

Productive disciplinary engagement according to students' school levels: a comparative study in gymnastics

Nabila Bennour

*University of Gafsa, Tunisia &
UMR EFTS, Toulouse 2, France*

Abstract: *The research that we propose in this article is placed within a didactic framework for the analysis of ordinary classroom practices. It seeks to understand and then compare the modalities for productive disciplinary engagement of students in the teaching-learning process in two different institutions in the course of physical education lessons in Tunisia. To this effect, we rely on two theoretical frameworks, namely that of didactic joint action and that of productive disciplinary engagement.*

Data is derived from ethnographic observations and video recordings, coupled with interviews with two female teachers. The study uses a micro-didactic analysis describing the action of students at significant episodes of their task transformation behavior in the teaching of gymnastics.

We show how ruptures in the didactic contract contribute knowledge progression and enable students to contribute to the didactic process in situ. The results characterize the mesogenetic conditions in which contrasted students (strong and weak ones) teach themselves and set into relief some generic patterns likely to enroll students in a productive disciplinary engagement.

Keywords: *Didactic joint action, Differential didactic contract, Productive disciplinary engagement.*

I. Introduction

Research related to student's engagement in physical education points out the necessity to know better the different modalities of students' engagement in their physical education lessons. However, on the ground, teachers frequently observe the fact that some students do not make any progress in physical education. In this vein, Tunisian teachers of physical education express the difficulties that they have to bring about transformations for students. They evoke their weak participation in class and point out differences in students' time of engagement according to their level of aptitude, their motivations and their interests. These observations made in the literature (Carlier, 2004; Doyle, 1986; Placek, 1983; Siedentop, 1994) highlight the fact that students do not engage themselves in the same manner in the proposed tasks.

Didactics scholars, on their part, have shown that, depending on their school level (high, intermediate or weak), students are given tasks by their teacher in a differential way (Schubauer-Leoni, 1996; Elandoulsi, 2011). In physical education, "strong" students are considered to be more active than "weak" students.

Our problematic seeks to go beyond these reiterated observations. We think, in fact, that by studying students' productive disciplinary engagement, we bring into daylight phenomena that might prove useful, at later stages, for teacher education by teaching them to concentrate on what has to be observed in order to make students more productive.

In this article, we attempt to answer two main questions:

- In terms of the different school levels attributed to them (strong vs. weak), do students participate in the same way to the evolutionary dynamics of the didactic contract?
- When students transform the tasks given to them, what are the generic characteristics of the topogenetic process favoring the emergence of a productive disciplinary engagement?

II. Literature Review

We present, first, the theory of didactic joint action, as well as the concepts borrowed from the north-American trend of "productive disciplinary engagement" (PDE). Then, we show the articulation of these two theoretical approaches.

2.1. The Model of Didactic Joint Action

The first sketches of a modeling of teachers' action (Sensevy, 2001; Sensevy, Mercier and Schubauer-Leoni, 2000) articulate many levels of description, going from fundamental structures of teacher action (defining, regulating, devolving, institutionalizing) borrowed from Brousseau's (1998) theory of didactic situations, to descriptors of joint action borrowed from Chevallard (1991): mesogenesis, topogenesis, and chronogenesis.

The joint action model to which we are referring was formalized by Sensevy and Mercier (2007). It articulates three levels of descriptors: that of the didactic contract and the environment, that of teachers' actions, and, finally, that of joint teacher/student action which accounts for the dynamics of knowledge in the classroom (Amade-Escot and Leutenegger, 2013).

For the observation of "joint action" in class, Schubauer-Leoni (2008) proposes four macro descriptors of the teacher's action, namely:

- Defining: refers to any behavior by the teacher which tends to specify the rules of the game, in the course of the session.
- Regulating: refers to all behaviors produced by the teacher aiming at causing students to adopt "winning strategies".
- Institutionalizing: refers to what the teacher does to cause a behavior and/or piece of knowledge to be considered as legitimate, true and expected in the institution and even outside the institution-class.
- Devolving: refers to all behaviors that the teacher produces aimed at enabling students to take the responsibility of engaging in the proposed activity. The "devolution" process means that we are interested in seeing how "the teacher accepts to disengage himself from the problem in order to enable students to invest in the first person" (Schubauer-Leoni, 2008).

The four descriptors of the teacher's action thus defined can only be meaningful when we consider the fact that they bear a triple mesogenetic, chronogenetic and topogenetic production.

- Mesogenesis defines the evolution of a complex system of objects (material, symbolic, linguistic) that are jointly constructed by the teacher and students in the course of their interaction.
- Topogenesis or sharing of responsibilities in the course of the teaching/learning process defines, within the didactic contract, what is related, implicitly, to the evolution of the systems of the place of the teacher and students as regards the objects of knowledge.
- Chronogenesis defines what is related to the production of knowledge in the course of didactic temporality. It locates, therefore, events on knowledge along the line of their succession. In the school didactic contract, chronogenesis depends essentially on the teaching activity.

These three geneses permit the characterization of the evolutionary dynamics of the didactic systems observed, and especially the differential evolution of the didactic contract according to students (Schubauer-Leoni, 1996; Verscheure, 2005; Verscheure and Amade-Escot, 2007).

As has been demonstrated by Amade-Escot and Leutenegger (2013), the model of didactic joint action has specified quite operationally the descriptors of the teacher's action and the descriptors of the joint teacher/students' action. However, these authors point out the fact that the descriptors of students' action seem insufficiently developed to allow the comprehension, in detail, of how students contribute to advancement in didactic phenomena. This is the reason why we will turn towards the domain of productive disciplinary engagement of students, which seems to us to be interesting in as much as it concerns itself more particularly with students' actions in the teaching/learning process.

2.2. Productive Disciplinary Engagement (PDE)

The concept of "productive disciplinary engagement" (Engle and Conant, 2002) was elaborated in the teaching of sciences with a view to helping teachers to elaborate learning environments favorable for students' scientific acquisitions. The objective of these authors was to provide principles aiming at creating conditions favorable for learning that could be applied in other learning environments. In this article, we define the concept of productive disciplinary engagement, and we attempt to shed light on the principles that are conducive to its development.

Engle and Conant (2002) substantially define the PDE as the capacity of students to maintain a deliberate learning activity in a given domain, in connection with the disciplinary knowledge required in this domain. These authors show that the degree and nature of the productive disciplinary engagement can be studied empirically by separately examining the forms of the engagement, the disciplinary basis for this engagement, and the disciplinary productivity of this engagement.

One of the main contributions of these authors was to propose a set of four general principles making it possible to characterize productive disciplinary engagement (problematizing, authority, accountability, resources). In order to analyze a learning environment in which a productive disciplinary engagement takes place, these authors advise that we take into consideration these four principles at the same time in varying degrees of contribution of each component.

The first principle is based on the notion of "Problematizing". It is every individual or collective action that is conducive to the identification of disciplinary uncertainties in students. A learning environment incarnates the principle of problematizing in so far as students are encouraged to tackle problems. The second principle is defined by the term "Authority". Engle and Conant (2002) stipulate that if students are

really engaged in situations of problem solving, they will develop at least a certain degree of intellectual authority. They must feel authorized and encouraged, in order to be responsible by themselves, in solving problems. The third principle is that of "accountability". Engle (2011), in defining accountability, refers to a norm in the learning environment to the effect that students will have the responsibility to regularly consult with a view to knowing how to make sense of their ideas and of the relevant work of others. The fourth principle indicates that the learning environment must provide students with access to "necessary resources" for their work. Some resources are directly favorable for students' productive disciplinary engagement. This includes, for instance, giving enough time for learning, paving the way for and determining workplaces where they will access technological tools, objects, practices or other materials to do a particular disciplinary job. Engle (2011) thinks that the promotion of productive disciplinary engagement consists in establishing and maintaining a dynamic balance over time. For this author, if productive disciplinary engagement takes place, resources must be balanced against problematizing, and accountability must be balanced against authority. What must be retained is that the stronger the fusion of these four principles gets the stronger disciplinary engagement gets.

On the whole, the model of productive disciplinary engagement was elaborated through the verbal behavior of students in scientific disciplines. In order to secure a possible transfer in physical education, what is at stake is to detect in the context of teaching gymnastics what could be understood by problematizing, authority, accountability or even resources.

- We can consider that problematizing in gymnastics rests upon the idea that a complex gym action constitutes a problem to students, which engenders on their part a reflection and investigation procedure in search for driving solutions, be they collective or individual. The teacher, by suggesting gymnastic learning situations, constrains the student to construct a project of gymnastic space management, to manage the time and synchronize his gymnastic performance in the framework of a rhythmic structure and in consideration of the code (Goirand, 1998).

- We can consider that, in gymnastics, the teacher give authority to students by allowing them to act in problematic situations (Gréhaigne and Cadopi, 1990), and authorizing them to detect what they are doing and identify the errors not to commit and discuss the question with their peers. The student has authority when he contributes to the gymnastic realization and/or to the technical comprehension of another student or of a group of students by lending them his own know-how and his own "winning strategies" (Sensevy and Mercier, 2007).

- The criterion of accountability, in gymnastics, can relate to the object of learning. The student is made responsible for the articulation of the body's aesthetic and acrobatic dimensions while in movement, the choice of the rhythmic structure that should be in harmony with his own rhythm of realization when performing a series of actions, observation and evaluation of the production of other students. Accountability can relate equally to the manner of realizing the task, such as for example making a demonstration of a gymnastic element or else managing a warm-up session. The learning environment in the case where the student finds himself responsible for the arrangement of material (disposition of devices, placement of mats, etc.) or else the management of groups (setting up of groups and workshops, parade aids etc.)

- The teacher provides resources in the sense that he arranges and determines the workplaces in which students will have access to gymnastic material to do a specific disciplinary task. He creates, according to Goirand (1998), conditions facilitating the implementation of the know-how by respecting a certain progression in the difficulty of managing the material apparatus (for example by proposing the use of comfortable reception surfaces such as mats for falls or the reception cleave with a minimum number of mats). In Tunisia, these material resources are sometimes lacking in school institutions. Besides, the teacher provides documents that are necessary for the comprehension of the object of learning and that are based on sketches, illustrations and gymnastic figures in order to motivate the student to respect the form of the answer whereby the know-how is recognized (for example a sketch where the reversed push is realized with body in an aligned posture ending in a forward stride etc.). It also invites students to respect regulatory conditions for the production of know-how (by specifying, for instance, the height of the accessories, the duration of the exercise, the number of passages to the vaulting horse, etc.). He provides various instructions related to the amplitude of the move, the postures to be adopted along the course of action (for instance the positioning of the legs), to the position of the body in space (such as the body being in retreat of the position of the feet at the moment of impulsion on the springboard in the vaulting horse), to the nature of the support position (manual, pedestrian or mixed) and aerial phases (such as the second flight in the vaulting horse), to cite but a few examples.

2.3. The Articulation of Two Theoretical Frameworks

Venturini and Amade-Escot (2014) discuss the links between the theory of didactic joint action and the theoretical framework of productive disciplinary engagement. Even if their goals and perspectives are different, we assume that the two frameworks have common denominators. Both of them deal with teaching, learning and knowledge, considered to be a whole (the systemic approach). Based on this point of view, joint action, and this

also applies to the productive disciplinary engagement framework, focuses on the conduct of students towards disciplinary knowledge and implicitly includes the teacher who must create and maintain the conditions which allow a good productive disciplinary engagement in class. This idea of mutual adjustment between the teacher and students, as regards some knowledge and some game, is at the heart of two theoretical frameworks.

In addition, we consider that the two frameworks handle the question of conception and analysis. The descriptors of the theory of didactic joint action (defining, devolving, regulating, institutionalizing as well as the geneses) are useful to think of a learning environment by deciding upon the type of didactic contract, the particular didactic milieu, the specific regulations of the teacher and his ways of devolving the situation. On the other hand, the identification of particular moments at different levels of problematizing, authority, accountability as well as the identification of relevant resources provides information, from the point of view of productive disciplinary engagement, on the didactic joint action.

From our perspective, these elements allow us to consider that there is a possible connection between the two theoretical frames, making it legitimate for us to discuss the link between these different concepts. By basing our study on what has been written by Engle (2011), we point out the close relations between the notion of “resources” in productive disciplinary engagement and the notion of “didactic environment”, even if the co-constructed characters remain a particularity of the environment according to the theory of didactic joint action. At any rate, the didactic environment and the notion of resources have the same function. This holds true for “authority” and “responsibility” (in didactic joint action). We assume the fact that the different levels of the latter concepts can be considered as the results of particular didactic contracts. By agreeing with Brousseau and Warfield (1999), the didactic contract concerns the set of the specific behaviors that the teacher expects from his students and also the set of specific behaviors that students expect from their teacher. That is why we consider that authority and responsibility are descriptors of the effects of the didactic contract from the vantage point of students.

Moreover, these concepts are also used to interpret the particular forms of the topogenesis associated with those of mesogenesis and chronogenesis. This discussion leads us to conclude that the levels of authority and accountability can be used to define how students enroll in particular didactic environments and in a specific didactic contract.

Furthermore, we suggest that the problematizing and devolvement that we use to relate productive disciplinary engagement and didactic joint action are part and parcel of the same process which is described from two different but complementary points of view of joint action.

III. Methodology

Our research is a case study conducted in two final year classes in two secondary education schools. By focusing on what is called “ordinary didactics” (Schubauer-Leoni, 2008) and by placing ourselves within an ethnographic approach, our research is positioned in line with a descriptive and comparative procedure.

3.1. Characteristics of the Observed Empirical Contexts

Our choice targeted two institutions from two different governorates:

- « Ibn Abi Dhief » High School: a public sector institution in a peripheral urban milieu in the governorate of Mannouba. This establishment hosts students coming from different social classes, some from the middle classes, and others from agricultural backgrounds. This school is known for the heterogeneous nature of its students.

- The “International School of Carthage” (ISC): is a private institution in an affluent zone in the governorate of Tunis. This school is accredited by the French Ministry of Education and provides teaching based on the French programs. The latter is classified as top of the list in the Tunisian capital (both politically and economically). From this perspective, the urban pole with the highest density (100%) with students recruited from affluent or very affluent quarters and children belonging to families of leading executives (such as the President of the Republic, ministers, senators etc.).

We observed two female teachers in institutions located in two different suburbs of Tunis: Najoua is a teacher in a public sector school whereas Sonia works in a private school. The selection of Najoua is due to the fact that her timetable perfectly coincides with that of the researcher whereas the choice of Sonia was motivated by the fact that she was the only teacher who did not object to our presence and to being observed. We had to do with two teachers who had a working experience of over twenty years each (26 and 22, respectively). They had followed the same University education. Both teachers are not specialists in gymnastics and have no experience of the activity other than their initial education.

The choice of students was based on two criteria: first the teachers' categorization of students into strong and weak ones and then their attendance all along the cycle. The question was to agree with both teachers that it would be useful to make observations more special in order to have a more representative sample of the different levels at school.

To preserve the ecological nature of our observations, we also sought to observe in the public sector school both girls and boys since the teaching of physical education takes place in mixed classes.

As for the private school, and despite the fact that in the French educational system physical education is mixed, we only kept four girls since, in conformity with the French Baccalaureate program, students choose three physical activities to be tested on. In this institution, only girls had opted for the gymnastics test.

In a nutshell, the observations took place in two final year classes belonging to different orientations: the math's section in the public sector institution and the science and economics sections in the private school. In each class, we kept four students, girls or boys with different levels of aptitude representing the characteristics that we summarize in the following table:

Table 1: Characteristics of Student Selected For the Study

	Names	Codes	Gender	Skill levels	Parents' socio-economic levels	
					Mothers	Fathers
Public institution	Myriam	F13	Girl	Strong	Teacher	Official in a bank
	Rami	G3	Boy	Strong	Jobless	Head of department at the Ministry
	Marouan	g10	Boy	Weak	School teacher	Clerk at post office
	Rim	f9	Girl	Weak	Jobless	Teacher
Private institution	Myriam	F14	Girl	Strong	Engineer	Accounting Officer
	Farah	F21	Girl	Strong	Teacher	University professor
	Amani	f2	Girl	Weak	Jobless	Bank Manager
	Sarra	f7	Girl	Weak	Official in a travel agency	Architect

3.2. Data Collection

We collected data on students' activity as well as those of the two teachers in ordinary classes. For each institution, we filmed three consecutive sessions aimed at the learning of a gymnastics cycle, in relation to the preparations for the Baccalaureate exam in physical education according to the Tunisian programs for the public school and to the French programs for the private school.

Data collection allows the compilation of different corpora: interviews with the teacher, notes at the flight, planning documents and observation data. The collection process took place in many stages. First, we started with pre-observation interview. Then, in the course of each session, we realized a pre-session interview, an audio and video recording, notes at flights and a post-session interview. Finally, at the end of the cycle, we undertook a post-cycle interview marking, thus, the end of the data collection process.

3.3. Data Treatment and Analysis

We tackle data treatment in terms of the articulation between productive disciplinary engagement and didactic joint action.

For a starting point, we relied on students' behaviors of task transformations by selecting significant episodes in the sense of Leutenegger (2003) that are likely to shed light on how the teacher's and students' joint action contributes to the productive disciplinary engagement. In sum, 15 episodes crop up at different moments of the observed sessions in each institution: eight episodes in the public school and seven episodes in the private one.

We classify them in the following table by assigning a title to them derived from their interpretation:

Table2: Description and Characteristics of Retained Episodes

	Sessions	Episodes	Duration	Tasks relative to the retained episodes	Students involved
Public institution	S1	1	3':15"	Use the wall to produce a more efficient cartwheel	g10 et F13
		2	1'	Look for the difficulty to start the round off flip-flop	G3 et G11
	S2	1	30"	Pretend manipulation of front scale to help another student	F13 et f9
		2	5':15"	Do the same as G3 and work out press handstand against the wall	g10, g4 et G3
	S3	1	1'	Work in pairs to try the front flip	g10 et G3
		2	45"	Modify the initial position to do a handstand backward roll	G3
3		3':15"	Join g5 and improve her tucked forward roll over a	G3 et g5	

		4	7'	Swedish bench Benefit from g10's help to achieve a better straddled forward roll	f9 et g10
Private institution	S1	1	3':15"	Distance herself to continue working on the previous task	f7
		2	6':15"	Not respect the teacher's instructions and realize the task in a different way.	F21 et F14
	S2	1	2':45"	Change the initial position of task departure for a better run up	F21
		2	1'	Work in pairs to try to achieve the task successfully	f7 et f2
	S3	1	1':15"	Learn a task that different from the initial one suggested by a peer	F14 et F6
		2	1':45"	Look for the difficulty in the initial task	F21
		3	2':36"	Work out in two's to learn a new task	F14 et f2

These episodes will allow us to analyze the link between topogenesis, the productive disciplinary engagement and the differential didactic contract (weak/ strong), without forgetting, however, the chronogenesis and mesogenesis that lie in the background.

The selected episodes are analyzed according to the description of the didactic joint action and that of the productive disciplinary engagement. To account for the learners' activity in the teaching/learning process, we work on each of the significant episodes in an expanded synopsis.

In a first column, we transcribe the significant episodes of the retained tasks as well as their duration. In column II, we report the overall verbal interactions transcribed relatively to that episode. Here, we keep only information about the most significant elements, and use suspension points to indicate that not everything is reported. In column III, we conduct a qualitative analysis, based on video recording, of learners' behavior while transforming the tasks. We describe the performances of four students – one at a time- through observing videos recorded during the episodes. In the next columns, called “interpretation tracks”, we point out to the accounts achieved in relation to the descriptions of the didactic joint action and those of the productive disciplinary engagement.

IV. Findings And Discussion

In this section, we attempt to present and discuss the school levels attributed to students (weak vs. strong), productive disciplinary engagement and the participation in the progressive dynamics of the didactic contract. We first examine what happens in each institution, before we proceed with a comparison.

4.1. Modalities of PDE and Involvement in the Didactic Contract According to Public School Students

We synthetically present the findings collected during the three sessions observed. In the discussion, we highlight the different ways how students, based on their school levels, participate in the didactic process by developing engagement forms that are more or less disciplinary and more or less productive. This analysis will help us identify the links between productive disciplinary engagement and differential didactic contract.

4.1.1. Productive Engagement of Low Level School Students and Differential Didactic Contract

Our task is to pinpoint the disciplinary engagement of the students considered to have low ability in gymnastics. Taking into consideration the knowledge in gymnastics that these students have actually studied during the task transformation, we will show what type of didactic environment modification they produce, the way how they get / don't get involved in the didactic contract or negotiate it and according to what disciplinary productivity. While describing the students' actions during the task transformation behaviors, we will try to identify generic features relative to the manners how the low school level students contribute, within the joint action, to advance knowledge and with what impact on their didactic trajectory.

- The case of f9: Student f9's two task transformations are characterized by a didactic contract negotiation aiming at creating favorable conditions to study gymnastic objects that she intends to work on. In episode I, session II, this negotiation takes place in a didactic environment of cooperation (help of F13). Student f9 is provided with individualized didactic regulations from F13. These regulations came in the form of tactile instructions with a mesogenetic function allowing a productive disciplinary engagement. While performing the front scale with bar, student f9 managed to keep her body horizontally aligned from head to heel with the waist placed in a frontal plan and the heel of her free leg pointing upward. In episode IV, session III, student f9's negotiation with student g10's collaboration is achieved through simplifying the initial didactic environment. This is done by following the didactic contract of the previous task. Profiting from the individualized regulations such as verbal, tactile and visual instructions, and doing a straddled forward roll on a tilted surface, student f9 is experiencing a productive disciplinary engagement which enables her to boost the knowledge where she detains herself. She manages to move her body forward and to rotate her body round a transversal axis, a placement of the center of gravity above her hands, which allowed her to regain her stand- up position with straddled legs.

- The case of g10: Very often, student g10 is outside the didactic contract to achieve personal goals that are far beyond his potentialities at the moment. By transforming the environment into a more complex one, student g10's actions reveal an engagement that might seem disciplinary although he is non-productive, which often happens at the individual level.

In episode II, session II, g10 transforms the initial task by realizing a press handstand. He started from a front scale, as defined to group of strong students. Even though he benefited from his mates' didactic help (G11, G3, and g4), he failed to push his shoulders forward, from the position of frontal scale with straddled legs, to place his waist in force and to keep his arms vertical.

Similarly to episode I, session III, with the collaboration of G3, student g10, trying to perform a front flip with the use of the springboard, fails in his attempts, and his action ends in a fall flat on his stomach. Only once, was student g10 involved in a didactic contract negotiation (episode I, session I), during the cartwheel against the wall. His actions, dominantly mesogenetic, are translated by didactic environment simplification, which can help him profit from the retroactions of the wall so that he can improve his segmental alignment. In this regard, we have noticed that student g10 took the responsibility of fitting out a working space that could allow his disciplinary engagement, which remains not totally productive though. This engagement is restricted to student g10's individual level despite his mobilization of resources from the part of students F13 and G3. Learning by himself, g10 tries to correct his hand position in the axis of foot support as well as to correct the execution faults thanks to the wall. Yet he doesn't manage to.

4.1.2. Productive Engagement of High Level School Students and Differential Didactic Contract

We now study the didactic environment modifications produced by those students considered by the teacher to enjoy a strong school level, as well the students' way how to enroll to the didactic contract. The generic features relative to the ways how, in the joint action, these students contribute to the advances of knowledge, are identified later.

- The case of F13: The actions of F13 in the course of the sessions do not consist in transforming the didactic environments proposed by the teacher. This student performs the required gymnastic elements with application. She is a good subject of the didactic institution, in as much as she participates in the session by offering, recurrently, didactic help to peers in difficulty (g10 and f9). In episode 1 – session 1, her regulations in terms of verbal and visual instructions provide pertinent assistance that contributes to an engagement that is not totally productive for g10 in his performance of the cartwheel against the wall. In an identical manner, in episode 1 – session 2, following the judicious positioning of her intervention, she helps f9 to engage herself productively in the front scale, a task that is prescribed by the teacher. Her action towards f9 is essentially on the environment that she enriches through the contribution of tactile instructions and the manipulation of f9, allowing the latter, thus, to better succeed in this exercise.

- The case of G3: Student G3, who is considered «expert» in tasks transformation, negotiates the didactic contract whenever possible (episode 3 - session 2, episodes 1, 2, 3 - session 3). These actions are mainly carried out within the frame of an initial didactic environment. In a recurrent way, G3 undertakes to fit out the suggested space of gymnastic work, modifying the didactic environment set up by the instructor to carry out more acrobatic or virtuoso actions lying within the internal logic of gymnastics. G3's actions come under an important disciplinary engagement which cannot be usually productive. In episode 2 - session 1, due to the lack of kinaesthetic imagery and for fear of backwards unsteadiness, he partially fails to teach himself the round off flip-flop. The same issue has been observed in episode 1- session 3 where he does a front flip in a sitting position landing. It has been noticed that his engagements are rather individual and it can be assumed that more condensed learning adjustments brought by the instructor might undoubtedly have helped him succeed in these complex gymnastic figures. It is not the case with episodes 2 and 3 in session 3 where he succeeds in perfectly negotiating a didactic contract according to the mesogenetic modalities allowing him a disciplinary engagement that is really productive. It can be considered that in this site, G3 teaches himself under the tacit agreement of his teacher.

G3 is also a good subject to didactic institution. It has been noted, as is the case of F13, that when not directly concerned with tasks transformation, he acts as a didactic assistant to his classmates in difficulty through creating a didactic environment of cooperation and adjusting pairs' performance (episode 2 - session 2 and episode 3 - session 3). In episode 3 - session 3, he gives instructions to g5, thus contributing to a productive disciplinary engagement for the latter. In episode 2 - session 2, he acts as a didactic assistant for g10 in his handstand against the wall. He takes the initiative in placing his head between hand supports while reducing his head extension, a relevant action favouring the upright aligning of g10's body.

4.2. Modalities of PDE and Involvement in the Didactic Contract According to Private School Students

4.2.1 Productive Engagement of Low School Level Students and Differential Didactic Contract

The case of f2: f2 case is uncommon. It is noticed that this student developed a considerable behaviour of application, which shows school abiding, undoubtedly less autonomous, by the suggested didactic contracts. She carries out all the required tasks. This low school level student does not really change the didactic environments where she acts. Her transformation actions come under an implication of «didactic tutoring» compared with her mates. In episode 2 - session 2, it is within a didactic environment of cooperation that she regulates the tasks compared to f7.

In episode 3 – session 3, it is outside the contract that she collaborates with F14. f2 helps with favouring a disciplinary engagement, not totally productive for f7 and F14, yet she does not really profit from her actions as to apprenticeship. It may be said that she has a « fairly » flat trajectory.

- The case of f7: f7's actions function to «verge on» the didactic contract while refining the environment because the initial tasks as prescribed by the teacher are not appropriate to her skilfulness level. In episode 1 - session 1, she negotiates the didactic contract at its lowest point, allowing herself to carry on exercising the previous task, which allows her to progress in the proposed one. In the backward roll, she shifts her center of gravity backward, which allows her to increase her rotation speed, realize arms antepulsion, which enables her to turn and get back on her feet again, in front scale, with straddled legs. Her engagement is personal. In episode 2 - session 2, she further negotiates the didactic contract within the frame of a didactic environment of cooperation. For all that and contrarily to the previous episode, the resources she gets from the environment are not enough for self-teaching and her successes remain sporadic at the handstand. Her engagement does not enable her in this episode to reach a satisfactory disciplinary productivity.

4.2.2. Productive Engagement of High School Level Students and Differential Didactic Contract

The case of F 14: Recurrently, F14 negotiates the didactic contract at most. She proves her ability to get relevant data on the environment and draws her resources from the verbal and tactile instructions of her pairs (f2, F6). In episode 2 – session 1, this allows her to adjust to each move to the springboard site and to have an impulse in the appropriate zone. Her mesogenic actions are successful. In episode 1 –session 3, F14, with the help of F6, keeps the initial aspect of the gymnastic figure suggested by the teacher, enriching it in an original way. At the individual or collective level, F14 acts in a productive disciplinary engagement, which allows her some self-teaching beyond her teacher's expectations. But the latter is difficult to maintain throughout sessions and sometimes even within the same session. When F14 behaves outside contract (episode 3-session3) and draws information from an environment she constructed with f2, her disciplinary engagement does not remain totally productive. For her handstand into a bridge, she cannot manage to either block her shoulders and hips in a parallel position or to press sufficiently on her hands to stand up straight.

- The case of F21: F21 often negotiates the didactic contract at most (episode 2 - session 1 and episode 2 - session 3) except in episode 1 - session 2 where she modifies the didactic environment to simplify the criteria to achieve backward roll. F21 draws relevant information from the didactic environment, along with her body's image reflected in the mirror. With no exception due to her negotiations, F21 is within productive disciplinary engagement. In episode 2 - session 1, she manages to optimize her impulse before the straight jump as she takes a run up in an appropriate zone of the springboard. In episode 2 - session 3, during a turn of 720° on one leg, she proves her mastery of roll speed thanks to her body vertical elevation and relevant arms' action which leads to kinetic energy transfer. All these productive disciplinary engagement are taken up individually.

For further details, the evidenced results in both institutions will be compared.

4.3. Students' PDE and Dynamics of Differential Didactic Contract: A Comparison between the Two Sites

In this section, a comparative didactic perspective is to be adopted to compare two modalities of productive disciplinary engagement in gymnastics in the two studied didactic systems, and to compare the differential modalities of this engagement in the joint action according to students' school level: « high/low ». It is necessary to compare the different kinds of students' productive engagement in public institution and private one so as to bring to the fore some recurrent points and characteristics.

Our findings check off a plurality of students' didactic trajectories according to their school level, apart from the context of the joint action during task transformation behaviour. The types of students' productive engagement tied with evolutionary dynamics of didactic contract - whatever the institution be - account for the following issues:

- Students do not progress in the same way:

While transforming tasks, f9 and F21 are in productive disciplinary engagement. During the three observed sessions, productive didactic trajectories among these students are recorded. They rely on self-teaching, each depending on her own means. Others, even though their disciplinary engagement is most of the time productive as to the tasks they are devoted to, have an interesting didactic trajectory but slightly inconsistent as is the case with F14. Although students like f7 and G3 manage to draw from the environment of relevant resources allowing them to teach themselves, they emerge onto a productivity tied with their actions context, which

explains the irregularity of didactic evolutions. These students have a sporadic and chaotic apprenticeship trajectory.

- Students negotiate the contract differently:

Having a skilfulness level superior to others', G3, F21 and F14 in their mesogenic actions generally negotiate the didactic contract in terms of environment complexification. Students with low-level skilfulness such as f9 and f7 tend to simplify the topics assigned by their respective teachers. Their didactic contract negotiations at the lowest point are carried out to refine the didactic environment to make fit their levels.

- Students do not progress:

Many students show engagements often non-productive. Student g10, overestimating his potentialities, fails in his productivity attempts. He has a negative didactic trajectory. Students f2 and F13, who are satisfied with their positions as didactic assistants, do not get profit from mesogenic actions. They show a « flat » didactic trajectory.

V. Conclusion

The analysis of the modalities of students' productive disciplinary engagement makes clear the differential dynamics according to their school level. If « strong » and « weak » students engage differently in tasks, the analysis sheds light on complex processes which strengthen in a particular way, this disciplinary productivity engagement. These processes combining the teachers' requirements according to their level and their own actions emerge onto different didactic trajectories; some learn more than others. Besides, it is worth noting that the attempts of productive disciplinary engagement carried out by students in their behaviours of tasks transformations cannot be reduced to a strict differentiation between "strong" and "weak" because both groups are capable of productive disciplinary engagement.

References

- [1]. G. Carlier, Si l'on parlait du plaisir d'enseigner l'éducation physique (Montpellier : Éditions AFRAPS, 2004).
- [2]. W. Doyle, Classroom organization and management, in M.C. Wittrock (dir.), Handbook of research on teaching (New-York : Macmillan, 1986) 392-431.
- [3]. J.H. Placek, Conceptions of success in teaching: Busy, happy and good ? in T. Templin & J. Olson (dir.), Teaching in physical education (Champaign : Human Kinetics, 1983) 46-56.
- [4]. D. Siedentop, Apprendre à enseigner l'éducation physique (Montréal : Gaëtan Morin, 1994).
- [5]. M.L. Schubauer-Leoni, Étude du contrat didactique pour des élèves en difficulté en mathématiques. Problématique didactique et/ou psychosociale, in C. Raitsky et M. Caillot (dir.), Au-delà des didactiques, le didactique. Débats autour de concepts fédérateurs (Paris, Bruxelles : De Boeck, 1996) 160-189.
- [6]. S. Elandoulsi, L'épistémologie pratique des professeurs : effets de l'expérience et de l'expertise dans l'enseignement de l'appui tendu renversée en mixité. Analyse comparée de 3 enseignants d'éducation physique et sportive en Tunisie, thèse de doctorat, Université Toulouse 2, Le Mirail, France, 2011.
- [7]. G. Sensevy, Théorie de l'action et action du professeur, in J. M. Baudouin et J. Friedrich (dir.), Théories de l'action et éducation, (Bruxelles : De Boeck, Raisons Éducatives, 2001) 203-224.
- [8]. G. Sensevy, A. Mercier et M.L. Schubauer-Leoni, Vers un modèle de l'action didactique du professeur. A propos de la Course à 20, Recherches en didactique des mathématiques, 20 (3), 2000, 263-304.
- [9]. G. Brousseau, Théorie des situations didactiques, in R. Noirfalise et M.-J. Perrin- Glorian (dir.), Actes de la VIII école d'été de didactique des mathématiques de Saint Sauves 1995. Clermont-Ferrand : IREM. Cahiers de psychologie cognitive, 3(1), 1998, 49-63.
- [10]. Y. Chevallard, La transposition didactique : du savoir savant au savoir enseigné (Grenoble : La pensée sauvage, 1991).
- [11]. G. Sensevy et A. Mercier, Agir ensemble. L'action didactique conjointe du professeur et des élèves (Rennes : Presses universitaires de Rennes, 2007).
- [12]. C. Amade-Escot et F. Leutenegger, Actualité de la théorie de l'action conjointe en didactique : questions théoriques et méthodologiques. Conférence d'ouverture à la journée des jeunes chercheurs au 3ème Colloque de l'ARCD. Marseille 9-12 janvier 2013.
- [13]. M.L. Schubauer-Leoni, La construction de la référence dans l'action conjointe professeur-élève, in N. Wallian, M.-P. Poggi et M. Musard (dir.), Co-construire des savoirs : les métiers de l'intervention par les APSA, (Besançon : PUFC, 2008) 67-86.
- [14]. I. Verscheure, Dynamique différentielle des interactions didactiques et co-construction de la différence des sexes en Éducation Physique et Sportive : Le cas de l'attaque en volley-ball en lycées agricoles, Thèse de doctorat en Sciences de l'éducation. Toulouse III, Université Paul Sabatier, 2005.
- [15]. I. Verscheure & C. Amade-Escot, The gendered construction of physical education content as the result of the differentiated didactic contract, Physical education and sport pedagogy, 12(3), 2007, 245-272.
- [16]. R.A. Engle & F.R. Conant, Guiding principles for fostering productive disciplinary engagement: explaining an emergent argument in a community of learners' classroom, Cognition and instruction, 20(4), 2002, 399-483.
- [17]. R.A. Engle, The Productive Disciplinary Engagement Framework: Origins, Key Concepts, and Developments, in D. Dai (Ed.), Design Research on Learning and Thinking in Educational Settings: Enhancing Intellectual Growth and Functioning, (London: Taylor & Francis, 2011) 161-200.
- [18]. P. Goirand, EPS au collège et gymnastique (Paris: INRP, 1998).
- [19]. J.F. Gréhaigne et M. Cadopi, Apprendre en éducation physique, in AEEPS (dir.) Éducation physique et didactique des APS, (Paris : AEEPS, 1990) 17-24.
- [20]. P. Venturini & C. Amade-Escot, Analysis of conditions leading to a productive disciplinary engagement during a physics lesson in a disadvantaged area school, International journal of educational research, 64, 2014, 170-138.
- [21]. G. Brousseau & V. Warfield, The case of Gaël, Journal of mathematical behavior, 18(1), 1999, 7-52.
- [22]. F. Leutenegger, Étude des interactions didactiques en classe de mathématiques : un prototype méthodologique. In A. Danis, M. L. Schubauer-Leoni et A. Weil-Barais (dir.), Interaction, acquisition de connaissances et développement, Bulletin de psychologie, 56 (4), 2003, 559-571.