

# **Intention and Pedagogical Competence: Use of Collaborative Learning in the Subject of Mathematics in Secondary School**

## **Intención y competencia pedagógica: el uso del aprendizaje colaborativo en la asignatura de matemáticas en secundaria**

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## Summary

This review analyzes the experience reported by teachers of mathematics in public junior high schools in Jalisco, México, about the collaborative work of students to learn mathematical content and processes. Weekly logs of 30 teachers were analyzed during one school year to identify modalities of collaborative work, contents or processes taught in this way, evaluative comments about this modality of work to achieve learning and the decisions made by teachers after evaluating its efficacy. It was found that all teachers promoted collaborative work but with varied frequency and in different ways, mainly to solve problems, for discovery activities, to generate hypotheses and to extract information from given information. Drawing from their experience, teachers made different evaluations about collaborative learning and consequently they took the decision to continue promoting it or decrease it and in the latter case increase the direct teaching and individual work of students. It is concluded that teachers try to promote learning through collaboration, but lacked the pedagogical competence required to do it, so not all of them had the results they expect, so some of them return to teach through direct teaching, giving explanations and writing demonstrations on the blackboard.

**Keywords:** Collaborative learning, mathematics education, junior high school.

## Resumen

En este artículo se analiza la experiencia reportada por profesores de matemáticas de secundarias públicas en Jalisco acerca del trabajo colaborativo de los estudiantes para aprender contenidos y procesos matemáticos. Para ello se revisaron las bitácoras semanales de 30 profesores durante un ciclo escolar y se identificaron las modalidades del trabajo colaborativo, los contenidos o procesos en los que lo utilizaron, los comentarios evaluativos acerca de esta modalidad de trabajo para lograr aprendizajes, así como las decisiones que

toman a partir de la reflexión que hacen sobre su eficacia. Se encontró que todos los profesores promovieron el trabajo colaborativo con muy variada frecuencia y en diversas modalidades, principalmente para la resolución de problemas, actividades de descubrimiento, generación de hipótesis, y para extraer información a partir de información dada. Los profesores mostraron comentarios evaluativos diferentes según su experiencia y, a partir de ellos, tomaron la decisión de continuar fomentándolo o de disminuirlo y, por tanto, incrementar la enseñanza directa y el trabajo individual de los alumnos. Se concluye que los profesores intentan promover el aprendizaje mediante la colaboración, pero que carecen de la competencia pedagógica requerida para hacerlo, por lo que no necesariamente tienen los resultados que esperan y algunos regresan a enseñar a través de explicaciones y demostraciones en el pizarrón.

**Palabras clave:** Aprendizaje colaborativo, enseñanza de las matemáticas, educación secundaria.

## Introduction

In Mexico, mathematical competences of junior high school students evaluated through PISA were historically low. From the first evaluation of PISA (Programme for International Student Assessment), conducted in 2000, Mexico recorded 387 points. In 2003 it decreased to 385, in 2006 it escalated to 406 and, in 2009, it also escalated to 419. Notwithstanding during the next two assessments there was an improvement, this was very slight, and during the last assessment, in 2012, it decreased again to 413 points. Mexican students are well below the average of member countries of the Organisation for Economic Cooperation and Development (OECD) and also of countries such as the United Arab Emirates, Kazakhstan, Thailand, Chile and Malaysia (OECD, 2013). This low mathematical competence was attributed to different factors e.g. pedagogical factors.

During the last decades, direct teaching of school content by teachers was very questioned (McDermott, 1993). It is argued that this modality of teaching is not appropriate for learning all these contents (Marušić & Sliško, 2014), that students learn better and are more interested in when interactive methods are used instead of explanations given by the teacher (Andrews, Leonard, Colgrove & Kalinowski, 2011; Slavish & Zimbaro, 2012) and it is necessary to use different modalities of teaching that allow for a better learning, taking into account the nature of content and the students' characteristics (Brown Wright, 2011).

One of the pedagogical modalities currently suggested is collaborative learning, which showed, if properly implemented, to enrich learning of students through the involvement in specific tasks, and at the same time to promote inter-personal relations, leadership skills and learning autonomy (Pai, Sears & Maeda, 2014).

In the classrooms of a group of mathematics teachers of some public junior high schools of the city of Guadalajara that took part of a mathematics teaching improvement project, the author of this review noted that

collaborative learning was used with a different frequency after taking a course on collaborative learning, therefore teachers were requested to allow for reviewing work logs to analyze how the use of this pedagogical modality was referred to in the classrooms.

To objective of the study was to characterize the use of collaborative learning methodology by a group of junior high school mathematics teachers through the analysis of record logs written on a weekly basis during one school year with the aim of finding regularities that allow for understanding the use and assessment performed by teachers on this way of teaching.

### **Collaborative Learning.**

Collaborative Learning is a pedagogical practice proposed by John Dewey and Lev Vigotsky from the beginning of last century and widely disseminated in the 70s from the publication of reviews on the benefit of this type of practices (Gillies, 2014). Thereafter, many studies compared results of cooperative, competitive and individual learning (Johnson, Maruyama, Johnson, Nelson & Skon, 1981; Johnson & Johnson, 2002; Hattie, 2009; Slavin, 1996; Gilles, 2008).

Studies showed that collaborative work promotes academic achievement and positive social interaction of students in all educational levels and in a big variety of subjects (Slavin & Cooper, 1999; Johnson & Johnson, 2000). Work effect on small groups showed to have an impact on the transfer of learning compared to individualist learning. Pai, Sears & Maeda (2014) conducted a meta-analysis of 124 empirical studies that measured the impact of learning on small groups in learning transfer and found out that this method was superior to individual or competitive work. Also, discussions of small groups, on online education, caused deeper understanding than other modalities of work (Bliss & Lawrence, 2009).

At present, collaborative learning is used and studied as a mean to learn different contents in varied scenarios. For instance: in primary school, to

learn how to write (Guzmán & Rojas-Drunmond, 2012), to understand geographical contents (Celikten, Ipekcioglu, Ertepinar & Geban, 2012) and to promote understanding and reading fluency (Valdebenito & Duran, 2013). It is also used for daily life learning (Mejía-Arauz, Keyser & Correa, 2013), in the English virtual environment as a second language (You, 2014), in physical education and for mathematics learning as well (Hooker, 2011).

Since 1989, the US National Council of Teachers of Mathematics advocated for using collaborative learning to teach this subject because small groups provide a forum where students ask, discuss ideas, make mistakes, learn to listen to ideas from others, give constructive criticism and summarize information learned in writing (NCTM, 1989, p. 79). This Council included communication in one of its five standards, (NCTM, 2000), which was developed through collaborative learning.

The foundations for collaborative work may be found on one of the premises of Vygotsky's socio-cultural learning theory (1979), which considers that every psychological process appears twice: firstly in the interpersonal level and, then, in the intrapersonal level. Those authors who followed this line of thought say that, during the involvement in an activity, students build new understandings and knowledge (Mercer & Littleton, 2007; Rogoff, 2003). Shared forms of action are internalized through semiotic mechanisms and form part of the intrapersonal functioning of the subject (Wertsch, 1988). What is executed in the intrapersonal level is progressively built in the interpersonal level.

Activity involvement makes the student learn through semiotic mechanisms, but it is not sufficient to put them together to learn, it is necessary to design a activity structure so that an intended process can occur and teach students to participate, because in some occasions they do not know how to act, how to incorporate differing inputs or what to do with those people who give little input (Gillies, 2014). Taking ideas from Johnson & Johnson (1990), Gillies (2014) developed a structure with five elements to avoid these difficulties: the first one is to establish a state of positive interdependency or

achieve a goal, where students understand it is not sufficient to do its part, but all of them should contribute; the second element is that each individual should report its input to each student; the third element is the development of skills to manage behaviour and interactions in order to achieve the goal; the fourth element is to promote interaction, and the last one is group processing consisting of the fact that members of a group make reflections on performance, recognize positive things and identify what they need to achieve the team goal.

Millis (2014), from a wide review of literature, points out seven principles of collaborative work that promote students' learning. Some of them are similar to Gillies' elements: 1) a defined structure, 2) focusing on problem solving, 3) forming heterogeneous groups, 4) using cooperative structures to promote deep learning, 5) establishment of positive interdependency but with individual responsibility, 6) reflection on work process (group processing) and 7) development of social and leadership skills.

Moliner, Flores & Duran (2011) deepened on one of the modalities of collaborative work: tutorship between pairs, where a student firmly assumes the role of a tutor of a less advanced student or when there is exchange of roles and both of them act as tutor and tutoree in a different time.

For this work, as defined by Johnson, Johnson & Holubec (1999), collaborative learning will be understood as "the didactic use of reduced groups where students work together to maximize own learning and others' learning" (p. 14).

## **Method**

Research was of qualitative type, since the use of methodology of cooperative learning was characterized by junior high school mathematics teachers. The research interest was focused on the experience reported by teachers through written reports. Questions that guided the research were as follow: How do teachers report that collaborative work will be implemented in

classrooms? How is the work process described? What types of curricula or processes use this modality of learning activity? What are the advantages and disadvantages? How is work valued? What decisions are made from these appreciations? How is work performed by these teachers compared to information stated by the theory as collaborative learning?

The participating group was of 30 teachers who teach mathematics in the first grade of junior high school in public schools of the city of Guadalajara. 53.3% of them were women and 46.6% were men, who in average made 27 entries in the weekly record logs during school year 2012-2013, as may be seen in Table 1.

**Table 1.**

*Participants and data corpus.*

Participants	Number	No. of Entries	Percentage of Deliveries
Women	16	358	90.4%
Men	14	453	92.9%

Teachers have a professional title in Mathematics and Engineer. The first of them have pedagogic knowledge, but less knowledge of the subject as engineers. The latter have knowledge about mathematics and its application, but no knowledge about pedagogical aspects; however, they receive training on this issue by the Department of Education.

Teachers were invited to participate in a research project that offered them teaching of mathematics and follow-up during the school time year a virtual practice community. On their part, they had to participate on a weekly basis in a virtual forum and upload, with the same periodicity, a record log of activities and reflections. A part of the results was already published (Gómez & Silas, 2012; Gómez, Silas & Miranda, 2015; Gómez & Silas, 2016). This review only analyzes collaborative learning reported by teachers in their record logs.



The data corpus was composed of 30 record logs –teacher logs– with 811 entries in total; i.e., each record log was updated, in average, 27 times. There, teachers recorded on a weekly basis, during school year 2012-2013, what they deemed relevant for practice, either on the stage of planning, implementation or subsequent reflection. Format was free and its extension was variable (between 3 and 8 pages), therefore some of them give emphasis on planning, others give emphasis on classroom work and some of them on process reflection, but all of them had these three elements. Since it was not a mandatory task, only an agreement, some of them did not write for weeks. Teachers read and commented on works of others (Gómez & Silas, 2016). One of them said that he was not concerned about exposing his limitations on virtuality.

Regular use of teacher log “allows for reflecting the author’s point of view about more significant processes of the dynamic in which he is immersed” (Porlán & Martín, 1991, p. 23). Work focused on subjective perception of teachers about practice and decisions made; therefore subjectivity is subject matter of research (Zabalza, 2004).

The analysis process consisted of reducing information by choosing collaborative work as thematic unit; then the following elements were identified and classified: modalities of collaborative work, evaluative comments from teachers, practice examples, situations that could lead to this type of activity and decisions made by teachers, what is called “open codification” by Straus (1987). Then, information was deployed in matrixes (Miles & Huberman, 1994) for analysis and drawing of conclusions through a process of inductive inference, and from this the collaborative work performed in this set of secondary classrooms was characterized, from the perception of teachers and authors of record logs. Finally, this work was compared to what is theoretically called collaborative learning.

During the analysis, to refer to record logs cited initials of each teacher are written as well as the page number which contains the information.

## Results

The analysis of the record logs shows that in 473 times reference was made to collaborative work in the classroom, with wider variations between some teachers and others, e.g. from 35 occasions (who used more this modality of work) to 3 (who did used this modality less). Then, evidence is showed in relation to how was this collaborative work performed, which curricula was used, how where teachers assessed and what decisions were taken from this.

### **Process and Modalities of Collaborative Work.**

The reported collaborative work was organized in different ways: small teams (346 times), work in pairs (91 times) and also work with tutors (36 times). Teachers who show a more organized work preferred that students work in pairs, to ensure their continued involvement, although sometimes groups of three members were allowed. Others formed teams of four or more students but in some cases reported disorder and lack of work in teams. The most recurrent reference was that the teams were composed of four students. Usually, teachers assigned students to groups but some of them allowed joining due to affinity or contiguity of seats. Some teachers expressed their reasons related to the collaborative group formed, for example: “Work in pairs when some support from one to another is required” (VT, P. 15) to maintain order, when the work is simple or when the activity is exercise and review.

Some teachers also refer that organize them in groups when the activity requires the participation of several students to complete various parts of group work but “no more than three or four members are required” to achieve all members work. Also when the activities are very complex or for discovery, in which several people are required to contribute with their views to the team. However, most teachers do not give reasons for choosing the grouping type.

Although there are teachers who have chosen working in pairs and others to form teams of four members, sometimes the size of the team depended on the availability of materials for a particular activity.

Working with tutors meant that students with more knowledge were responsible for encouraging and advising on the work of a small group of their peers. This modality of work was used, according to teachers, because “*my words are not the same than the words of their or their explanation*” (SN, p. 18). The teacher that considers a student who has already understood something, can explain this to his classmates in a manner and with a language that the teacher does not have; further, the teacher considers that shared experiences of students allow the “monitor” use them to make his classmates understand the mathematical method under study.

Although in that work, couples of students were created who assumed an asymmetrical relationship, because one acted as tutor and the other as tutoree, working for the same goal, a key element was missing as pointed out by Duran (2006): interaction regulated by the teacher.

The work process had, invariably, the following structure, regardless of work in pairs, small groups or monitoring: raising an issue or discovery activity, collaborative work by students, observation and work feedback by the teacher to some teams, sharing of the results of all or some teams. In this last phase, teachers and students said if the solutions were correct or not and the reasons for their judgment.

Both in small and pair groups, there were three ways in which students were grouped: by teacher assignment, student preference or contiguity. Some teachers use one of these ways to group, while others use all of them, depending on the situation, as written by one of the teachers: *There is no fixed organization, sometimes, some students ask me to sit next to me on the desk and they work better there, sometimes I choose to work in pairs, others in groups, but if they are very anxious, I leave them in their respective seats. When I ask for material but they do not bring it complete, I ask them to get together to create a complete set of required material* (OG, p. 9).

To encourage participation, teachers used the intrinsic motivation that was generated because the activity was interesting or funny: *“I told them we were going to play, so they need to create groups of three”* (HO, p 19) or used awards as score to grade, points redeemable for school supplies, sweets, etc. An example of awards is related to the teacher LB, who writes: *“At the end they redeem their points: A colour gel pen, 1000; a regular pen, 800; a good brand pen, 100; a letter size drawing, 50”* (p.17).

In the record logs, there are 15 clear proofs that some teachers planned the collaborative activity, including students who had brought materials that had been commissioned to them by the teacher in the last class: geometry games, *fomy*, paper, sticks, colourful sheets, etc, or that she took dices, rewards, printed sheets, cardboard and presentations: *“They grouped in teams of no more than 3 members and I gave them colourful sheets with exercises, each sheet (2 sheets) contained 9 different problems”* (SN, p.3).

The main instruction given by teachers to their students for collaborative work was to group in teams and complete an activity; usually, they did not assign functions or ask for an account on the contribution of each member of the group. Only if a monitor was assigned, there was a specific activity for each one of the members. Teachers seem to believe that simple grouping and an activity to be performed are enough to promote learning.

No record log contained information about asking students for reflecting on performance in the group or assessing what had been generated as group. Emphasis of teachers was put on keeping them in activity and assessing results in a collective class; i.e., there was little attention to learning process in collaborative teams.

As may be seen, there are different forms of implementing the modalities of collaborative work in the classroom, with the aim that each member enriches knowledge and understanding from input and reasoning from classmates, either in pairs, teams or teams with a tutor. There is also evidence that most of these activities were planned; however, students were

not told to work in team and at any time they were requested to reflect on the learning process.

### **Curricula and Purposes for this modality of work.**

Contents used for collaborative work were practically the same than in any other form of teaching: operations with integers, fractions and decimals; geometry, in particular measurements of figures; measurements of length, surface, time and capacity; equations, information interpretation and graphic representation. That is, what is indicated in the official curriculum: numerical sense and algebraic thought, form, space and measurement and management of information. Difference was made to address these contents.

In general, when teachers teach a complete group, they are explained concepts and shown some algorithmic procedures which are written step by step at the whiteboard. When they are asked to make individual work, it is usually in order that they perform a procedure or solve simple problems. For collaborative work, they used to choose, mainly, activities related to problem solving, discovery of patterns, verification, testing hypothesis and drawing conclusions from this information given.

Collaborative work in more than half times was used to solve problems such as: *“After achieving a height of 3795 meters above sea level, a space rocket expels one of its turbines and this one falls down the ocean at a depth of -792 meters. What is the distance run by the turbine? Why are the negative numbers used to represent distance to which the turbine is immersed in the ocean?”* (CF, p. 22), or *“A science magazine published that one of the first existing satellites took 95.57 minutes to circle the Earth. According to this information: a) How many minutes did the satellite take to circle the Earth in 9.5 turns?; b) How many minutes did it take to give 100 turns?; c) How many days did it take to give 100 turns? and d) How many hours did it take to give 100 turns?”* (BL, p. 43).

Discovery is another purpose of teachers. RS asks students to “build regular flat figures: equilateral triangle, square, pentagon and hexagon, to find similarities and differences there (p. 6) or to duplicate, triplicate and halve the measurement of sides of a regular polygon to discover the following: a) What happens with the perimeter?; b) What happens with the apothem? and c) What happens with the area?

Moreover, this modality of work is appropriate for students to make own verifications: “*In groups they go to the basketball field and measure circles painted on the floor; then they measure other circles of different sizes and prove pi value*” (MR, p. 13). Another teacher asked them to prove the Pythagorean Theorem and, another teacher, the formula to get the square, rectangle and triangle by calculating square units they had.

Teachers also use the collaborative work so that students can learn to formulate and test hypothesis. Teams are instructed that each member can make a projection about the number of times a certain face of a dice will appear upon dropping it 60 times; they are requested to make a table, see if the hypothesis was confirmed and reasons should be tried to be explained (HO, p. 19).

Information analysis is also addressed through collaborative work so that students can learn to draw conclusions of information presented. Teacher BP gives teams the following instruction: “*Analyze the following bar chart showing the results of a survey to a group of students in relation to favourite sports. Then, answers must be given*” (p. 24). It is expected that students learn to analyze information and draw conclusions from there.

Although contents of collaborative work and other forms of activity in the classroom are the same, the purpose is markedly different. In the exposition concepts are explained and procedures are modelled, while, in group work, the objective is to solve a problem, discover, test hypothesis or draw conclusions.

### Teacher's Assessment.

According to record logs under review, teachers mention 165 times an evaluative comment on the collaborative work: 79 positive references, 23 negative references, 32 advantages and 31 difficulties of this modality. Teachers assess in a different form, depending on the particular experience in the classroom for implementation.

Among 79 positive references, teachers say that through collaboration they increase motivation and enthusiasm, which improves discipline, enhances understanding of students who are more lagged due to support of others, who show to be more active and interested in and enthusiasm is increased to learn.

One of the main advantages reported by teachers is motivation and interest: "*Students were motivated to solve these squares and asked me to do more at home*" (VH, p. 1). "It is true that I felt well to see interest in this activity" (SF, p. 4). "*Actually I was surprised with the enthusiasm felt by many young people on designing projects*" (AG, p. 28).

It should be mentioned that students really like this activity: "*100% of them mentioned they liked to work in team and it was useful for practicing equations*" (VF, p.2), and involvement: "*They showed to be participative*" (CF, p. 22). "*I noted that students are participative, almost everybody likes to make questions, they show their willingness to carry out activities*" (GL, p. 40).

Furthermore, it should be emphasized the significance of exchange of opinions enriching work, because very often there are various ways of solving problems and significant learning occur in the debate: "*It is true that I was really surprised because of their way of working, at pace and with a huge number of different ideas*" (PL, p. 69).

One of the advantages they see is that there are students with more knowledge to help others learn: "*The teamwork they do is excellent, there are*

*monitor children who help me a lot and make my class work easier” (RM, p. 38). “With the teams, I bear responsibility on the most capable students, and they are responsible for guiding their peers, and believe me they do it better than me with the whole group. Yes, it works; believe me” (RL, p. 55).*

A teacher also expresses her enthusiasm for collaborative work: *“For the first time in almost 16 years, I feel completely satisfied with the result I observed in students” (CF, p. 22).* All teachers included in their record logs a lot of photographs of collaborative work, especially when using concrete materials or when students were building figures, elaborating graphics or making outstanding exhibitions.

But not all were positive evaluations, several teachers were discouraged to implement collaborative work in their classrooms, as can be seen in the following excerpts from their record logs:

*Many boys have expressed in different ways a bad development of collaborative learning, if they are asked to socialize without rigorous supervision, they begin wandering and completely forget the goal they are working at (RV, p. 8).*

Other teachers say that:

*This way to work results in leadership of some students and also, imprudence of others that as a consequence of closeness they do not work in a collaborative form, but sometimes they only expect one or two of them do all work (RS, p. 26).*

*In 1° A they sit down by affinity, they do not change teams, students match with the more intelligent person or sit down with the one who really works. Team work becomes a problem because this leaves alone the one who can solve it and the one who fails to do so, so solving this problem takes more time (SD, p. 31).*

*In my opinion, guys are taking on responsibility for own process, but, surprise, they become responsible for nothing, because they are learning*



*nothing, because they continue to solve them on the fly, repeating models to abandon them in a corner of memory, if perhaps, but transfer does not occur, nor they are able to develop minimum competences that can give an answer to cognitive needs, both immediate and mediate* (RV, p. 24).

A possible explanation of difficulties encountered by teachers upon implementing collaborative work is that they did not appropriately promote discussion between members of the group, or a proper collaborative structure was established. It seemed that the teacher left the process to the leaders of each group to promote others' learning. Thus, in spite of the fact that the teacher's book suggests to follow a methodology for collaborative learning, not all teachers may implement it.

## **Decisions**

Main complaint from teachers about collaborative work was indiscipline. RV writes: *"They worked in teams, where they showed to be very aggressive with lagged students"* (p. 18). It should be expressly stated as follows: *"I noted, when they work individually, they are quieter; discipline is better"* (LV, p. 15).

There were two main advantages perceived by the ones who positively assessed this type of work: *"Environment became pleasant, funny"* (CF, p. 7), and it was better understood because, when a person understood or solved a problem, he/she was supporting his/her classmates; *"working in teams, more than one could do so and it was explained to the others, so that many exercises were made"* (AI, p. 21).

From the experience of each teacher on implementing collaborative work, they made a decision to continue to promote it, since they consider in this way students learn, or reducing it to increase, instead, direct teaching and individual work to achieve more control on behaviour of students and progress in a more predictable manner in presenting contents indicated by the program.

## Discussion

Collaborative work is reported on record logs of teachers, which evidences they are trying to comply with the instructions given by the authority, who states that motivating and significant situations should be ordered for students, which promote collaborative work and autonomy to learn (SEP, 2011), which is performed in a diversified way and frequently results and different assessments are obtained. There was evidence of planning learning situations in many record logs. Planning was focused on designing situations to promote problem solving, discovery and planning of hypothesis, among others. For this, they prepared materials, exercises and problems that, sometimes, were related to interests and experiences of students.

Teachers were focused on the fact that students remained in the activity for manufacture of products requested, but it was not always a success. Collaborative work itself was not planned or under review by teachers and students. It seems that teachers consider giving homework, providing materials and grouping students is sufficient for detonating collaboration and learning, in contrast to what is supported by scholars as follows: “We are talking about a more sophisticated way to work in group where, mainly, positive interdependency is promoted between members of the team and need of input of each member to achieve a goal” (Duran, 2006, p. 7).

Although in general terms what occurs in the classroom can be called collaborative work, if it is understood as the “didactic use of reduced groups where students work together to maximize own learning and the other’s” (Johnson, Johnson & Holubec, 1999, p. 14), implementation was hugely poor since there was no structure as proposed by Gillies (2014) or by Johnson & Johnson (1990), and which was previously shown in this review.

It would be convenient that, instead of just grouping students and providing them with an objective and specific time to achieve it, a highly structure interaction, as stated by Duran (2011), can be settled to focus more on learning than on goal achievement.

## Conclusions

If, as stated by Pai, Sears & Maeda (2014), working in small groups showed to have an impact on learning transfer, compared to individualist learning, it would be convenient that teachers be familiar with foundations of this type of educational intervention and specific ways to establish work objective, roles of participants, temporary structure, ways of relationship promoted by learning, and communication of results and reflection on the work process itself and utility, so that students can build new mathematic knowledge.

Taking a course of collaborative learning seems to have motivated teachers to use more this modality of learning in the classrooms. However, motivation was insufficient; it was necessary to make an implementation like what was stated by the one who successfully applied this way of learning promotion.

Raising an issue to students and ask them to work in group to solve it is an element of collaborative work, but it is also necessary to teach students how to organize and identify roles that should be played by each one, time required to conduct the activity and the product resulting therefrom. In addition, it will be necessary to teach them to plan works, assign responsibilities and use criteria to assess the product and process of work.

While teachers do not properly apply collaborative learning as a pedagogical method, results deemed different from the one indicated by research works shall be gathered, which describe successful practices and they feel frustrated and unmotivated to continue its application. Therefore, it is necessary that, besides taking courses on the issue, there are other mechanisms contributing to successful implementation, e.g. monitoring a more expert teacher, working in communities of practice or academic institutions.

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