THE EFFECT OF COOPERATIVE LEARNING ON STUDENTS' PERFORMANCE IN COMPUTER COURSE USING BLACKBOARD

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ABSTRACT

Cooperative Learning is one of the most successful strategies used to develop class performance [1]. This procedure involves groups of students working together to complete a given task. The presented strategy helps students with low level (weak students) of abilities to increase their understanding of a topic and then improve their grades in the exam. The purpose of this study is to explore the use of face-to-face and e-learning (Blackboard) environments used by students to communicate and collaborate with each other. Clear instructions were providing to all students in order to be part of this study. During the achievement of this strategy, students realized that each person's work benefits not only that individual but the member of the same group as well.

Keywords: Cooperative Learning, Face-to-Face and Online Environments, Learning Management Systems (LMS), E-learning Technology, Students' Performance, and Instructions.

I. INTRODUCTION

The aim of this project is to examine the effects of cooperative learning on students' performance in a computer course class. This study was conducted over two semesters of lectures in Foundation Program at Qatar University. It was tested at the computer labs as a face-to-face environment and also tested by applying the Learning Management System Blackboard as an asynchronous online environment [2]. To verify and validate the results of the strategy presented in this paper, the project took place over two semesters; spring 2007 and fall 2010. Two classes participated in the current study and each class consisted of 8 to 9 groups of two students per group. The results of another class which didn't participate are included in this study for purpose of results comparison. Classes which had participated and which had not participated in this study had the opportunity to use blackboard. Students' reorganization was the only difference between these classes. In addition, clear instructions were provided to students who participated in this study in order to follow. These guidelines consist mainly of attendance rate which should be 75% or above per semester, and the number of assignments (homework and quizzes) done per a student should be more than 2. The creation and formation of groups was done according to the midterm exam's marks. Each group was formed by two students one with low and the other with high midterm exam marks.

This paper will first provide a brief introduction to the course content used in this study, the participants (Students), the instructions, the LMS used by students to communicate with each other, and finally an analysis and discussion of the results obtained. The paper will end with conclusion and references.

II. COURSE DESCRIPTION

The course selected for the current study is computing for foundation level 1. This course is designed to provide students with learning environments to master fundamentals of computer skills. The course content is divided into three main subjects as mentioned below and it focuses on basic computing skills both theoretical (computer concepts) and practical (using operating system such as Windows XP and Microsoft Word 2003 and 2007).

a. *Computer Concepts*:
Computer components, basic computer architecture, basic networking concepts, security and legal issues associated with computers.

b. *Working with Windows XP and File Management:*
Introduction to the basic functions with other important concepts of an operating system, and skills to manage and organize files, folders and disk drives.

c. *Word Processing*:
Basic operations to create, edit, format, and enhance word processing documents for distribution.

III. GROUPS

Group-based learning creates an environment in which students can practice, increase, and improve their skills [3]. Advanced students can gain leadership, improve their communication and social environment. In the current study, two classes were selected; one male class (016 - spring 2007) and one female class (120 – fall 2010) to participate in this cooperative learning analysis. The results of another male class (021 – spring 2007) presented in figure (1) is included in this study in order to be compared with the other results for purpose of comparison and validation.

The participants were new students to the university coming from different high schools with different level of skills and with different majors as shown in table 1. Each class consisted of 18 to 19 students. Table 1 shows an example of one male class (M16 – spring 2007) with serial number, students' university **Id**entification number (Student **ID**), specialty, and midterm exam marks out of 100.

IV.   INSTRUCTIONS

As stated, instructions were circulated to all students and it consists of:

   a.   A student's attendance rate should be 75% or above
   b.   Student should take at least 2 Quizzes and 2 Homework
   c.   Students should respect all ideas and thoughts expressed by the other member of the group
   d.   Students should prepare the topic before the lecture
   e.   Students should participate online through discussion board as part of LMS
   f.   Students should cooperate with other members of the group
   g.   Students should be online through Blackboard for at least one hour per day after each lecture
   h.   The participation to a discussion board is mandatory
   i.   Students should answer questions and put their own questions related to the topic of the lecture
   j.   Students should use office hours on weekly basis
   k.   Students should respect their assigned groups during the achievement of the project

Serial	Student ID	Specialty	Midterm Exam
1	200607977	Science	93.0
2	200601051	Business	61.5
3	200600312	Science	82.0
4	200600771	Eng.	86.0
5	200604026	Law	77.5
6	200603403	Art	57.5
7	200607144	Eng.	85.0
8	200603575	Business	89.5
9	200600054	Art	70.5
10	200604957	Business	80.5
12	200607289	Eng.	89.5
13	200606891	Business	74.5
15	200607191	Business	88.5
16	200607331	Business	92.5
17	200602344	Business	94.0
18	200602925	Business	84.5
19	200607108	Business	69.5
20	200608099	Business	85.0

Table 1: Class List (RAW DATA)

V.   LEARNING MANAGEMENT SYSTEM (LMS)

E-learning systems have become one of the main components to implement effective education systems, especially in higher education institutions [4]. This study investigated the use of computer technologies as electronic learning tools. Therefore, an online environment strategy was adopted in this study as an e-learning system. Students who participated in this cooperative learning approach were asked to use Blackboard as an asynchronous learning environment tool [5, 6]. Figure (1) is a snapshot of blackboard used with class 120 during fall 2010. A discussion board feature from blackboard was used by all groups in order to share skills and knowledge after the class meeting. Also, after each lecture, a thread was posted by the teacher in blackboard to keep students active after the lecture.
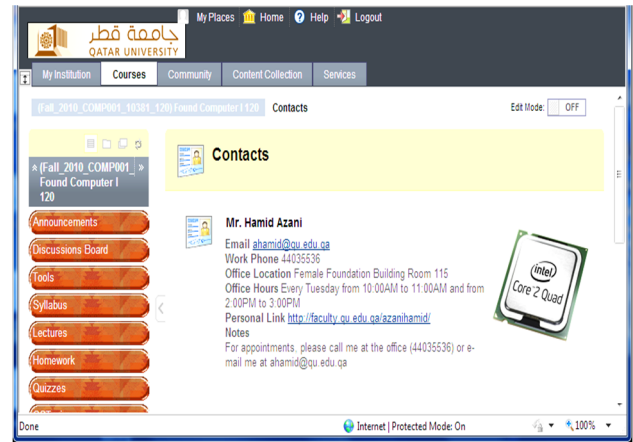

Figure (1): Snapshot of Qatar University's Blackboard for Class 120

VI.   GROUPS' SELECTION METHOD

Table 1 shows a midterm grades for male class 016. According to Qatar University regulations regarding the attendance rate, students with serial numbers 11 and 14 were barred from the class. The absence rate of these two students exceeded 25%. For that raison their marks were not part of the current study and not shown in table 1. The method used to reorganize and create group was to start by sorting the students' list as shown in table 2. The following steps describe the way used to select and reorganize the groups:

STEP 1:
Sort the list in ascending order (Smallest to Largest) according to midterm marks as shown in table 2.

Step 2:
Divide the list into two equal sets as shown in table 2. The first set of grades will be assigned to lowest marks starting from the smallest mark at the beginning of the list and ending at the middle of the list. While the second set of grades will be given to the highest marks beginning from the middle of the list and ending to the last mark in the list.

$Set_1 = \{min_1, ..., min_n\}$

$Set_2 = \{max_1, ..., max_n\}$

Step 3:
Create groups with pair of maximum and minimum marks as shown in table 3.

$$G_1 = [max_n, min_1];$$
$$G_2 = [max_{n-1}, min_2];$$
$$.$$
$$.$$
$$.$$
$$G_{m-1} = [max_2, min_{n-1}];$$
$$G_m = [max_1, min_n].$$

n is the number of students

m is the number of groups

Serial	Student ID	Specialty	Midterm Exam	Sets	
6	200603403	Art	57.5	min_1	
2	200601051	Business	61.5	min_2	
19	200607108	Business	69.5	min_3	
9	200600054	Art	70.5	min_4	
13	200606891	Business	74.5	min_5	Set_1
5	200604026	Law	77.5	min_6	
10	200604957	Business	80.5	min_7	
3	200600312	Science	82	min_8	
18	200602925	Business	84.5	min_9	
7	200607144	Eng.	85	max_1	
20	200608099	Business	85	max_2	
4	200600771	Eng.	86	max_3	
15	200607191	Business	88.5	max_4	
8	200603575	Business	89.5	max_5	Set_2
12	200607289	Eng.	89.5	max_6	
16	200607331	Business	92.5	max_7	
1	200607977	Science	93	max_8	
17	200602344	Business	94	max_9	

Table 2: Selection of set_1 and set_2

Serial	Student ID	Specialty	Midterm Exam	Groups
17	200602344	Business	94.0	G_1
6	200603403	Art	57.5	
1	200607977	Science	93.0	G_2
2	200601051	Business	61.5	
16	200607331	Business	92.5	G_3
19	200607108	Business	69.5	
12	200607289	Eng.	89.5	G_4
9	200600054	Art	70.5	
8	200603575	Business	89.5	G_5
13	200606891	Business	74.5	
15	200607191	Business	88.5	G_6
5	200604026	Law	77.5	
4	200600771	Eng.	86.0	G_7
10	200604957	Business	80.5	
20	200608099	Business	85.0	G_8
3	200600312	Science	82.0	
7	200607144	Eng.	85.0	G_9
18	200602925	Business	84.5	

Table 3: Groups' creation

VII. RESULTS AND ANALYSIS

After reorganization and formation of groups, students worked hard, particularly those from set_2. These students improved their skills and helped other students from set_1 to increase their marks.

Results for three groups are presented below. Figure (2) shows graph for one male class 021 that wasn't included in this study. Figure (3) illustrates a result for male class 016 which contributed in this research. In order to validate the result of this study offered in this paper, one more female class 120 from fall 2010 semester was added in this project. Figure (4) shows results for that female class from fall 2010.

MS Excel 2010 was used as tool to process the collected data and to create charts shown in figures (2, 3, and 4). Each chart displays both midterm and final exams' marks per class. Every student is represented in all charts by its serial number in the X axis and its midterm and final exams together in Y axis.

Figure (2) illustrates results for male class 021 (spring 2007) that is not included in the current study. A result for the class where the research was conducted during the same semester is shown in figure (3). The last figure (4) verifies the achievement of the proposed cooperative learning technique.

From the first graph, a progress of only 29% of students in the final exam is observed. This small improvement was expected since students worked individually without any reorganization of the class during the entire semester. These students had also access to blackboard.

Cooperative learning effects on students' success was observed with another male class 016 in the same semester. This progress is illustrated in figure (3). Around sixty-nine percent (68.75%) of students improved their marks in the final exam. One critical case can be mentioned in the same figure which is the student with serial number 12. The student's mark decreased seventy-four percent (74%) from midterm to final exam. After investigation, the student's attendance was found that it exceeded 25% after this project was started. Consequently, the mark of that student decreased.

As specified previously, to validate the technique offered in this paper, another class (female students - fall 2010) was included in the current study. The result is shown in figure (4). For this case, eighty-eight percent (88%) of students improved their grades in the final exam.

The formula used to calculate the percentage mentioned on the three graphs is given by the following equation Eq. (1).

$$Percentage\ \% = 1 - \left(\frac{Student's\ total\ number - Improved\ students}{Students'\ total\ number}\right) * 100 \quad Eq.\ (1)$$

Table 4 summarizes the results given on each graph.

Class	Total Number	Improved students	Percentage %
021	14	4	28.57%
016	16	11	68.57%
120	17	15	88%

Table 4: Students' improvements (%)

VIII. CONCLUSION

The aim of this study was to investigate on the effect of the cooperative learning approach by reorganizing students in computer labs after the midterm exam. This goal necessitated the implication of three classes over two semesters and the use of Blackboard as an asynchronous online tool.

This current study with cooperative learning using face-to-face and online environments was positive to the achievement of almost all students.

This technique will be improved and applied with other groups in the coming semesters.

IX. Acknowledgements

Only 28.57% from the total number of students improved their marks

Midterm & Final Exam's Marks per student
Class 021 - Spring 2007

Improved vs Unimproved
Class 021 - Spring 2007

Improved 29%
Unimproved 71%

Midterm Sp07
Final Sp07

Student's Serial Number

Figure (2): Midterm vs. Final Exam Male class [021] - Group not included in the study - spring 2007

68.75% from the total number of students improved their marks

Midterm & Final Exam's Marks per student
Class 016 - Spring 2007

Improved vs Unimproved
Class 016 - Spring 2007

Unimproved 31%
Improved 69%

Student's Serial Number

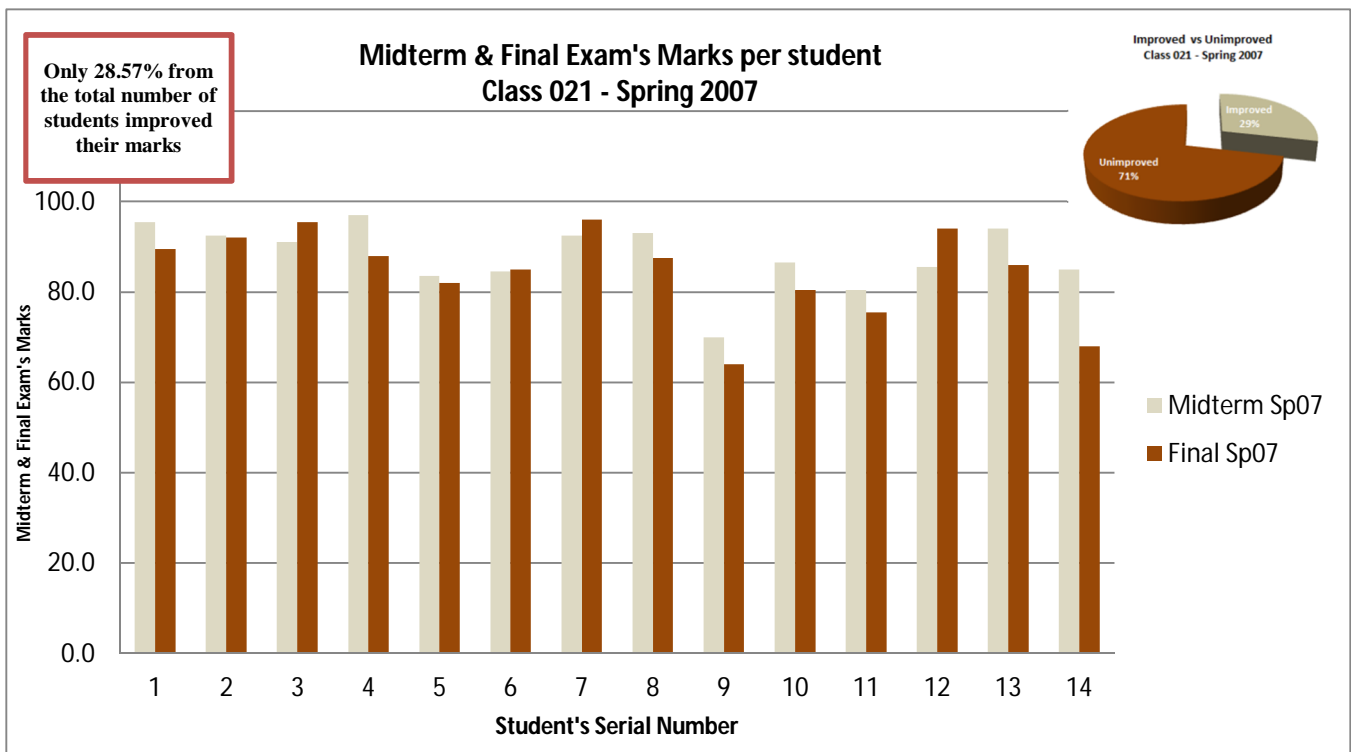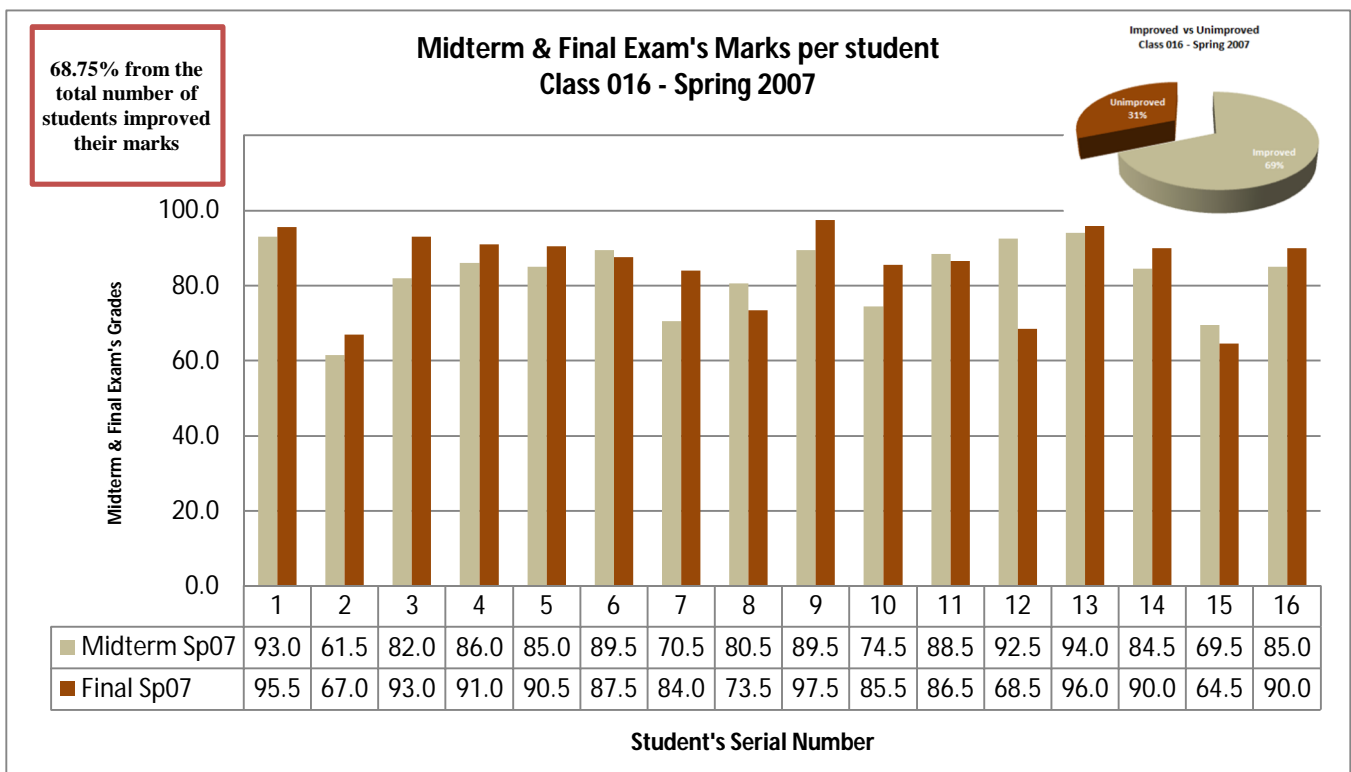|	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Midterm Sp07	93.0	61.5	82.0	86.0	85.0	89.5	70.5	80.5	89.5	74.5	88.5	92.5	94.0	84.5	69.5	85.0
Final Sp07	95.5	67.0	93.0	91.0	90.5	87.5	84.0	73.5	97.5	85.5	86.5	68.5	96.0	90.0	64.5	90.0

Figure (3): Midterm vs. Final Exam Male class [016] - Group part of the study - spring 2007
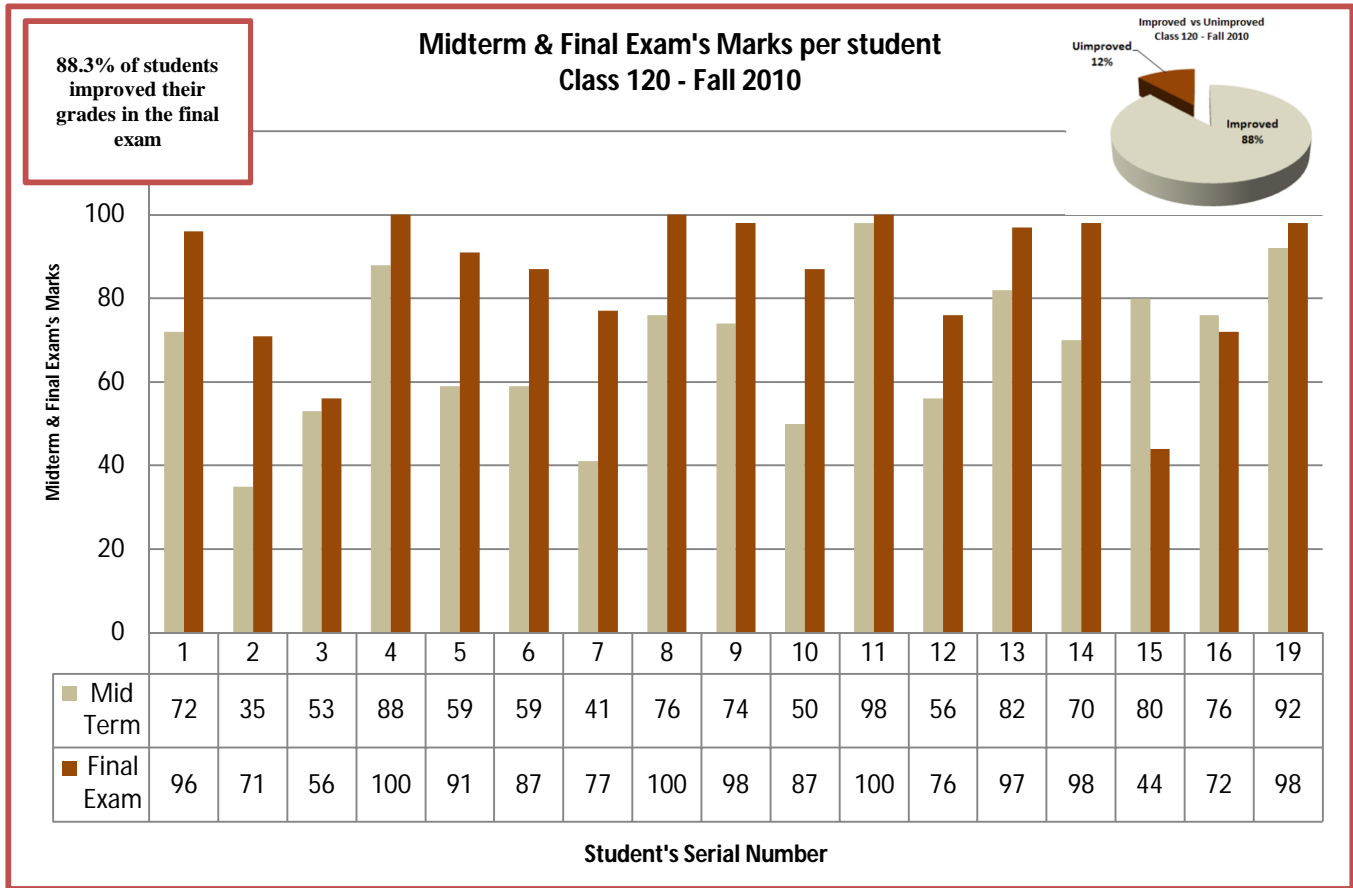
Figure (4): **Midterm vs. Final Exam Female class [120]** - **Group part of the study** - f**all 2010**

X. REFERENCES

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