# The Effect of Problem-Based Learning With Cooperative-Learning Strategies in Surgery Clerkships

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**BACKGROUND:** Cooperative learning is used often as part of the problem-based learning (PBL) process. But PBL does not demand that students work together until all individuals master the material or share the rewards for their work together.

**OBJECTIVE:** A cooperative learning and assessment structure was introduced in a PBL course in 10-week surgery clerkship, and the difference was evaluated between this method and conventional PBL in an acute abdominal pain module.

**METHODS:** An experimental design was used.

**RESULTS:** No significant differences in achievement were found between the study and control group. Both the study and control group students who scored low on the pretest made the greatest gains at the end of the education. Students in the cooperative learning group felt that cooperation helped them learn, it was fun to study and expressed satisfaction, but they complained about the amount of time the groups had to work together, difficulties of group work, and noise during the sessions.

**CONCLUSIONS:** This study evaluated the impact of a cooperative learning technique (student team learning [STL]) in PBL and found no differences. The study confirms that a relationship exists between allocated study time and achievement, and student's satisfaction about using this technique. (J Surg 69:226-230. © 2012 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

**KEY WORDS:** cooperative learning, problem-based learning, medical students

**COMPETENCIES:** Medical Knowledge, Practice Based Learning and Improvement

## INTRODUCTION

Problem-based learning (PBL) is used widely in medical education. Many medical educators believe that PBL fosters long-term memory of basic concepts and enhances problem solving.[1] These outcomes are more important than being successful on standardized test.[2] PBL strategies offer many advantages, but it could be reinforced by using a cooperative learning approach and assessment.[3-5] Many studies compare PBL with traditional methods. Reviews on these studies have reported some positive but largely ambiguous outcomes.[1,2,6,7] Albanese[8] suggested that the absence of cooperation in problem-based learning may account for the ambiguous outcomes. In the current study, we evaluated the difference between conventional PBL and PBL with a cooperative learning component.

In cooperative learning, students work in small groups and help each other to learn academic content.[9] The small-group format used in PBL fits the cooperative learning situations. Cooperative learning is often used as part of PBL process.[8] But PBL does not demand that students work together until all master the material or share the rewards for their work together.[10] In cooperative learning, individuals perceive that they can reach their goals if and only if the other group members do so also.[9,11]

Over the past century a large number of studies have been conducted to compare the cooperative learning strategies in promoting productivity and achievement. Cooperative study and assessment methods have been shown to increase achievement scores,[3,4,10,12,13] promote the development of critical thinking and reasoning, increase positive attitudes toward learning, increase interpersonal skills, and increase self-confidence.[14]

In this study, we questioned whether any achievement difference occurs between conventional PBL and PBL with a cooperative learning component (cooperative PBL). In the current study, we selected student team learning (STL) technique among various cooperative learning strategies[11] and integrated

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1931-7204/$30.00
doi:10.1016/j.jsurg.2011.07.010

group assessment into PBL. The STL technique encompasses 3 principles: team rewards, individual accountability, and equal opportunity for success. Students work together to learn and are responsible for their group mates' learning as well as their own.[10]

## METHOD

We hypothesized that PBL with cooperative learning would lead to higher achievement than conventional PBL. We asked the following questions: (1) Does cooperative learning and assessment in PBL improve medical students' achievement in acute abdominal pain; (2) what is the improvement after cooperation, especially among students with the lowest pretest scores; and (3) do students express satisfaction with cooperative learning?

### The Setting

We instituted a cooperative learning and assessment method in fourth-year surgery clerkship in Hacettepe University Faculty of Medicine (HUFM). We chose the acute abdominal pain module in 10-week surgery clerkship to apply PBL and PBL with cooperative learning (CL).

### Subjects

Students take the general surgery clerkship (lasting 10 weeks) divided in groups, each containing approximately 20 students (range, 17–20), in addition to the theoretical lectures, each group attends to rounds, operations and practical sessions, under the supervision of faculty staff responsible for specific group. During the study period eight groups (total of 148 students) were randomly assigned to one of the study arms, four groups to PBL and four groups PBL-STL (Fig. 1).

Study groups are divided to small groups of 4–5 students (STL groups). Control groups consisted of 17–20 students, and a standard PBL course was applied. At HUFM, there are 2 curricula, 1 in Turkish and the other in English. Medical students admit the medical faculty according to result of a selection examination in Turkey (National University Entrance Examination). Students who apply the English curricula have higher scores. However, the English and Turkish curricula of our faculty are identical. We assigned an equal number of students from English and Turkish curricula in the study and control group.

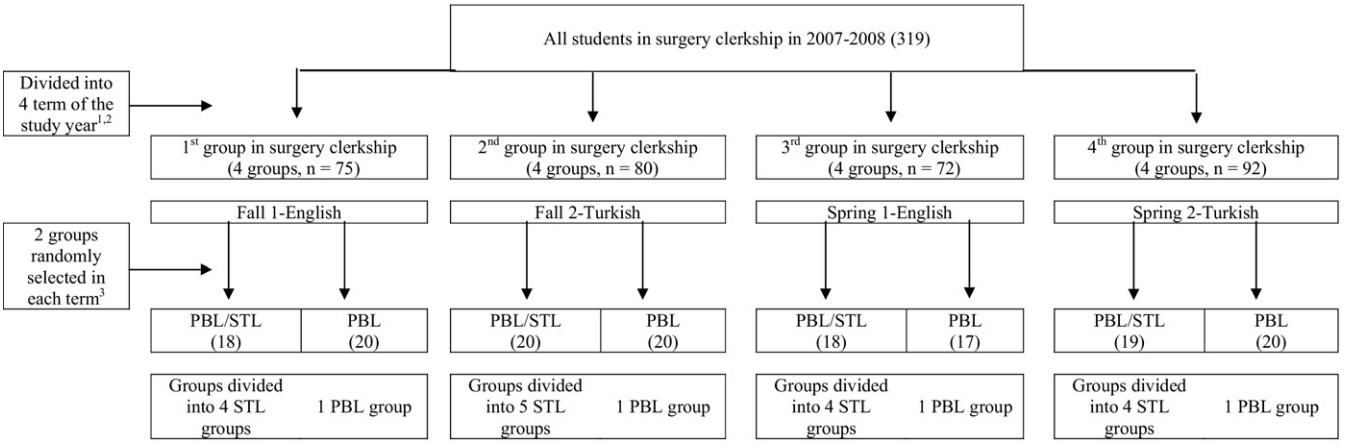
### Procedure

**We used an experimental design and followed the steps below:**

*Step 1.* At the beginning of the acute abdominal pain module, all students took a 20-item case-based multiple-choice pretest and earned an individual score. The students were informed about the objectives and steps of the study and were asked for informed consent forms to the students, requesting their willingness to participate and permission to evaluate their achievement scores. The PBL + CL groups were informed that they were expected to learn cooperatively throughout the course and they would share the final achievement score, and that any group that achieved a specified gain in knowledge would take full score from the surgery clerkship clinical evaluation as the reward.

*Step 2.* After the pretest, control group students attended conventional PBL. Control group students discussed the cases with all PBL group members and took part in the individual assessment. In contrast, study group students discussed the PBL cases through STL method and took part in the cooperative assessment. The study and control group PBL cases were similar to each other.

*Step 3.* Study and control group students received posttest at the end of the module. The posttest was the same as the pretest. Individual achievement scores—the difference between the




1. Students members vary due to different number of assignments by the Dean's office
2. Group determined by Dean's office an part of routine general surgery training
3. Group determined by investigators per protocol

**FIGURE 1.** Composition of study and control groups.