learners (a) adapt with the surrounding environment,

(b) achieve their goals and aspirations and (c) be active participants in any task assigned to them. As a result, the educational institutions need to pay more attention to the skill of the decision-making and calls for the need to train students on acquiring it due to its efficiency in facing and coping with the technological advances and the explosion of knowledge that we have recently witnessed.

Therefore, with the exception of Colliton's results, the findings of the current study agrees with the results reached by Sohail (2000), Pedretti (1999) as well as the ones reached by Miqdadi (2006), Mohammad (1984), Miller (1990), Yusof (1998) and Shamasneh (2001) concerning the decision-making skill and the cooperative learning, respectively.

In light of the results and the discussion of the study, the following recommendations are made:

-The need for employing the strategy of the cooperative learning in teaching mathematics as part of the teachers' guidance textbook because of its impact on developing the students' decision-making skill and their academic achievement in mathematics.

-Further research is needed to investigate the impact of training students on the decision-making skill in other subjects and find out how it could enhance their achievement. Also, longitudinal studies are recommended in order to examine the long term effect of the cooperative learning on the decision-making as a high thinking skill.

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