# Collaborative Learning

Subjects: Others

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Collaborative learning is an exchange of ideas that enables and improves the interaction between two students (student–student) coping with the learning material on a network. When somebody imagine individuals seemingly completely focused on the screens and keyboards of their devices, people most frequently have a preconception that they are using those learning devices by themselves. However, such images of individual learning accompanied by electronic tools frequently do not reflect the hidden reality. In reality, students often use their computers to interact with others, and it is frequently their peers whom they interact with. These ideas arise from learning technology known as collaborative learning. Collaborative learning principles arise from a well-established approach to education, have a specific meaning and are specifically applied in practice.

collaborative learning digitalization education process

## 1. Introduction

Since the early 1970s, there has been an idea that students learn through participation in evaluating work completed by other students of the same class (in the same study year or attending the same subject). By participating in their peers' work and projects, students acquire specific types of knowledge by considering the set problems, checking the obtained results, researching the literature used and taking part in two-way communication. Considering the fact that students are active in reasoning and are functionally active [1], such collaborative learning processes enable students to develop and learn a methodology and develop critical thinking intellectually. Given the nature of the process, there is a knowledge transfer between students. Collaborative learning is closely connected with information processing, which makes it suitable for environments based on contemporary technology, where the focus is on neither a type of hardware nor software, but on the learning experience. The development of e-education technologies, especially during the shift to e-education during the COVID-19 pandemic, has prompted a search for new approaches to collaborative learning oriented toward practical and project work.

By applying collaborative learning methods, models used for the improvement of the teaching process in electronic education should enable the relevant, authentic, transparent and safe evaluation of student work [2], especially in the context of systems with a large number of students, such as MOOCs (Massive Online Open Courses) or e-learning systems [3][4][5]. In traditional approaches to mass subjects in higher education, the evaluation of students' knowledge is typically performed by testing. The outcome is information about whether a student has or has not passed the test. There is often no clear information about the material that a student has learned from and how successful they were. Furthermore, there is no information on whether the student has been trained to apply

scientific material to solve problems in practice. This segment is evaluated through seminar papers and projects, particularly in engineering disciplines, where a concrete project is expected as a learning result. For this reason, students must be enabled to learn in a project-oriented manner, which should be more dominant than the reproduction of what has been discovered [6]. To provide a quality education process, it is necessary for students to work on practical projects and research and to develop their problem-solving abilities and critical thinking [7][8][9][10][11], with this being accompanied by the quality evaluation of student work [12][13][14].

Blockchain has a high potential to achieve sustainability in business and industrial practices as it offers resources to extend the life cycle of a given product and maximize the use of resources, contributing to sustainability. Blockchain technology is efficiently applied in many sectors, including education. Although blockchain technologies are rarely involved in education, current research indicate their potential in the education sector [15]. Although the use of BCTs in education is in its initial phase, blockchain-based applications are rapidly being developed in different fields of education, including collaborative learning environments with a high security level for all participants [16][17][18]; the management of competencies and learning outcomes; copyright management [19]; student examinations and examination systems [19][20]; the assessment of students' professional capabilities, which can be used by companies when employing them [21][22][23]; lifelong learning [23]; online education [24]; and the issuance and verification of diplomas, transcripts, and certificates [25][26], which can be shared between individuals and organizations for verification [27][28]. The EduCTX credential recording transfer platform used amongst partner higher-education institutions to eliminate an intermediary [29] and the data management of educational systems [30] are examples of this approach. Applying blockchain technologies in education encompasses intermediary-free data management and verification without jeopardizing authenticity while simultaneously providing constant availability and confidentiality with complete transparency.

During both their education and professional work, each individual goes through a series of education programs and courses to acquire skills and appropriate certificates issued by different educational institutions. The researchers[31] highlight the necessity for the existence of the records of these certificates to be easily authenticated by an employer.

## 2. Collaborative Learning

Collaborative learning is an educational approach implying the use of learning improvement groups through joint work. It implies groups of two or more students who work together on problem solving, task solving or learning new concepts. This approach actively includes students in the analysis and synthesis of information and concepts instead of promoting their learning by heart and remembering facts and figures. Students have the possibility to cooperate between themselves on projects where they have to act as a group in order to understand the concepts presented to them [32]. By defending their attitudes, reshaping their ideas, listening to other participants' points of view, and articulating their standpoints, students acquire a more complete understanding of working in a group than they would be able to do working individually [33].

Collaborative learning takes into consideration the different learning premises, which all have one thing in common —to not only present pieces of information to students, but also to make them actively construct knowledge in interaction with other students [34]. For example, collaborative learning can be performed in pairs (dyads) of students, e.g., in the reciprocal teaching process, in small groups of, say, four students or with those attending the course as a whole.

When speaking about collaborative learning in the sense of the roles inside an organization and software development, the group of junior programmers has the task of learning a new framework and then developing a part of the program while using it. Each programmer has his/her part of the development code, but their work will only be a success if they all learn and properly perform their part of the code. Although each person has their own separate role in the work being carried out, the group as a whole has a share in the success of others [16]. In a joint learning process, individual participants also have to take responsibility for the learning results and success of their team, but their roles, resources and organization are left to themselves. There is no organizer who would be applying engagement rules, so the group has to direct itself on its own.

Moreover, a lot of research was conducted in the collaborative learning field and on the practical model itself. Although collaborative learning covers a broad range of participants, fields and learning manners for the needs, the focus will be on network learning. Generally, collaborative learning itself has numerous positive effects on the participants' cognitive and affective variables [35]. Nowadays, the research studies on collaborative learning in connection with online learning are worthy of significant attention on the part of the professional public, which can be seen in the Internet databases of the International Association for Studying Cooperation in Education (IASCE).

Collaborative learning can also be defined as a set of principles and techniques intended to assist students in cooperation with other peers and other people [36]. In practice, hundreds of different collaborative learning models have been developed so far, a large number of which provide teachers and students with a plethora of ideas about how to take further steps towards raising the probability that student-to-student interaction will achieve its potential. Furthermore, there is a note of optimism that collaborative skills and attitudes developed by students in the interaction process with their peers will serve students throughout their lives, both in the lifelong learning process and in any other context they may find themselves in.

There are several collaborative learning models based on principles such as heterogeneous grouping, collaborative teaching skills, group autonomy, maximum interaction between students, equal possibilities of participation, individual responsibility, positive interdependence, and cooperation as values. Research studies suggest that collaborative learning is connected with improved cognitive and affective outcomes.

Teaching collaborative skills may especially be important in online environments, such as discussion panels, email, and social networks, for the reason that these environments represent new challenges requiring a variety of skills appropriate in face-to-face environments [37].

Group autonomy is a significant principle. Students quite often tend to excessively depend on their teachers, neglecting their and their peers' abilities. The group autonomy principle encourages students to first look to their group peers when they need help or when they want feedback. In order for students to adopt the lifelong learning concept, they have to assume some roles that used to be considered the teacher's exclusive domain, such as assistance and feedback provision roles. Taking on these roles allows students to learn while also encouraging peer-to-peer interaction. When students are assisting one another according to their respective possibilities, teachers may offer assistance exceeding the students' current abilities [34].

The collaborative learning literature offers a lot of ideas for promoting group autonomy since it may be especially important in IT environments, so much more than in classrooms, because it is less likely that teachers will immediately be available for assistance. In online environments, when students face difficulties, they may contact their peers instead of giving up or waiting for a few hours or even longer for their teachers' help.

The collaborative learning principle of maximum interaction amongst students refers to maximizing the two aspects of interpersonal interactions.

First, the number of student-to-student interactions increases in group activities, especially when there is a small number of members in each group. A similar situation happens on occasions when certain students interact with only a small number of their peers instead of the group as a whole.

Second, the usefulness of student-to-student interactions increases when students use higher-order reasoning skills [38]. The "magic" of collaborative learning actually lies in the quality of student-to-student interactions. These reasoning interactions promote harder learning, greater processing depth, and greater engagement in students [39]. Therefore, the greater the number of these quality student-to-student interactions, the better.

Information technologies offer a lot of new and attractive peer-to-peer interaction tools. Together with different software, information technologies provide the tools that offer all group members equal opportunities to participate. For example, unlike face-to-face discussions in which some group members may have difficulties being heard, asynchronous network communication enables students to exchange their ideas without needing to compete for their place in the conversation. The other ideas promoting equal possibilities for participation include colour coding. This concept demonstrates the contribution of each person to the graphic presentation, a table or a text, or of the group members randomly selected to share their respective groups' ideas. Moreover, some pieces of software enable students and teachers to track the distribution and quality of divergence in their groups.

Individual responsibility is reflected in the fact that the individual responsibility principle exerts pressure on the members to achieve their equitable share in groups as long as there is an equal possibility of participation, which tends to offer all group members an opportunity to play important roles in their groups. Therefore, individual responsibility can be perceived as the opposite side of equal participation. Students should use the offered opportunities to contribute to their groups as best they can [40]. A significant benefit is that collaborative learning theories and IT tools offer ideas for promoting individual responsibility. For example, groups may appoint who

should do what and when and track if that has been completed. Apart from that, the same software that promotes equal possibilities of participation by tracking every group member's participation can also inform group peers and teachers about who does and does not perform the entrusted work in the group. Including peers in a grading process is one of the two ways to overcome the difficulties often encountered in the process of grading. Most often, lecturers impose the difficulties on themselves for the purpose of grading, forgetting the fact that students are in a better position to supervise their peers' contributions; the other way implies students learning together, but grading each other themselves, e.g., after they have been working together on solving a set of online problems, they work on yet another set of similar problems on their own.

Positive interdependence is the collaborative learning principle that most prominently encourages sharing amongst students. When students feel positively interdependent on their team peers, the group feels their outcomes are positively connected. Positive interdependence can also stimulate motivation for learning since students not only learn for themselves but also learn for the welfare of their teams. Cooperation as a value is built on positive interdependence, with a tendency to convey positive feelings and attitudes of a small group of students to the whole generation, educational institution, city, nation, world and beyond.

Apart from the more reliable assessment of students' competencies, in accordance with the needs of the market, i.e., employers, the proposed model also offers an efficient way for students to self-evaluate during the teaching process. It simultaneously presents an invitation to educational institutions better adapt their educational programs to the market's needs.

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