Cooperative learning approach in secondary school physics lessons

Naser SHALA
I. Secondry School "Fehmi Lladrovci", Gllogoc, Kosovo

Jerneja PAVLIN
Faculty of Education, University of Ljubljana, Ljubljana, Slovenia

Abstract. The aim of this study was to identify the effects of the cooperative learning approach in higher secondary physics classes on the topic of thermodynamics. Students followed two different methods: one group followed frontal work (FW) and the other followed cooperative learning (CL). Data were collected using a knowledge test and a questionnaire. 49 secondary school students participated in the study and a pre-post design was used. The group that followed CL increased their knowledge more than the group that followed FW. Based on the results, it is recommended that teachers should be encouraged to use cooperative strategies in the classroom to teach selected physics concepts.

1 Theoretical background

Teaching methods are reflected in student learning, academic achievement, interest in physics, and student relationships. It is reported that the reason for poor student performance is that teachers commonly use the FW. So, it is a must to find and apply the appropriate methods for teaching physics to enhance students' learning. An effective teaching method can ensure effective learning by allowing students to reflect on their own ideas. To make it easier for students to understand the concept and become interested in learning physics, the teacher must choose methods that help students by acting as learning facilitators and pushing students to excel in learning objectives. Therefore, teachers need to know motivational techniques that will arouse students' interest in physics class. This is in line with the view that a student's achievement is the result of what the student has learned through certain educational experiences. However, researchers agree that traditional teaching methods, in which the teacher is an active participant, and the students are passive participants in the classroom, do not provide students with the desired level of achievement. In FW, for example, the teacher faces the class as a whole and the material is taught through presentations and explanations without any individual or group work. CL is widely accepted as a pedagogical practice. CL is the structuring of small groups so that students work together to maximize their own and each other's learning. Students must talk about what they are learning, write about it, relate it to experiences, and apply it to their daily lives [1-6].

2 Research question and methodology

The following research questions were set: What is the level of interest in physics among students in the control and experimental groups? Is there a significant difference in the knowledge progress of students taught with CL (experimental group) and those taught with FW (control group)? The design of the study was a quasi-experimental, pretest-posttest. A non-randomized, purposively sample was used in the research. A total of 49 10th grade students of the Republic of Kosovo vocational high school participated in the study on thermodynamics, 24 students in the experimental group and 25 students in the control group. A regular teacher was the researcher for both groups, experimental and control. The students are mostly 15 years old, in mixed gender classes. The instrument was made in Albanian language. It consisted of 2

parts: a knowledge test to test students' knowledge about physics content thermodynamics, and a questionnaire with questions about students' views about teaching and learning physics.

3 Results

The results of the Mann-Whitney U test show that there were no significant differences in knowledge on the pretest (U=291.000; p=0.805) between the experimental and control groups, but significant differences in self-assessment of interest in physics between the experimental and control groups (U=183.500; p=0.015). 24 students in the experimental group scored an average of 39.17 points out of 100 (SD =11.00) in the knowledge test before and 81.50 (SD = 14.82) after the implementation of the teaching module. However, a high knowledge gain was found (g=0.73). The students in the experimental group self-rated their interest in physics on a 5-point Likert scale at 3.63 (SD = 1.41), indicating that they liked physics. The 25 students in the control group scored an average of 38.40 (SD =8.00) on the knowledge test pretest and 67.20 (SD = 18.15) on the posttest. However, a mean knowledge gain was found (g=0.48). Students in the control group self-rated their interest in physics on a 5-point Likert scale at 2.92 (SD = 0.81), corresponding to a neutral opinion. On the post-test, a statistically significant difference (U=155.500; p=0.002) was found between experimental and control groups.

4 Conclusion

It is evident that using the CL strategy with students who are interested in learning physics leads to greater student academic achievement than FW method. Therefore, it is recommended that physics topics at all educational levels be examined and evaluated from this point of view, and that teaching practices be adjusted according to the results.

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