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THE IMPACT OF TECHNOLOGY ON COLLABORATIVE LEARNING

Ilie Vali (a)*
*Corresponding Author

(a) Department for Teacher Training, University of Craiova, A. I. Cuza, nr. 13, Craiova, Romania, vali.ilie@edu.ucv.ro

Abstract

Taking place between the teacher and the students, between students and students, between them and the elements of the educational environment, the collaboration aims at situations and group activities related to a common goal. Technological development in the online environment has influenced the social practice of teachers and students, the way they collaborate. The benefits of social networking are not simply embedded in technology, but the latter is nuancing and modifying them. The use of digital resources in the learning process puts teachers and students in a position to identify and use the most appropriate platforms and tools to support collaborative learning. When collaboration is accomplished through technology, it promotes a way of learning during which students build their knowledge as a consequence of engaging, discussing, and re-expressing their learning material. The aim of our research is to analyze the impact that technology has on collaborative learning in students. In the process of collecting, processing and interpreting data, we resorted to observation, interview and experiment. The experimental factor is the call for digital resources within the experimental group, where they worked collaboratively. We were interested in both the performance of the students and their attitude towards the role of technology in learning. The results of the research confirm the positive impact that modern technology has on collaborative learning.

Keywords: Collaboration, collaborative learning, students, technology

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1. Introduction

Labeled in different ways (learning communities, collaborative learning groups, linked courses, interdisciplinary seminars, joint student-faculty research effort), collaborative learning is based on active engagement in learning. Because the focus is on the interaction between students, teachers are no longer necessarily transmitters of knowledge, but rather designers who are experts in intellectual and social experiences for the students. Smith and MacGregor (1992) appreciated that:

> In collaborative learning, there is the intellectual synergy of many minds coming to bear on a problem, and the social stimulation of mutual engagement in a common endeavor. This mutual exploration, meaning-making, and feedback often leads to better understanding on the part of students, and to the creation of new understandings as well. (p. 12)

Placing students in collaborative situations contributes to the verification of individual learning structures and to the detection of contradictions or failures of these structures, confusions, inconsistencies in the use of strategies and language, as a means of mutual understanding. Even if learning begins at the individual level, when it is accomplished with the help of technology, it acquires new valences. In a relational context, students find other elements of the problem, discover aspects that they have not noticed previously or other interpretations, negotiate with others and reach a consensus, then a generalization that provides a global understanding of the problem.

Starting from the premise that technological turbulence positively moderates the relationships between task implementation competence, knowledge generation and knowledge dissemination, Jardim et al. (2021) conclude that "relational competence is an antecedent of knowledge generation and dissemination through interorganizational relations" (p. 223).

From a critical perspective, we can say that there is a fear of minimizing the importance of differences and individuality in collaborative learning. However, the goal of reaching a consensus gives the members of a group an interest in the group which they belong to. Chapman (2019) recalls the dark side of collaboration, expressed by: illusion of association, fabricated cooperation, collaboration with the "enemy", contrived collegiality. In arguing that collaboration is not always beneficial, even if its effects are generally positive, Hargreaves (2019) notes that most collaborative efforts between teachers are limited to storytelling or sharing ideas, materials, and practices, and their involvement in the teaching team and collaborative professional development are rare.

On these coordinates of the critical approach, we believe that collaboration itself does not guarantee getting outstanding results, but provides a perspective on addressing common issues, tasks, projects and themes, which can lead to better performance. This perspective brings together more people who have different experiences (cognitive and socio-affective) and different learning styles, their own values and beliefs, various learning strategies. What matters is the time each participant is willing to spend, the effort made by each individual to contribute to the achievement of common goals and tasks, the willingness to discuss and solve problems proposed by the teacher or chosen by the group, through negotiation.

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2. Problem Statement

2.1. Specific aspects of collaborative learning

Overall, collaboration is “a philosophy of interaction and personal lifestyle where individuals are responsible for their actions, including learning and respecting the abilities and contributions of their peers” (Laal & Ghodsi, 2012, p. 486). Another way of defining collaboration is to say that this is a situation where learners interact in a collaborative way through: interactivity (the extent to which interactivity influences the cognitive processes), synchronicity (the activity of doing something together: e.g. e-mail – synchronous and chat box – asynchronous) and negotiability (the way partners can build a common solution) (Dillenbourg, 1999, pp. 8-10). Arguing that the essential aspect of collaboration is the issue of convergence, Roschelle (1992) understands by convergence a process that takes place gradually, based on "mutual construction of understanding" and presents an alternative to previous accounts: “Vygotskian account tends to portray asymmetric roles, whereas the Piagetian account emphasizes the benefits of conflict. Each focuses attention away from the process of mutually contributing to shared knowledge” (p. 272). Because the whole behavior of the group is more than the sum of its individual parts, the interactions within it matter. Thus, “the words ‘collaborative learning’ describe a situation in which particular forms of interaction among people are expected to occur, which would trigger learning mechanisms, but there is no guarantee that the expected interactions will actually occur” (Dillenbourg, 1999, p . 5). Unlike classical instructivism, constructivism reflects the focus on the student who listens, discovers, but also builds in a context based on interrelationships. Thus, knowledge is built through social interaction, and collaboration becomes a condition of learning, an environment based on social negotiation. Although the socio-cultural perspective is broader and helps to understand the context, the educational perspective aims at what actually happens in the instructive-educational process, following more the activities and methods that facilitate social interactions. Collaboration is beneficial for learning, but, from a pedagogical perspective, it matters how to provide students with the possibility and opportunities to collaborate and what are those conditions that facilitate better individual and collective outcomes.

When it becomes a means of solving socio-cognitive construction tasks, we can talk about an application that is specific for collaboration – group cooperation. Based on the coordination of the participants' efforts to reach a specific result, in accordance with their expectations, the cooperation focuses not so much on the situation as on its functionality. More effective in small groups (even in pairs) and with a certain way of structuring that allows for procedural variety, cooperation is linked to the situational knowledge of knowing and learning. It can be said that in cooperation, each person is responsible for a part of solving the problem. In essence:

> Authentic cooperation does not imply that team members focus solely on consensus to the detriment of openly sharing dissenting views. On the contrary, studies have indicated that, when team members share cooperative goals, they tend to engage in more deliberate and thorough information exchange (Lu & Hallinger, 2018, p. 242).

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Noting that students with higher abilities may participate more actively than students with low abilities, Lai (2011) noted that "collaboration can have powerful effects on student learning, particularly for low achieving students. These effects are seen in the form of higher scores on work completed collaboratively, even when students turn into separate products" (p. 40). From the experience of our educational activity with the students, we found that not all students with higher cognitive skills necessarily have social skills, the same way as students who excel in social skills do not always show that they perform in terms of cognitive ones. We consider that the instructive-educational activities designed and carried out with the students in a collaborative manner should valorize those defining skills for each student and provide the framework for practicing their highlighting.

The role of the group in building and developing cognitively and socially was highlighted in research that focused on various aspects of collaboration (Chen et al., 2018; Dillenbourg, 1999; Knapp, 2019; Koeslag-Kreunen et al., 2018; Pierroux et al., 2022; Tudge, 1992; Yilmaz et al., 2020). The new direction of collaborative learning is focused on the new technologies that mediate, facilitate, support interactions between the members of a learning community.

2.2. The role of technology in online collaborative learning

Beyond the problems generated in the existential plan (individual and social), the Covid-19 pandemic has forced schools to reduce the technological gap and contribute more to the formation of digital skills in students and teachers. Computers have become the new tools that have made professional tasks easier and put in a new framework the collaboration between the students and the teacher, respectively between one student and other students. We find that the effect of digital technology on collaborative learning in students depends largely on how these technologies are integrated into the classroom (whether we are talking about online or face-to-face instruction). It is estimated that "new mobile technologies could affect learners' perceptions, outcomes, and interactive behaviors in collaborative learning activities" (Fu & Hwang, 2018, p. 141). We believe that, in a relational way, connections are the ones that can generate and maintain learning successfully. In the age of advanced technology, the way connections are built is changed by the use of new tools. One research that examined the links between student networks and academic performance shows that "student proximity to other students within the network seems to be significantly linked to better performance" (Vignery, 2022, p. 181).

There are a number of ways to achieve collaborative learning in the online environment. They can take the form of discussions, work tasks (e.g. projects, concept maps) or peer feedback and assistance. Online Collaborative Learning (OCL) is an effective way for learners to develop a common understanding, build new knowledge together, and develop a variety of skills through collaboration in synchronous and asynchronous activities (Magen-Nagar & Shonfeld, 2018; Margaliot et al., 2018). Interactive online learning is part of the collaborative learning. All students should be encouraged to share ideas, talk with colleagues, and participate in learninging activities together. In addition:

> From the learner-learner and learner-teacher interaction perspectives, providing live chat, embedded with social media sites and assessing others' posts (e.g. reaction features, such as cool, funny and

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> interesting), discussion forums, and awards for top comments on posts and ensuring a learner-friendly interface are suggested (Quadir et al., 2022, pp. 303-304).

The computer-supported collaborative learning paradigm (CSCL) focuses on the idea that technology can support collaborative learning by improving interaction between participants. If in the synchronous activity the collaboration is done through direct interaction, in the asynchronous activity we resort to technological artefacts (e.g. web applications through which students can communicate) and to instructive artefacts (e.g. the exchange of informational resources useful for learning). These can be used during the three stages mentioned by Harasim (2012):

> The generation of ideas (the brainstorming stage), the organization of ideas (the stage during which the participants interact with each other) and the intellectual convergence (the stage of synthesis, during which the participants formulate their own position, accept different opinions and try to reach a consensus). (p. 81)

The model of online collaborative learning has also influenced the way instruction is organized. It is about "a new theory of learning that focuses on collaborative learning, knowledge building, and Internet use as a means to reshape formal, non-formal, and informal education for the Knowledge Age" (Harasim, 2012, p. 81). In this context, during a research conducted by Lei and Medwell (2021) on the results of the interview applied to students - future teachers provides an insight into how the OCL experience changed the views of teachers and students during the COVID-19 pandemic, finding both disadvantages. as well as benefits. Analyzing the ways in which technology can be used to improve the learning outcomes, Lewin et al. (2019) study its impact on literature and language, mathematics, science and learning through practice and exploration, identifying integrated learning (in which technology is incorporated into traditional instruction) and the use of technology as an additional practice.

Magen-Nagar and Shonfeld (2018) conducted a research in which they started from the assumption that teachers' attitudes, perceptions and beliefs about technology affect their teaching in an ICT (Information and Communication Technology) environment. The results of the study showed that:

> An online collaborative program that is meaningful for the students and increases intrinsic motivation, might promote positive attitudes towards technology. The research findings indicated that in a highly collaborative online environment, intrinsic motivation strongly affected the students' attitudes toward technology (Magen-Nagar & Shonfeld, 2018, p. 624).

The analysis of social networks (SNA) in the educational environment studies the subgroups of actors incorporated in the network and their positions in relation to others. Actors can be students, groups of students and teachers, as well as non-human actors (e.g. learning materials, learning environment). Relationships are described by a number of characteristics, such as frequency, communication, association, level, or power of interaction. Thus:

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> Both SNA and CSCL are concerned not only with human actors and communication ties, but in any relation, connection, association between relevant human and non-human actors in order to understand processes and outcomes in the social context under analysis (Dado & Bodemer, 2017, p. 173).

The Trialogic Learning Approach (TLA) focuses on the role of collaborative processes aimed at developing concrete knowledge artifacts and new technologies that could mediate and support these processes. The conclusions of the study based on the approach of trialogical learning suggest the need for greater opportunities for students to develop skills and knowledge through the process of collaboration and role assumption. This has proven effective not only in terms of developing the motivation and confidence to use technology in teaching and learning, but also in terms of preparing for a professional career (Sansone et al., 2019).

In the informal environment, too, collaborative learning is gaining ground. Analyzing the research on the characteristics and trends of technology-supported collaborative learning in informal learning environments between 2007 and 2018, Zheng et al. (2019) argue that "most studies adopted mixed collaborative learning methods such as learning together, team games, collaborative creation, discussion, and group investigation" (p. 549).

Students have a number of digital resources that they can use in collaborative learning (see Figure 1):

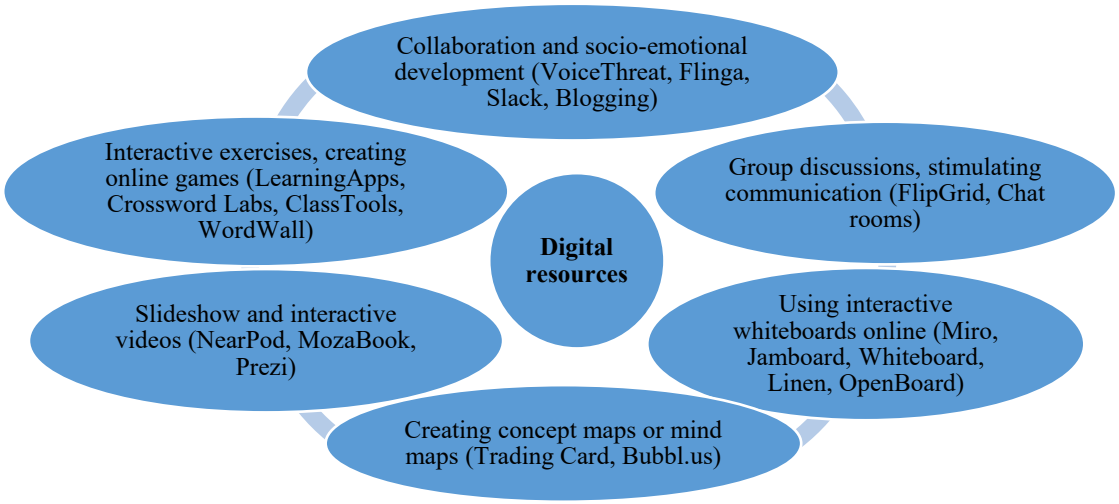

Figure 1. Digital resources used in collaborative learning

Because there are a multitude of other variables that influence computer-supported collaborative learning, we consider the term "orchestration" to be appropriate, meaning "the process of productively coordinating supportive interventions across multiple learning activities occurring at multiple social levels" (Dillenbourg et al., 2009, p. 12).

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3. Research Question

As the instructive-educational activity in higher education was carried out online during the Covid-19 pandemic, we were interested in providing the collaborative framework necessary for the interactions between students.

In this context, we have focused on the following questions:

i. What does collaborative learning entail in the instructive-educational activities carried out online?
ii. What are the students' attitudes towards the use of technology during collaborative learning?
iii. To what extent are students' performance influenced by computer-supported collaborative learning?

4. Purpose of the Study

The aim of the research is to analyze the impact that technology has on collaborative learning in students. Technology provides a new, digital framework, and customizes methods, tools, and ways of interacting with students. It matters to what extent the effects of using digital resources (synchronous and asynchronous) contribute to improving and facilitating collaboration, and this was found by analyzing the students' attitudes towards collaborative learning in the online environment. We were also interested in identifying group interactions in online learning situations that facilitate collaborative learning, as well as student outcomes from collaborative learning.

The objectives of the research are:

O_1: Identifying the specifics of collaborative learning and the role of using technology in online collaborative activities specific to the learning process;

O_2: Formulation of research hypotheses and their testing in order to outline the answers to the research questions;

O_3: Application of research methods to test hypotheses;

O_4: Elaboration of conclusions based on the results obtained, specifying the positive aspects and possible dysfunctions or limitations of the research.

We started from the assumption that the new technologies shape the context in which collaboration between students is achieved, by capitalizing on digital resources, influencing the learning outcomes in the form of individual school performance, and the attitude of students towards online collaborative learning.

Particular hypothesis 1: The use of digital resources in group activities leads to superior individual results.

Particular hypothesis 2: The attitude of students about the importance of digital resources in online collaborative learning activities is a positive one.

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5. Research Methods

5.1. Participants. Samples

In order to provide some psychometric evidence of the results obtained in the research, we used two samples, including students enrolled in the psycho-pedagogical module (Department of Science). Sample 1 (experimental) consisted of 62 students, and sample 2 (control) included 54 students, all enrolled in the Undergraduate program. The chosen sample follows the conditions of a representative group for the reference population (the criterion of homogeneity is respected, as age, education and school and professional interests, there is heterogeneity in terms of variables and a number of over 100 students). In order to take into account the characteristics of the students, we added as a control variable their previous performance (the results obtained in another course within the psycho-pedagogical module, which we conducted together, but during which we did not pursue collaborative learning).

Table 1. Previous performance: categories, frequencies and percentages

Previous performance	**Results Experimental group**		**Results Control group**	
	Number	*Percent*	*Number*	*Percent*
High previous performance (9 and 10 grades)	16	25.81 %	13	24.07 %
Average previous performance (7 and 8 grades)	32	51.61 %	27	50.00 %
Low previous performance (5 and 6 grades)	14	22.58 %	14	25.93 %
Total	62	100 %	54	100 %

The experimental research was carried out in the first semester of the academic year 2021-2022, in the two samples being included the students who participated in the summative assessment at the end of year I. We are stating that, when the control condition was computer-assissted individual learning, the performance of the group tasks and social interaction were not included in the analysis. The students were informed of the purpose of the research and they gave their consent to participate in this investigation.

It is appreciated that "at the beginning of the semester, students are not able to point to valuable friends in terms of learning and achievement" (Vignery, 2022, p. 181). They wait for the teacher to organize the activity and tell them how to carry out the interactions. Therefore, but also because they did not have the opportunity to meet during the face-to-face activities before the pandemic period, we divided the students (G_1) into several subgroups (comprising both girls and boys), taking into account the specialization of each of them.

The resulting subgroups are divided as follows:

Table 2. The composition of the groups in the experimental sample

The composition of the groups by number of members	**Experimental sample (G_1)**
Groups of 4 students	5
Groups of 5 students	6
Groups of 6 students	2

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Because "studies have found that students who occupy a central position in the network tend to perform better cognitively and metacognitively" (Dado & Bodemer, 2017, p. 172), we created subgroups so that each includes at least one student who occupies a central position in the network. This can be an "engine" for the other members of the group. We should mention that this composition of the groups remained the same throughout the instructional program specific to teaching and learning in the educational discipline "Theory and methodology of instructional. Evaluation theory and methodology".

5.2. Instrument

We used the observation method to record elements of the relationship between students and we noted, along the way, the findings in relation to the degree of involvement of the members of each group, in the context of online collaboration. We have included in the observation sheet some observational indicators that helped us to systematize the information found in relation to the topic of our research.

We also used the method of the pedagogical experiment, in order to implement the experimental factor, represented by the use of digital resources based on the collaboration of students. Throughout the research, we took into account the context variables - online (synchronous and asynchronous), the process variables – interventions, interactions, educational experiences, as well as the product variables – the constructs targeted in the research (the students' attitude towards collaborative learning and the exam results at the end of the instructional program).

Because we were interested in the students' attitudes regarding the impact of digital resources in group activities, we applied an interview built on two constructs: the role of digital resources in collaborative learning tasks and the self-assessment of collaborative learning efficiency.

5.3. Procedures

The observation method that we used helped us to identify issues related to the interaction between the students in two situations: the situation in which the students were not divided into groups at the beginning of the instructional program and did not have group work tasks (G_2) and the situation in which they were divided into several groups (G_1) and were encouraged to collaborate in a collaborative learning community.

Table 3. The observation sheet used in the research

Time planning	**Observational indicators that operationalize relationships between students**															
	Degree of interaction						Frequency of interactions						Presence of the consequences of the interaction			
	Low		*Medium*		*High*		*Low*		*Medium*		*High*		*Existing*		*Non-existing*	
	G_1	G_2	G_1	G_2	G_1	G_2	G_1	G_2	G_1	G_2	G_1	G_2	G_1	G_2	G_1	G_2
Week 1																
Week 2																
Week 3																
Week 4																
Week 5																
Week 6																
Week 7																
Week 8																
Week 9																
Week 10																

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The analysis of the relations between the students in the didactic activities is complex and includes a series of aspects related to communication, leadership, socio-affectivity. However, we were interested in the extent to which the organization of students in small groups and the collaborative accomplishment of the teaching tasks during the instructional program stimulates the group activity and makes the interactions between the students more efficient. The frequency of interactions is an indicator of student involvement, but the degree of intensity of the interaction, which we grouped in low, medium and high, depending on the duration of the interventions and the depth of the topics covered, as well as establishing connections and interdependencies also counts. We followed the involvement of students along a continuum, noticing, for example, that fewer interactions may occur, but with a higher degree of intensity (as in the case of the experimental group in weeks 4 and 8) or that an average frequency of interactions can have positive consequences, which we have approached from the perspective of reaching consensus and generating conclusions or products of students (as in the case of the control group in week 4).

During the pedagogical experiment we considered that the independent variable is the use of digital resources during collaborative learning in the experimental group. The students were encouraged to use collaborative-technological tools specific to the online environment, such as group blogging, group discussions during synchronous and asynchronous meetings on the Google Classroom platform, group pages on WhatsApp, etc. The students participated in online lectures in which they were active and were divided into group rooms to discuss the group topic. They periodically uploaded group-made (asynchronous) Power-Point presentations to Google Classroom and presented them synchronously, sharing their responsibilities. For example, in a group of five students, they searched for the relevant content for the given topic and discussed on WhatsApp what each one has to accomplish. Then they negotiated the roles that each could play at the group level, using the email: one student made the synthesis, essentializing the content, and another chose a specific online tool, available for free on the Internet. There were situations when the presentation of the results was made by several members of the group, by alternating interventions, as well as situations of mutual evaluation. Because “taking into account the learning outcomes of their peers in order to inform their own learning” (Dado & Bodemer, 2017, p. 173) is important, we ensured that students had access to the artifacts of knowledge created by peers in the CSCL system.

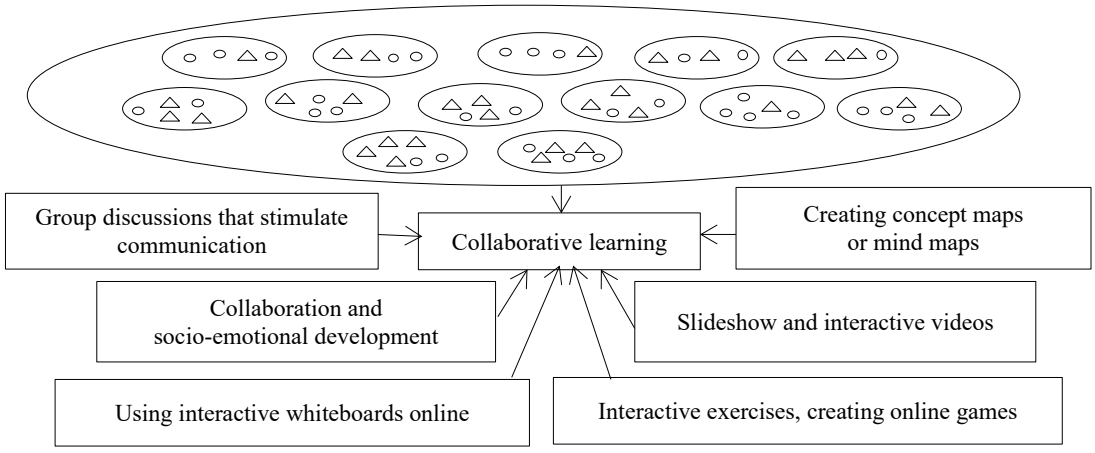

Figure 2. Categories of digital resources used in collaborative learning

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In the control group, on the other hand, they did not work collaboratively, the students participated in the teacher's lectures in synchronous online format, while online in asynchronous format, having to solve independently-individually, different work tasks. Because the dependent variable is represented in our research by the final results of the students in the two groups, we compared the students' performance in the exam at the end of the semester, by testing the particular hypothesis 1.

In order to test the particular hypothesis 2, we used the interview. Because the involvement of the students in collaborative activities through digital resources has both quantitative and qualitative components, the answers given by the students gave us a broader picture, which includes how they relate to digital resources in collaborative online learning activities. We ensured the equivalence of interview conditions and referred to two constructs: the role of digital resources in collaborative training tasks and the self-assessment of the effectiveness of collaborative learning.

In both constructs, the questions were structured based on the following indicators: cognitive (e.g. "I think I am competent to use technology in school activities," "I don't know what facilities the MozaBook platform has"), affective (e.g. "I feel comfortable with using technology for learning tasks with others", "I am unsure when I have to work with another colleague in online activities) and socio-behavioral (e.g. "I used at least two digital tools in the group activity", "I feel very confortable when I have to present a PowerPoint material with another colleague"). During the interview, we took into account the requirements that ensure the efficiency of the conversation. Thus, we ensured the naturalness and elasticity of the conversation (which took place in a climate of full confidence), we avoided artificial situations (which produce suspicion and blockages), we made the conversation more flexible (to engage the interlocutors in a free and honest discussion) . The answers provided in this framework complete the research register, highlighting whether and to what extent a positive attitude towards the use of technology influences collaboration between students.

6. Findings

The performance of the students is the dependent variable of our research. At the end of the instructional program, we centralized the results obtained in the exam (Table 4). The total number of students who participated in the exam did not change significantly (G_1 – 57 students and G_2 – 51 students).

Table 4. Exam results of the members of the two groups

Student performance at the end of the instructional program	**Results Experimental group**		**Results Control group**	
	Number	*Percent*	*Numberăr*	*Percent*
High performance (9 and 10 grades)	30	52.63 %	13	25.49 %
Average performance (7 and 8 grades)	26	45.61 %	28	54.90 %
Low performance (5 and 6 grades)	1	1.76 %	10	19.61 %
Total	57	100 %	51	100 %

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It was found that the results of the students in the experimental group were superior to those in the control group (see Figure 2), but also that the students in the experimental group performed better compared to the previous results, in terms of the collaborative activity online (see Figure 3 and Figure 4).

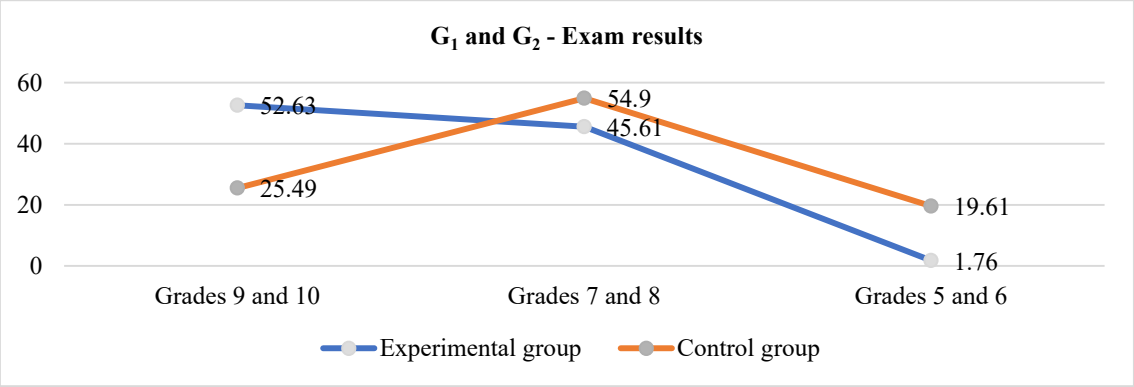

Figure 3. The results of the two groups in the final evaluation

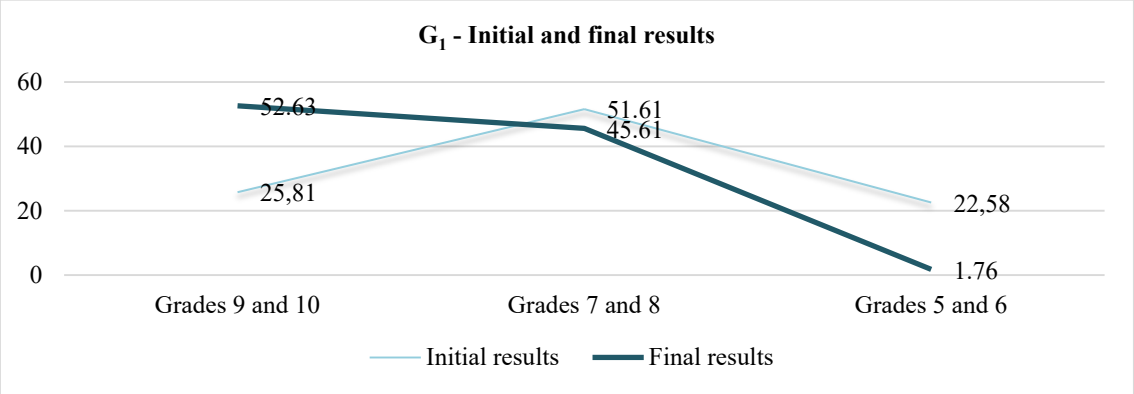

Figure 4. Comparative analysis of results before and after the introduction of the independent variable

The analysis of the two graphs shows an increase in the performance of the students in the experimental group. The percentage of the students who scored 9 and 10 increased significantly and, as a result, the percentage of those with low grades decreased. If in the initial assessment the percentage of those with low grades (5 and 6) was 22.58%, in the final assessment it was 1.76%. The control group also showed a slight increase in the number of students with grades of 9 and 10, but it is insignificant (the difference in percentages is only 1.42%). As the school experience gained in the meantime can be a factor of progress, we can not say that the results obtained are 100% due to the collaborative activity, but the exercise of collaboration through technology has facilitated the involvement of students in online learning activities and the increase of their performance (both at group and individual level). We thus state that the first hypothesis of the research is confirmed and that the use of digital resources in group activities leads to superior individual results. Moreover, as it results from the analysis of the observational indicators to which we referred, the high frequency and the average or high degree of interactions, as well as the presence of consequences (in the form of products, achievements of the students using digital resources) are a predictor of positive results.

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Because we were also interested in the students' attitudes regarding the importance of digital resources in collaborative online learning activities, we tested the second hypothesis of the research by analyzing and interpreting the responses of the students in the experimental group. Regarding the first construct (the role of digital resources in collaborative learning tasks), we grouped the students' attitudes into positive and negative ones (see Figure 5 and Figure 6).

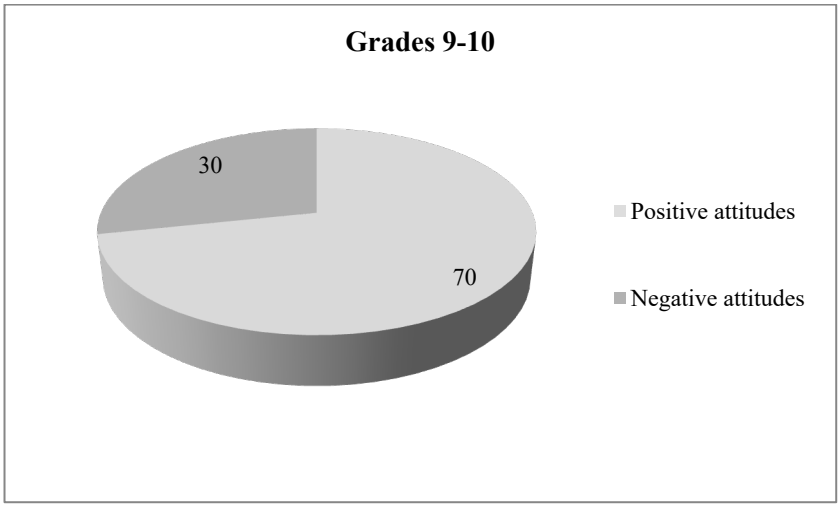

Figure 5. Attitudes of students in relation to the influence of technology in collaborative learning (Grades 9 and 10)

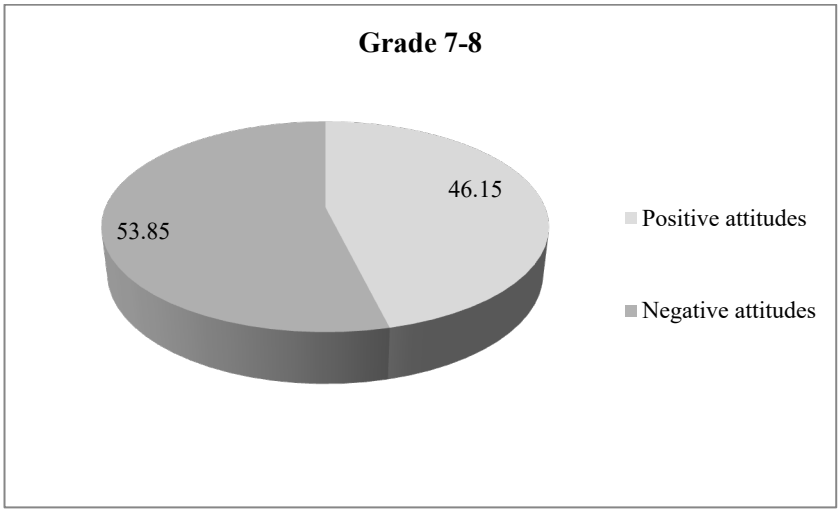

Figure 6. Attitudes of students in relation to the influence of technology in collaborative learning (Grades 7 and 8)

By comparing the answers in relation to the results, it is found that the students who obtained good and very good results have a positive attitude in a higher percentage (70%) than the students who obtained average results. The latter show a positive attitude of 46.15%. Because the interview took place before the exam, it is useful to reflect on the relationship between attitudes and results.

The second construct aimed at the self-assessment of the effectiveness of collaborative learning with the help of technology, most students objectively relating to the three indicators (cognitive, affective and socio-behavioral). For a systematization of the answers, we divided them into three groups: I know, I

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like and I do. I registered three possible variants: (1) I know + I like/ feel good + I do/ put into practice; (2) I know + I do/ put into practice (but I don't like/ feel comfortable); (3) I know + I like (but can't apply). Most of the answers were in the third version, which means that students are aware that they need exercise in this regard.

The findings indicated that a high level of OCL promoted positive attitudes towards technology (identified by an interview applied at the end of the instructional program) and better performance in solving work tasks. As better learning outcomes are an effect of a number of factors that need to be addressed in a uniform and consistent manner, we note that several variables need to be taken into account; collaboration is just one of them, but we must not neglect the geographical framework, the cultural context in which learning takes place, the effects of the pandemic, plus aspects related to psychological and pedagogical factors.

In the overall picture of our research, some limitations are outlined:

i. The data gathered through the interview are valid, but in order to be reliable, they must be collected from a larger sample of subjects.
ii. Research constructs can be improved and need to be validated in a broader context.
iii. In the answers that the students gave regarding the way in which the collaborative learning was carried out in the didactic activities developed, there is the tendency of "halo effect", generated by the attitude they have towards the teacher and the course they participated in (therefore, it is necessary to use several research methods).
iv. The present study provides little indication of the long-term impact of employment in such a learning pathway, as well as of the link between the attitude towards technology and the results of collaborative learning based on digital resources.

7. Conclusions

Beyond the reservations about the extent to which technology is able to sustain and develop or stimulate collaborative learning, we need to consider several issues (eg the ability of learners to provide the necessary technological support, the ability of the school to offer tablets or computers to each student). In the departments where there is a computer for each student, the collaborative activity is easier, while in those where there is a computer for two or more students, the situation changes. It counts the type and intensity of interactions, but also the type of interactions (in cognitive activities, but also in socio-emotional ones). No less important is the attitude towards technology, which can be an important predictor of superior academic performance.

The results of our study are in line with the stimulation of collaborative learning through modern technologies. After all, the Web 2.0 paradigm is a dynamic environment in which users (including students and teachers) interact and generate content and learning experiences together. Students use certain technologies only if the digital tools and resources are at hand or make sense to them in the collaborative approach. Ultimately, the success of collaborative learning through new technologies depends on how we relate to the sum of digital experiences that define a particular learning community.

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