

IMPACT OF COOPERATIVE LEARNING ON STUDENTS' ACADEMIC PERFORMANCE IN SOCIAL AND ECONOMIC SPECIALTIES

IMPACTO DA APRENDIZAGEM COOPERATIVA NO DESEMPENHO ACADÊMICO DOS ESTUDANTES NAS ESPECIALIDADES SOCIAIS E ECONÔMICAS

IMPACTO DEL APRENDIZAJE COOPERATIVO EN EL RENDIMIENTO ACADÉMICO DE LOS ESTUDIANTES DE ESPECIALIDADES SOCIOECONÓMICAS

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ABSTRACT: The purpose of the present study is to implement the technology of CL in the learning process of students in socio-humanitarian and economic specialties and prove its effectiveness in the professional training of students based on the results of interim academic tests and final course grades. An experimental study focused on a comparative analysis of learning outcomes in students of different specialties is conducted. The learning outcomes are assessed by two criteria: students' scores in interim academic tests and their final grades. Opposed to other technologies, CL demonstrates positive components: high results in mastering knowledge and obtaining skills and abilities; participants learn to cooperate; learning motivation increases, personal relations develop between students; the level of educational activity improves. The use of CL technology is an effective means of professional training of students in socio-humanitarian and economic specialties as it significantly improves performance in interim tests and final course grades.

KEYWORDS: Cooperative learning. CL technologies. Student learning. Higher education. Academic performance.

RESUMO: *O objetivo do presente estudo é implementar a tecnologia de AC no processo de aprendizagem de alunos em especialidades socio-humanitárias e econômicas e comprovar sua eficácia na formação profissional de alunos com base nos resultados de provas*

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acadêmicas intermediárias e notas finais do curso. É realizado um estudo experimental centrado na análise comparativa dos resultados de aprendizagem em alunos de diferentes especialidades. Os resultados da aprendizagem são avaliados por dois critérios: as notas dos alunos nos testes acadêmicos intermediários e as suas notas finais. Ao contrário de outras tecnologias, a AC apresenta componentes positivos: altos resultados no domínio do conhecimento e na obtenção de competências e habilidades; os participantes aprendem a cooperar; a motivação para a aprendizagem aumenta, as relações pessoais se desenvolvem entre os alunos; o nível de atividades educacionais melhora. A utilização da tecnologia AC é um meio eficaz de formação profissional dos alunos nas especialidades socio-humanitárias e econômicas, pois melhora significativamente o desempenho nos testes intermediários e nas notas finais do curso.

PALAVRAS-CHAVE: Aprendizagem cooperativa. Tecnologias de AC. Aprendizagem estudantil. Ensino superior. Desempenho acadêmico.

RESUMEN: El presente estudio tiene como propósito implementar la tecnología de CL en el proceso de aprendizaje de los estudiantes de las especialidades socio-humanitarias y económicas y probar su efectividad en la formación profesional de los estudiantes a partir de los resultados de las pruebas académicas intermedias y las calificaciones finales del curso. Se realiza un estudio experimental centrado en el análisis comparativo de los resultados de aprendizaje en estudiantes de diferentes especialidades. Los resultados de aprendizaje se evalúan según dos criterios: las puntuaciones de los estudiantes en las pruebas académicas intermedias y sus calificaciones finales. A diferencia de otras tecnologías, CL demuestra componentes positivos: altos resultados en el dominio de conocimientos y obtención de habilidades y destrezas; los participantes aprenden a cooperar; aumenta la motivación de aprendizaje, se desarrollan las relaciones personales entre los estudiantes; el nivel de las actividades educativas mejora. El uso de la tecnología CL es un medio eficaz de formación profesional de los estudiantes en especialidades socio-humanitarias y económicas, ya que mejora significativamente el rendimiento en las pruebas intermedias y las calificaciones finales del curso.

PALABRAS CLAVE: Aprendizaje cooperativo. Tecnologías CL. Aprendizaje de estudiantes. Educación superior. Rendimiento académico.

Introduction

Cooperative learning (CL) is based on the personality-oriented approach to students and is realized in small groups, which allows to identify the problem, prove and argue one's opinion for a more thorough further understanding of the learning material, as well as an enrichment of speech activity and thinking (DENISOVA *et al.*, 2021; KOROTAEVA; KAPUSTINA, 2021).

Let us briefly review the main principles of CL technology. The teacher divides the students into several small groups and gives them detailed instructions. Each student works on their tasks, their part of the material until they reach a complete understanding of the studied

problem and completion. Later on, the students exchange their results, which makes each person's work necessary and important for others as the problem cannot be resolved without it (a part of important information is lost, and the other recipients do not get it). Learning in cooperation is often organized in clearly defined subgroups formed within the main group. The focus should be on cooperation rather than competition because such an idea will ensure better results for all participants.

In the present study, we wish to demonstrate that CL technology presupposes free development of personality and the presence of creative or research activities, ensures the development of students' communication skills, contributes to the establishment of their cultural identity, and has a socializing effect when used in training students of various specialties.

Literature review

The advantages of CL, according to scientists, include the improved academic performance of students (YI; LU, 2012), the development of their ability to think critically and non-stereotypically perceive other people, the positive psychological climate in the group, students' desire for cooperation and constructive socialization, the presence of empathy, mutual assistance, sympathy, and friendly relations in the team, students' positive attitude towards learning, teachers, and the educational institution (JACOBS; LOH, 2003), personal growth, high level of self-respect and mental health manifested in emotional balance, awareness of personal individuality, expression of trust, and an optimistic view of the world and the environment (SILVA; FARIAS; MESQUITA, 2021).

S. Samuel (2010) interprets CL as a type of learning giving a small heterogeneous student group to achieve a common educational goal by means of cooperative interaction. Researchers suggest (DAVIDSON; MAJOR, 2014) that the use of CL technology in professional training fosters the development of students' teamwork skills required in their further professional activities.

Researchers note (HUANG *et al.*, 2012) that CL always takes place in groups, but not every group meets the principles of CL. To distinguish CL from other forms of group work, prominent teachers D.W. Johnson and R.T. Johnson (1990) have developed five fundamental principles of CL that make it different from traditional group forms of work in class:

- reliance on mutual interdependence, which, as argued by G.M. Jacobs (2015), is fundamental for cooperation. J.W. Strijbos (2016) states that to achieve positive

interdependence in a group, it is necessary to set the common goal and formulate the objectives to make them solvable only by means of cooperation. Furthermore, it is noted (EBRAHIM, 2012) that the teacher needs to develop the tasks in such a way that they could be solved with the direct individual activity of each group member;

- the principle of individual responsibility. According to researchers (LÓPEZ-CANCELOS; COMESAÑA; BADAOU, 2013), the teacher must control that all students work actively and not allow some students to perform tasks instead of others, as well as identify the students who need help. D.W. Johnson and R.T. Johnson (2007) recommend choosing small groups for CL. Researchers believe that the smaller the group, the greater the individual responsibility and the easier it is for the teacher to keep an eye on all students in the group and correct their work. Y. Sharan (2010) considers groups of four students the most effective for CL, which, if necessary, can be divided into two pairs;

- close interpersonal interaction, in which students should be able to support each other, encourage, praise for success, stimulate each other's learning activity, cognitively and empathically respond to partners' behavior. Researchers (ONWUEGBUZIE; COLLINS; JIAO, 2009) emphasize that, in this case, the physical arrangement of students in groups is of no small importance. Other authors (TSAY; BRADY, 2010) stress the necessity of observing time limits when performing a task;

- all group members need to have certain social skills necessary for effective communication (YAMARIK, 2007). Interpersonal interaction in the group is often marked by a conflict of ideas, opinions, approaches, and the ability to stop the dispute, to transform it into a constructive discussion, to create an atmosphere of tolerance and trust contributes to a deeper understanding and memorization of educational material, as well as provides learning motivation (SHIMAZOE; ALDRICH, 2010; GOLUBEVA *et al.*, 2021). Students gain experience in constructive conflict resolution through dialogue, learning to create an atmosphere of trust, convincing partners, and arguing their point of view (THAKRAL, 2017; KHAN; AHMAD, 2014);

- group analysis of the results to assess the effectiveness of achieving the common goal of learning and productive cooperation (SHARAN, 2014).

These principles distinguish CL from the traditional group forms of work in the classroom. However, the mentioned studies mainly concern the general approach to the organization of learning in collaboration. The study of the effectiveness of applying this technology in the university on the example of students of different specialties has not yet been studied separately.

In accordance with the above, the goal of the present study is to implement CL technology in the learning process of students in socio-humanitarian and economic specialties and prove its effectiveness in students' professional training based on the results of thematic tests and final course grades.

The hypothesis tested is that the use of CL technology is an effective means of professional training of students in socio-humanitarian and economic specialties as it significantly improves their performance in interim tests and final course grades.

Based on the goal and hypothesis of the study, the following research objectives are established:

1. To carry out a gradual implementation of CL technology in the learning process of students in socio-humanitarian and economic specialties.
2. To determine the influence of CL technology on the academic performance of students based on their middle test scores and final grades for the course.

Methods

The experimental study is conducted based on two higher education institutions: the Moscow State University of Food Production (1st-year social-humanitarian students, "History of Russia" course) and Moscow Polytechnic University (1st-year economics students, "Economics" course).

The experimental study is conducted to compare in-class marks and final grades in four groups of students, two experimental (CL) and two control (no CL), with a total of 204 students.

Students in the first experimental (EG1, 52 people) and the first control (CG1, 54 people) groups study the same "History of Russia" course with the same teacher (researcher).

Students in the second experimental (EG2, 48 people) and second control (CG2, 50 people) groups study the same "Economics" course taught by the same teacher (researcher).

In the experimental groups, CL technology is gradually implemented in the students' learning process.

At the first stage of the implementation, the learning process consists in work in pairs in small groups. Initially, work is performed in static pairs (students sitting at the same table work together), then in dynamic pairs (a group of four students sitting at adjacent tables) and variation pairs (a variation of teamwork in a group of four students), with half of the students answering and the other half controlling at each instance.

At the second stage of the implementation, teaching is carried out by the “Jigsaw-2” CL technology, which presupposes that each team of students works independently on the common topic, while each team member is presented with one fragment of the topic under study for a particularly close review, thereby making them an “expert” on this issue. Throughout the study of the topic, experts from different teams have meetings to add to each other’s knowledge. At the end of the cycle, a test is held, and based on its results, the team members receive the same grade – the average score.

Students’ learning outcomes are assessed using two main criteria: 1) students’ scores on interim tests (maximum score – 25 points) and 2) final grades for the course (maximum score – 100 points). Each criterion is analyzed and presented separately for the groups of students in different specialties.

This research model was designed to provide an opportunity to study the participants’ learning outcomes throughout the learning process, and thereby determine the impact of CL technology on student learning outcomes (academic performance).

Participants in the study are informed of the confidentiality of the obtained results and their use exclusively for statistical analysis.

Statistical analysis of the obtained data is conducted using several mathematical methods:

- quantitative analysis – calculation of frequency, percentage, mean value, and standard deviation (SOROKOVA, 2020);
- comparative analysis – calculation of t-tests for independent samples to assess the differences between the experimental and control groups of students of the same university in terms of academic performance (middle test scores and final grade) (SOROKOVA, 2020).

Results

The effect of the use of CL technology on the academic performance of socio-humanitarian students is described in Tables 1 and 2.

Table 1 – Quantitative characteristics of socio-humanitarian students’ academic performance in tests and final grades

Criterion	CG1	EG1
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Category	below average		average		above average		below average		average		above average	
	N	%	N	%	N	%	N	%	N	%	N	%
Test 1	17	31.5	20	37	17	31.5	0	0	16	30.8	36	69.2
Test 2	21	38.9	18	33.3	15	27.8	0	0	14	26.9	38	73.1
Test 3	15	27.8	23	42.6	16	29.6	0	0	15	28.8	37	71.2
Final grade	26	48.1	17	31.5	11	20.4	3	5,8	19	36.5	30	57.7

Source: Devised by the authors

Note: N – number of students (frequency), % – percentage in the group

Table 2 – Statistical characteristics of socio-humanitarian students' academic performance in tests and final grades

Criterion	Group	N	M	SD	t-test
Test 1	CG1	54	16.74	4.01	-4.066
	EG1	52	23.34	1.78	
Test 2	CG1	54	16.86	4.57	-4.232
	EG1	52	22.95	1.69	
Test 3	CG1	54	17.54	3.87	-3.763
	EG1	52	23.76	1.53	
Final grade	CG1	54	70.43	15.72	-4.793
	EG1	52	88.35	6.46	

Source: Devised by the authors

Note: N – number of students, M – group mean score; SD – group standard deviation

The influence of the implementation of CL technology on the academic performance of economics students is described in Tables 3 and 4.

Table 3 – Quantitative characteristics of economics students’ academic performance in tests and final grades

Criterion	CG2						EG2					
	below average		average		above average		below average		average		above average	
	N	%	N	%	N	%	N	%	N	%	N	%
Test 1	16	32	19	38	15	30	0	0	13	27.1	35	72.9
Test 2	20	40	15	30	15	30	0	0	14	29.2	34	70.8
Test 3	14	28	20	40	16	32	0	0	12	25.0	36	75.0
Final grade	28	56	13	26	9	18	2	4.2	18	37.5	28	58.3

Source: Devised by the authors

Note: N – number of students (frequency), % – percentage in the group

Table 4 – Statistical characteristics of economics students’ academic performance in tests and final grades

Criterion	Group	N	M	SD	t-test
Test 1	CG2	50	15.36	3.54	-3.658
	EG2	48	20.44	1.56	
Test 2	CG2	50	16.56	3.67	-3.895
	EG2	48	21.84	1.63	
Test 3	CG2	50	17.22	3.24	-4.112
	EG2	48	22.46	1.42	
Final grade	CG2	50	66.84	14.66	-4.673
	EG2	48	84.96	6.79	

Source: Devised by the authors

Note: N – number of students, M – group mean score; SD – group standard deviation

The results show that the first experimental group (EG1) significantly outperforms their peers from the first control group (CG1) in all tests and final course grades overall. T-test for independent samples reveals statistically significant differences between the two groups for all tests ($t = -4.066, p < 0.001$; $t = -4.232, p < 0.001$; $t = -3.763, p < 0.001$).

Moreover, EG1 performs better in all of the tests ($M1 = 23.34, SD1 = 1.78$; $M2 = 22.95, SD2 = 1.69$; $M3 = 23.76, SD3 = 1.53$) compared to CG1 ($M1 = 16.74, SD1 = 4.01$; $M2 = 16.86, SD2 = 4.57$; $M3 = 17.54, SD3 = 3.87$).

The obtained results also indicate significant influence of the CL technology on the final grades of socio-humanitarian students: $t = -4.793$, $p < 0.001$; students in EG1 receive higher grades ($M = 88.35$, $SD = 6.46$) than those of CG1 ($M = 70.43$, $SD = 15.72$).

Similar results are obtained in EG2 and CG2 students (economics students).

Thus, a significant positive correlation between learning with CL technology and students' academic performance is evident.

Discussion

The first objective of the study concerns the gradual implementation of CL technology in the learning process of students in socio-humanitarian and economic specialties. Let us more closely examine the way the fundamental principles of CL are implemented in the course of lessons using CL technology (JOHNSON; JOHNSON, 1990).

During the lessons, each group does their best to contribute to the common cause, the results of each student's work depend on the other group members' success in completing their tasks. This goes in line with the argument of researchers (JACOBS, 2015; PROKHOROVA, 2021) that positive interdependence stimulates students to learn, show mutual assistance, active cooperation, and mutual responsibility, necessitates mutual control, and ensures that students unite their efforts in achieving the common goal.

The positive interdependence in work according to the CL technology is ensured in the lessons through a special distribution of educational material (for instance, each student has only a part of the material necessary to complete the common task); assignment of roles (group leader, expert, reporter, observer, etc.); summation of the points received by each group member in the assessment of the work; introduction of team rewards.

To implement the principle of individual responsibility in the CL lessons, a teacher, using individual tests, surveys, or other control measures, assesses not only the result of a team's work but also the work of each student in particular. In this, according to researchers (LÓPEZ-CANCELOS; COMESAÑA; BADAQUI, 2013), individual work must be graded higher if all students complete the task successfully and reach the set goal. In accordance with the recommendations (JOHNSON; JOHNSON; SMITH, 2007), the students are divided into small groups of four students each, which are additionally divided into pairs when needed (SHARAN, 2010).

The principle of close interpersonal communication (JOHNSON; JOHNSON, 1990) is realized according to recommendations (ONWUEGBUZIE; COLLINS; JIAO, 2009)

suggesting that students are seated “face to face” during the work. In this case, the group leader performs the functions typically performed by the teacher in traditional lessons. By clearly regulating the time for assignments according to the recommendations (TSAY; BRADY, 2010), the instructor forces students to concentrate and encourages them not to waste time on secondary tasks.

The skills of interpersonal communication are purposefully formed by the teacher in specially created educational situations according to the four levels of difficulties of cooperation skills development indicated in the study (KHAN; AHMAD, 2014). Team building in a group and the formation of norms of behavior in it require the first level skills – addressing each other by name, not interrupting others, listening to the partners closely, and so on. The second level skills are required for the organization and support of effective group work. Among these are the skills of expressing support, asking for help, encouraging work, and the like. The skills of summarizing readings, highlighting the main points, and linking the material to what has been studied before belongs to the third level and provide for mental cooperation for better assimilation of the learning material. The fourth and highest-level skills of critiquing an idea rather than a partner, arguing, persuading, drawing conclusions, finding alternatives, and the like deepen understanding of the material and encourage creative, rational solutions.

Group analysis of the results in CL lessons is conducted, in accordance with (SHARAN, 2014), during reflection practices in the form of group discussion of individual and collective difficulties and achievements. The students evaluate the effectiveness of their interaction, review which models of behavior prove useful in collaborative work and what needs to be changed to ensure effective teamwork and make decisions on further improvement of the cooperation.

The second objective of the study relates to testing the effect of CL technology on students’ academic performance assessed by their scores in three interim tests and final grades for the course.

As demonstrated by the results of this study, CL technologies have a major positive influence on students’ academic performance. This results in students having higher scores in tests and better final grades.

Conclusion

The conducted study provides empirical evidence of the effectiveness and significance of CL technology in improving students' learning outcomes. Thus, the study results confirm the proposed hypothesis that the use of CL technology has a positive effect on students' learning outcomes assessed through their test scores and final grades.

The scientific novelty of the study lies in the performed comprehensive analysis of the influence of CL on students' academic performance in terms of their scores on tests and final grades in the course.

However, the results obtained have certain limitations related to an insufficiently wide range of students, disciplines, independent/factor variables (e.g., gender, major, average grades, and prior performance/achievements). Taking them into account in the future may be a prospect for further research and provide greater accuracy, validity, and confidence in the results obtained.

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