



## Engineering of Techno-Pedagogical Innovation in Science and Technique of Physical and Sports Activities (Ctsstaps)

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### Abstract

In an EPS lesson, the student can learn in three different ways, including learning by doing, observing, or thinking; the last method will be the subject of our study, the objective of which is to show how a debate of ideas (sociocognitive conflict), between a group of students will make it possible to construct learning through the educational mediation of the teacher? So by verbalizing the problems encountered in learning situations and concretizing theoretical behaviors (proceduralization of knowledge), students will be able to learn in an autonomous and responsible manner (self-management). This expected result is one of the purposes of competence-based pedagogy as well as the pedagogical orientations, namely to train a citizen capable of developing powers of analysis and reflection and the ability to adapt (the national charter for education and training) Control groups were planned to facilitate comparison of the results. At the end of the experiment, we noticed that the students in the experienced groups made greater progress than those in the control groups. The progress that has been made by the

experienced groups confirms the research hypothesis that the learning built by the students themselves through a collective project based on the verbalization of actions and problem solving is not only more profitable for the students but also for the teacher.

**Keywords:** Engineering, Techno-pedagogical innovation, Socio-cognitive conflict, Information processing systems.

## Introduction

The process of student learning is today a major concern of all recent theories of learning, each of which has tried to provide several explanations in order to identify this complex and often incomprehensible phenomenon. Starting from the work carried out by (piaget,1987), all knowledge is the result of an individual learning experience - appeal to the concepts of accommodation and assimilation. According to this model, the acquisition of knowledge involves the trans-formation of information received by the learner through his experiences and prior knowledge. To access a higher state of knowledge, it is therefore necessary to question and reorganize its initial conceptions by integrating new data. The student will only be fully ready for this difficult effort (because it involves a phase of destabilization) if he is aware of the insufficiency of his representations. The teacher will there-fore place the student in a situation capable of creating for him a cognitive conflict caused by a contradiction between his anticipation (based on his initial conception) and an observed reality. In short, it is an internal cognitive conflict between knowledge and an individual in a learning situation.

Physical and sports education is a school discipline which must mainly convey three types of knowledge: Principles of action, principles of management and regulation, and then methodological principles of learning to learn. However, the reality on the ground clearly shows that the teachers of the subject limit their teaching intervention to the proposal of content mainly conveying principles of action. Restricting the student's activity to reproducing and performing what is required by the proposed tasks. Indeed, we believe that engaging the student in a reflexive dynamic during the development of motor actions, awareness of the rules of action concerning the accomplishment of motor tasks by the debate of ideas and the verbalization seems very relevant for the effectiveness of learning. It represents an aid to the development of knowledge with the aim of developing attitudes, acquiring methodological skills. Our reflection is to show that the teaching of Physical and Sports Education (PSE) in school therefore consists not only in making students learn technical gestures to perform and tactical diagrams to reproduce, but also allow students to engage in a process of reflective practice based on the analysis of the relationships of principles and rules in relation to an action-in-project.

The aim of our research is to verify to what extent the debate of ideas through verbalization and proceduralization of knowledge can contribute to the efficiency of the teaching / learning process.

## Theoretical Frame

We have taken as the object of our study; interaction; a changing and polysemous concept According to (stengers,1987), interaction represents a nomadic concept. The use of the term is extremely frequent in the field of human and social sciences: interaction thus seems to be an essential characteristic of the teaching profession. (Lyster, R. 1994) defines teaching as "an interpersonal and intentional inter-active process that uses verbal and non-verbal interactions to achieve a learning goal". We find the concept in several scientific references which form the basis of the learning theories: The socio-historical-cultural theory of (Ivic, I. 2000), The theory of genetic equilibration of (Piaget, J.1975), the socio-cognitive theory of (Bandura, A. 1986). The teacher or that can be shared in order to engage in a conflictual debate (socio-cognitive conflict) understood as the passage from interpersonal to intrapersonal, the capacity that one has to introduce a conflict in oneself from a conflict that one delivers with others (Deriaz et al 1998).

The tactical approach to collective games proposed partially in the current TGFU (Teaching Games for Understanding), is based on a didactic modelling which aims at the students to build their own knowledge in and through play. Several cur-rents relate to it according to the countries original, but an important place is allocated to play as a means and starting point for learning. This approach presents three stages which are useful both in "reference situations", "learning situations" and - Times of action: this is the time the students are faced with carrying out a task proposed by the teacher; they play and try to overcome and resolve the problem encountered.

- Observation times where students who do not participate in the game directly but collect information based on criteria already set. These observations will be used to analyze the power relationships within the teams and to develop explanatory hy-potheses, to speculate on the causes and effects.

- The times of "debate of ideas" (Gréhaigne et al 1998) are situations in which the pupils express themselves and discuss the 46 game. a time for discussion between students with the aim of developing or not developing the team's action project, leading to a project to be implemented. Work and to be validated when returning to play.

-Thus for (Famose, J. P. 1991). Although motor learning processes are primarily cognitive in nature. These operate outside the control of the student. They are impenetrable to awareness when it is they who fundamentally participate in the motor learn-ing of students

- (Famose, J. P. 1991) (Delignières, D. 1991) (Famose, J. P. 1991) as well as (Temprado, J. J. 1994) recognize that there is a part of knowledge, of awareness necessary for motor learning that evolves rapidly in favour of an infraconscious cognitive process. Thus, they admit that in a first phase of learning, students rely mainly on their conceptions.

"evaluation situations" .

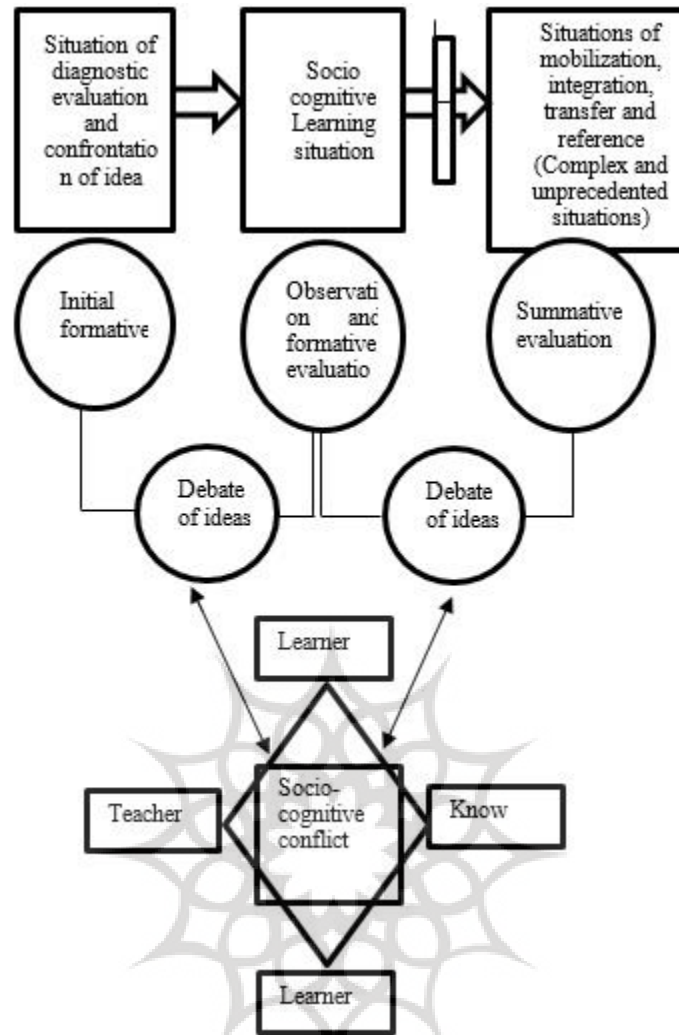


Figure 1. Title of figure

## Methodology

### Methodological Approach

Our experiment is part of an empirical research framework whose proposed protocol consists of organizing a football teaching cycle of eight sessions. The proposed situations are game-based situations, on a handball field 40 m long and 20 m wide.

Characteristics of the population studied: These are students of a second year in economics, belonging to the high school qualifying ANOUAL. The study population includes 24 subjects with an average age of 18 years. They are divided into two groups (experimental and control group). Each session is made up of two game situations (two meetings), under the teacher's supervision, interspersed with a sequence of debate of ideas (6 min). Group 1 (witness) consists of six players (Team A) and six observers (Team B) with the same distribution for group 2 (experimental) (Team C) and (Team D). After the game, the observation pupils are involved in

the discussion of ideas. During this cycle, the course of the matches is planned as follows. Each group is composed in such a way as to guarantee the equiprobability of the score that is to say according to a balanced balance of power. Group 2 (experimental) was confronted with the "instructions + debate of ideas" modality. While group 1 (control) was only confronted with "instructions". The instructions, in the form of effective action rules, were given at the start and during the game.

### Measuring Instrument

Our study aims at the analysis of numerical data, which aim to evaluate the achievements of the pupils (the analysis of the sequences of games), in order to verify the hypothesis according to which: the sociocognitive conflict (Audigier, F. 1988) allows the effectiveness of the motor actions students in complex situations (match situation). Thus it makes the learning pace faster in the students.

The analysis of the data relating to this experiment was carried out using statistical software: SPSS Statistics version 17.0 (Statistical Package for the Social Sciences). The analysis of the difference in performance between the period before debate of ideas and the period after debate of ideas was carried out on the basis of several parameters (Balls played, Balls conquered, Balls lost, Shots and Goals), by 1 application of the T-Test of Paired Samples with the grouping criterion: Before and after debate of ideas. The comparison between group 1 (control) and group 2 (experimental) according to the different evaluation parameters was carried out using the ANOVA Test (Analysis of Variance).

**Table 1. Title of table**

Paired samples test								
Matched differences								
Interval confidence 95% of difference								
		Average	Ecart-Type	Erreur std moyenne Inférieure	Supérieure	T	ddl	Sig. (bilatérale)
Paire 1	Avt_Balles jouées -	2.1250	7.3763	2.60794 - 8.29179-	4.04179	-.815-	7	.442 > 0.05
	Apr_Balles Jouées	0-	6					
Paire 2	Avt_Balles conquises -	3.1250	3.6425	1.28782 - 6.17021-	-.07979-	"-2.427-	7	.046 < 0.05
	Apr_Balles Conquises	0-	1					
Paire 3	Avt_Balles perdues -	2.3750	3.2923	1.16401 - .37744-	5.12744	2.040	7	.081 > 0.05
	Apr_Balles Perdues	0	1					
Paire 4	Avt_Tirs -	-2.8750	1.2464	.44068 - 3.91704-	"-1.83296-	"-6.524-	7	.000 < 0.05
	Apr_Tirs	0-	2					
Paire 5	Avt_Buts -	-1.2500	1.6690	.59010 - 2.64536-	.14536	"-2.118-	7	.072 > 0.05
	Apr_Buts	0-	5					

The performance analysis between the period before debate of ideas and the period after debate of ideas, carried out via the application of the T Test of Paired Samples, made it possible to note a significant difference for the number of balls conquered and for the number of shots seen that the bilateral significance P is less than 0.05. While, for the other evaluation parameters, in particular the number of balls played, the number of lost balls and the number of goals, the difference between the period before and after debate of ideas is not significant ( $P > 0, 05$ ).

The comparison between group 1 (control) and group 2 (experimental) according to the different evaluation parameters was carried out using the ANOVA Test (Analysis of Variance).

**Table 2. Title of table**

		Somme des Carrés	Ddl	Moyenne des Carrés	F	Signification	
<b>Balles jouées</b>	Inter-groupes	484.000	1	484.000	2.629	.127	> 0.05
	Intra-groupes	2577.750	14	184.125			
	Total	3061.750	15				
<b>Balles conquises</b>	Inter-groupes	20.250	1	20.250	1.245	.283	> 0.05
	Intra-groupes	227.750	14	16.268			
	Total	248.000	15				
<b>Balles perdues</b>	Inter-groupes	20.250	1	20.250		.283	> 0.05
	Intra-groupes	227.750	14	16.268	1.245		
	Total	248.000	15				
<b>Tirs</b>	Inter-groupes	39.063	1	39.063	5.531	.034	< 0.05
	Intra-groupes	98.875	14	7.063			
	Total	137.938	15				
<b>Buts</b>	Inter-groupes	9.000	1	9.000	5.250	.038	< 0.05
	Intra-groupes	24.000	14	1.714			
	Total	33.000	15				

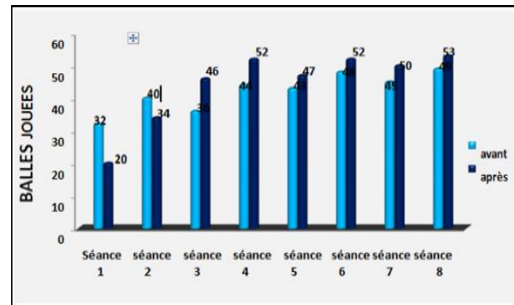
The application of one-way analysis of variance (ANOVA) for the analysis of student performance revealed the absence of a significant difference between the control group and the experimental group for the following parameters: Balls played, conquered bullets and stray bullets (Because the meaning is greater than 0.05 ( $P > 0.05$ )). While the parameters: Shots and goals showed a significant difference (with  $P < 0.05$ ) between the students of the control group and those who were subject to the debate of ideas (experimental group).

The analysis of data relating to the performances of the pupils, evaluated through several parameters (balls played, balls conquered, stray balls, shots and goals) in relation to the debate of ideas, made it possible to note the influence of the debate of ideas on the number of balls conquered and the number of shots in comparison with the performances recorded before the debate of ideas. While the analysis also allowed us to deduce the influence of the debate of ideas on the performance of the students subject to this experiment (number of shots and number of goals).

We also conclude that the parameters (Balls played, balls conquered, stray balls) are not significant, so we will proceed by a comparison based on the following histograms:

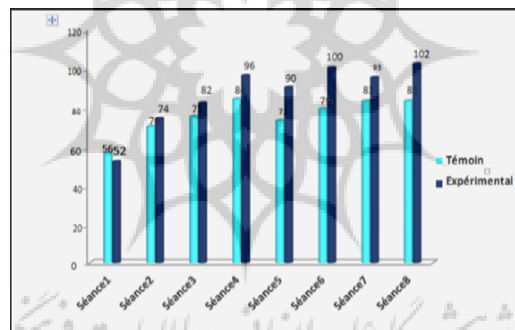
## Balls played

Comparison of the results of the experimental group before and after the verbalization



**Figure 2. Title of Figure**

We note in the first two sessions that the results obtained were not significant, this decrease in performance due to the first verbalization sequences can be interpreted by a kind of reorganization of resources that it also entails. This non-significant difference before / after verbalization can also be due to the latency time during which the players discover this new method based on verbalization. But from the third session until the end of the cycle, the number of balls played changed slightly.



**Figure 3. Title of Figure**

Comparison of the results of balls played from the experimental group and the control group. This figure illustrates the evolution of the balls played during the eight sessions for group 1 (control) and group 2 (experimental). We observe a significant increase from the 3rd session: the number of balls played is greater in the experimental group than in the control group. This growth tells us about the evolution of ball circulation between partners as well as the number of successful ball rallies.

## Balls Conquered

1) Comparison of the results of the conquered balls of the experimental group before and after the verbalization

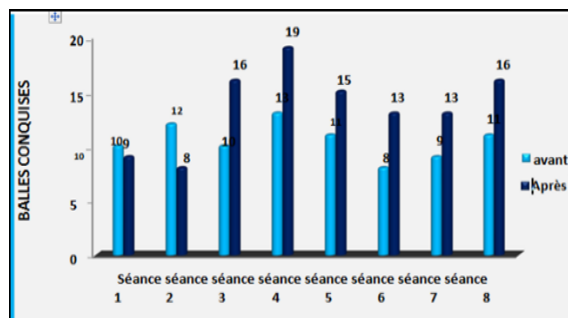


Figure 4. Title of Figure

From the figure above, we see that the balls conquered on interception increase from the 3rd session between the first (before) and the second streak of play (after). And that during the first two sessions, it may be because the players are discovering this new method based on the debate of ideas.

2) Comparison of conquered balls between the control group and the experimental group.

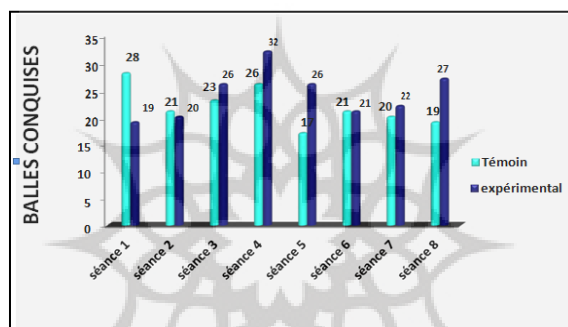


Figure 5. Title of Figure

This figure illustrates the evolution of the balls conquered during the eight sessions for the two groups. From the 3rd session, we find that the experimental group has conquered more balls than the control group. This means, as we have reported with the stray bullets level, that the experimental group was putting pressure on the other group and managed to recover the bullet through good collective organization.

**Lost Balls**

1) Balls lost in the game during the cycle, before and after the debate of ideas

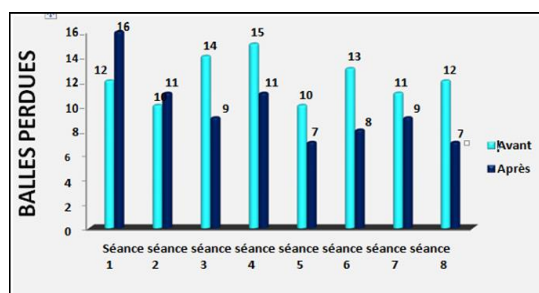


Figure 6. Title of Figure



2) During the first sessions of the cycle we noticed that the difference between before / after the verbalization is not significant, of course this is explained by a kind of familiarization with this method. Comparison of stray bullets between the control group and the experimental group

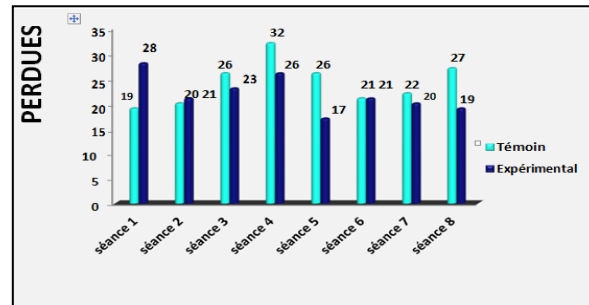


Figure 7. Title of Figure

This figure illustrates the evolution of stray balls during the eight sessions for the two groups. From the 3rd session, we find that the number of stray balls in the control group is very high in comparison with the experimental group. This informs us that the experimental group has made progress in collective organization and play reading as well as the pressure exerted by the experimental group on the control group.

### Shots

3) The shots in the game during the cycle, before and after the debate of ideas

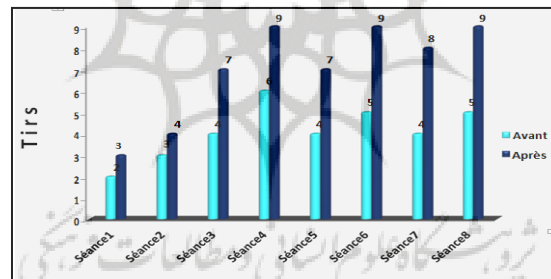


Figure 8. Title of Figure

For the shots, there is a significant increase throughout the cycle except during the first two sessions where there was little shooting.

4) Comparison of the number of shots between the control group and the experimental group

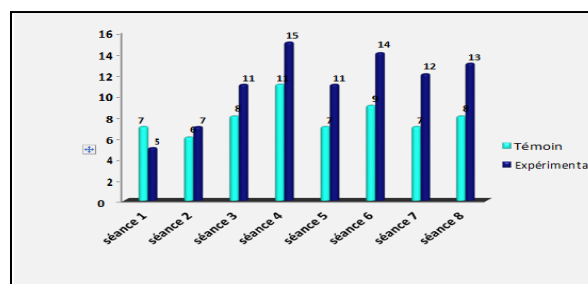


Figure 9. Title of Figure

The number of shots increased considerably in the experimental group compared to the control group, this is observed during the meetings from the third session, this is due to the different strategies adopted and developed during the verbalization sequences

## Results and Discussion

Starting from the results obtained during the experimentation cycle (football cycle). We found that the fact of engaging the students in sequences of debates of ideas to verbalize the different difficulties encountered to succeed in the development of effective and efficient motor actions, allowed the students to identify the different mechanisms that lead towards success. This is manifested during these sequences of verbalization when the students have been able to find rules of actions leading to the desired objectives during the sequences of action. Likewise, we record that the pace of learning in the experimental groups was very high in comparison with the control groups. This is justified by the remarkable evolution of the various parameters which determine the achievement of a better performance.

We add in this regard that the learning acquired during these sequences of debates on ideas was well stabilized, so that during the subsequent sessions of the experiment, the students were able to reinvest their knowledge from previous sessions. These findings confirm the hypotheses put forward at the start of our work.

However, statistically speaking, these results were not significant for a few parameters of the football cycle such as balls played, balls conquered and balls lost (ANOVA test analysis of variance), for the other two parameters: shots and goals, the results obtained were significant. In fact, we have moved on to another stage of analysis by relying on histograms. We proceeded by a comparison concerning the experimental group before and after the verbalization sequences, and another comparison between the control group and the experimental group.

In the first perspective, (Tardif, M., & Lessard, C. 1999). note that “interactivity characterizes the main object of the teacher's work, because the essential part of his professional activity consists of entering a class and initiating a teaching program. Interactions with students. This means that teaching takes place concretely within interactions: these are not only something that the teacher does, they constitute, so to speak, the environment - in the sense of marine or air environment - in which he is 'hire to work'. In this sense, interactivity constitutes for them a fundamental descriptive category of teaching work.

Following this in-depth reflection on the modalities of verbalization and conflictual and interactional debate, we have proposed a model of the sociocognitive conflict process in young adult learners with reference to the results of our research.

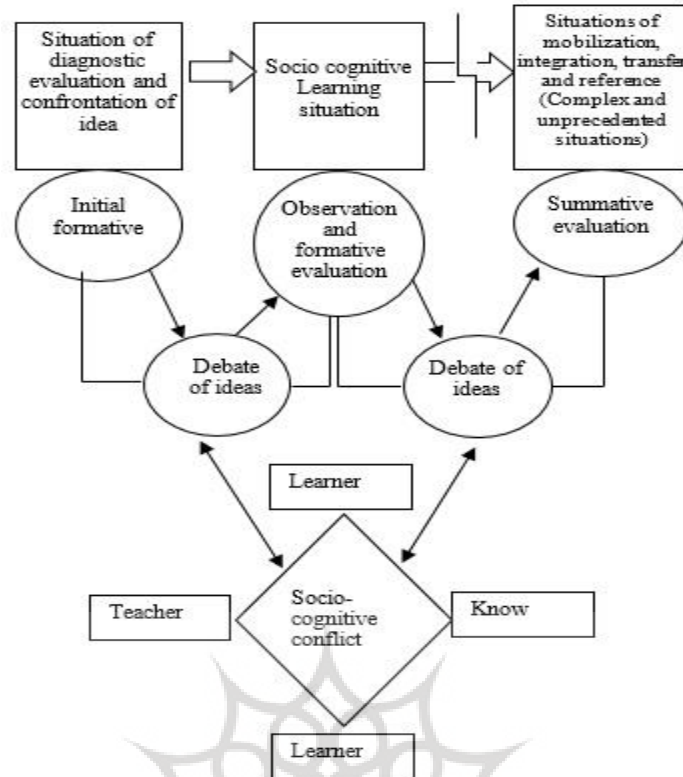


Figure 10. Title of Figure

## Conclusion

We conclude that the socio-cognitive conflict allows the efficiency of the motor actions of the students during complex situations (match situation). Thus it makes the learning pace faster in the students.

This work sets itself the following objective, on the one hand to operate a paradigm shift concerning the conceptions of learning in team sports, and on the other hand to propose a teaching model that takes into account the need to solicit a certain reflective practice in the pupils. The pupil is no longer a receptacle in which the teacher pours knowledge and solutions to be reproduced, but rather an actor, in the full sense of the term, supposed to give his full contribution in the teaching / learning process.

Our study always starts from a situation where the pupils are called upon to compare their points of view in the presence / absence of the teacher in order to build effective rules of action making it possible to overcome the obstacles encountered during the development of the teacher action. Indeed, we have used football as a support activity, which allows the student to participate in a collective search for knowledge in relation to his peers. As a result, he becomes a co-author of the meaning of the development of motor actions. This construction is done by appropriation / validation / discussion of the meanings carried in the action sequence.

(BARALLOBRES, G. 2018) have established the concepts of didactic contract (system of obligations and reciprocal expectations between the teacher and the pupil with regard to the knowledge under study) and of devolution (process by which the teacher entrusts the students with responsibility for their learning) (Daniel, M. F. 2006) seek to account for this necessary complementarity of social roles.

In the constructivist perspective on learning defended by the school, we hypothesize with (Gréhaigne, J. F., & Godbout, P. 1995) that the student learns better after having identified the mechanisms that lead to success.

So our research highlights the importance of verbalization in the teaching / learning system. This situation generates an inter-individual type conflict on which is superimposed another intra-individual type conflict, thus the discussion acquires a dialogical value which gives the development of motor behaviors a reflected and exchanged dimension.

Given the importance of the debate of ideas in the co-construction of knowledge and skills by the students, it is desirable to integrate these sequences of debate of ideas into the teaching / learning process while encouraging teachers to 'PSE to devote the appropriate time so that the pupils can interact with each other.

We can therefore say that inter-student discussions outside the teacher's control give the student more freedom to express himself since they develop in him spontaneity, which is synonymous with autonomy. This is why it is appropriate for the teacher to be aware of the impact of this freedom on the game, which is why we invite teachers to distance themselves a little from their students so that they can freely confirm or deny what is decided. in his presence. Therefore, the absence of the teacher often generates conflicts that lessen in his presence. As a result of these findings, we are witnessing a change in the role of the teacher. The latter must detect the moments when he must temporarily withdraw.

Extend the length of the learning cycles to twenty sessions so that the direct effects of the debate of ideas on student learning are more meaningful.

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