José María Cagigal lecture
AIESEP International Congress - La Coruña, October, 2002

Research methods in sport pedagogy and development of pedagogical knowledge

Maurice Piéron
University of Liège, Belgium

JOSÉ MARIA CAGIGAL AND AIESEP

José Maria Cagigal met with directors of higher education institutes of PE and a few university department chairpersons to found the AIESEP in 1962 in Lisbon. For some people the time was ripe to convince universities to integrate PE institutes within their own structure.

In 1966 José Maria Cagigal missed the AIESEP general assembly in Chatenay Malabry (Paris) as he was fully involved in his task of organizing a world congress of PO and setting up the National Institute of PE (INEF) in Madrid, the first created in Spain.

Since 1967 until his tragic accident he attended all AIESEP congresses, seminars and meetings. As a result of his election as President of AIESEP in 1968, the INEF organized a series of AIESEP international events in 1968, 1970, 1971 and 1977. The themes of curriculum and, the organization of PE studies, which form the initial preparation to postgraduate studies, were of particular importance to José Maria Cagigal

He devoted a large part of his scientific activities and his reflection on the sociology and philosophy of sport and also to educational problems. Enumerating his most important books shows the extent of his knowledge in human sciences:

Hombres & deporte (1957) – Men and Sport
Deporte, pedagogía & humanismo (1966) – Sport, Pedagogy and Humanism
Deporte, pulso de nuestro tiempo (1972) – Sport, Pulse of our Time
El Deporte en la sociedad actual (1975) – Sport and the Society Today
Deporte & agresión (1976) – Sport and Aggression
Cultura intelectual & cultura física (1979) – Intellectual Culture and Physical Culture
Deporte : espectáculo & acción (1981)- Sport – Show and Action
Oh Deporte! (Anatomía de un gigante) (1981) – Sport (Anatomy of a Giant)

With respect to AIESEP, he allowed and provided the conditions to organize an international seminar on teaching analysis during the 1977 AIESEP world congress. This seminar was the starting point of an international research endeavour in PE. This seminar gathered personalities considered as pioneers in this field: John Cheffers, Risto Telama, Muska Mosston, Sarah Ashworth, John Underwood, Jean Brunelle and myself.

In 1977, his values and his moral integrity drove him to take a crucial decision, leaving the tasks and responsibilities as director of INEF Madrid, a decision with multiple consequences in his personal, family and professional life.

PEDAGOGY OF PHYSICAL ACTIVITIES AND SPORT. ITS PARADIGMS

I began my research in PE or Sport pedagogy more than 25 years ago. This extensive experience allows me to invite you to join me in a walk through this research, its paradigms, research methods and examples of associated themes.

Like medicine and many other professions, education is a practical art and an applied science, a sequence of actions to achieve specific aims through appropriate strategies. Pedagogy is a body of theories and principles developed to guide teachers and educators in their daily actions. It is multidisciplinary. It deals with objectives, interactions with individuals and groups, and with various means to achieve the objectives (Piéron, Cheffers & Barrette, 1990).

In PE research, inspiration came without any doubt from the classroom pedagogy, with names like Bloom, Rosenshine & Furst, Dunkin & Biddle, De Landsheere, Doyle … Recently French authors referred to the didactics of sciences, like mathematics.

When considering educational research in physical education it is worth recalling the definitions from authors such as Locke & Dodds (1984) and Silverman (1991). The research can be subdivided into two broad categories:

1. Research on teaching: «... focuses on the teaching and learning process as directed by teachers. RT-PE includes inquiry into the pre-active (planning), active (execution), and post-active (reflection) phases of instruction.» (Silverman, 1991)

2. Research on teacher education: «...examines the preparation and development of pre-service and in-service teachers. That research includes study of the effectiveness of teacher training programs, teacher socialisation, method for providing feedback to teachers, and the process of in-service teacher development.» (Silverman, 1991).

The evolution of this research, through its research methods, themes and areas of application needs to go further than just school PE to deal with the research in the pedagogy of sports and physical activities. We need to account for not only the school area but also the pedagogical interaction in sports club and be concerned with the out-of-school lives of children and adolescents

As in each area of scientific research, research in pedagogy is based on several paradigms and conceptual models that enable us to structure the knowledge issued from this research. It is essential to consider the research paradigms for understanding the evolution of the research, through its themes and methodology. The most frequently referred paradigms are the Description – Correlation – Experimentation Loop (Rosenshine & Furst, 1973), the Presage – Process – Product, the ecological, the mediating processes and the experts paradigms

Research studies can be organized around paradigms such as the «Descriptive - correlational - experimental loop» (Rosenshine & Furst, 1973). The «Descriptive - correlational - experimental loop» entails at least three main elements: (1) The development of means and procedures which allow teaching to be described in quantitative and qualitative ways; (2) Correlational studies in which the descriptive variables are related to pupils' learning gains or to changes in attitude or motivation; (3) Experimental studies in which significant variables identified in correlational studies are tested in rigorously controlled situations. They search for causality. Most research in teaching has aimed at describing the teaching like it is, in natural settings. It concerns behaviour and thinking, the latter of which incorporates values, beliefs, and decision-making.

The descriptive approach

An accurate description is essential when wanting to understand any type of phenomenon. It is a step which should be taken by every science. The development of instruments of analysis, registration or description go in parallel with its understanding. Describing is the first step to understanding what is happening in PE classes, before relating behaviours and thoughts to gains in learning.

In its evolution, research on teaching in physical education was first linked to data directly accessible and which could be collected through observation techniques. These data provided a picture of what was happening in classes and on sports fields. This picture, taken from outside, allows interpretations, according to the researcher's quality of thought. The observation does not help to understand the meaning imparted to events by teachers and pupils.

Two types of information contribute to describing teaching and what surrounds it. That information deals with what is directly visible such as teaching behaviours and strategies and what we name invisible data which is concerned with values, attitudes, decision making and thought within the context of education. It is possible to collect the first information through observation. The second type of data requires various forms of questioning of the participants. It concerns what the participants think about the educational setting and, about their interpretation of events that they have experienced. This information is usually collected by means of questionnaires and interview. Information gathered by these means sometimes lacks the credibility inherent to each technique dealing with the individuals thinking about themselves. It can happen that to protect their own privacy, people do not answer sincerely.

It is essential to combine data collection techniques to increase the validity of the information gathered and to make it easier to interpret. In the evolution of educational research, one can observe a clear trend to varying sources of data allowing deeper and more secure knowledge of educational events.

Research on teaching PE started by analysing the verbal interaction between teacher and pupil. Some adaptations were set up within specific PE and sport settings. Personally, I started with interaction analysis (Piéron & Drion, 1977) before shifting to study the teacher and pupil interrelated behaviour within teaching contexts (Piéron, 1982). In my own research, my concern was always:

1. To account for the specificity of the PE setting compared to the characteristics of a traditional classroom (Widmer, 1976).
2. To consider that teacher and pupil behaviours are not isolated but are linked through a constant interaction and reciprocal influence (Doyle 1986). For example, the feedback provided by the teacher needs to account for the response by the pupil.

The teacher. It is easy to understand why many studies aiming to identify and analyse the teaching process have taken teacher behaviour as the starting point for collecting research data. Teachers are responsible for what is occurring in their classes and are the decision makers. One of their functions is to identify, define and select the tasks to be practised by pupils. When they do not take these decisions, there is a risk of losing sight of short and long terms objectives. When there no control, the pupils' progress is in jeopardy.

The observation of specific teacher behaviours in teaching PE started with Anderson (1975). He developed an observation system within the "Video data bank project". Other authors described essential teaching functions such as instruction, feedback, organization and discipline problems using other observation tools. Studies compared the profile of teacher interventions according to grade level (Anderson & Barrette, 1978; Piéron, 1982), teacher expertise (Grant, 1985; Piéron, 1982) and teacher experience (Freedman, 1978). Using only the profile of interventions is limited in interpreting data from observation. However, it is more interesting to use multidimensional observation systems to analyse specific interventions such as teacher feedback. The description concerns such dimensions as intent, form, general direction and specific referent (Fishman & Tobey, 1978).

Teachers' values, attitudes and concerns are part of the study of teaching. Mental structures and processes conduct teachers' behaviour. As the main objective of the research on teachers thinking is to improve the understanding of their actions, authors within the field of PE teaching have used research patterns from the classroom as suggested by Clark & Peterson (1985). Questionnaires were used to assess teachers' perspectives of what represents a good PE lesson (Arrighi &Young, 1987, Carreiro da Costa, 1992). The objective is to gain an insight on what they think. For example, teachers were asked:

* What are their views of an effective teaching?
* What is regarded as a PE good lesson?
* What are their preoccupations in and around teaching?

It is also important to analyse their thoughts within the decision-making process. It is necessary to understand decisions in various phases of teaching: planning decisions and interactive decisions (Housner & Griffey, 1985; Januario, 1992).

The pupil. In the development of the research on teaching, the observation of pupils' behaviour appeared just after the focus on teachers' behaviour. It is clear that the consequences of any instruction depend not only on teachers, but also on pupils. The setting and the content of instruction and pupils' behaviour are mediators of the success and effectiveness of teaching. It was a surprise to find that motor activities were not the main behaviour within the subject of PE (Costello & Laubach, 1978, Piéron & Dohogne, 1980). In PE classes, differences in pupils' behaviour were observed according to programme variables such as objectives (Telama, Paukku, Varstala & Paananen, 1982), subject matter (Piéron & Haan, 1980) and the teaching strategy used by teachers. These differences were greater than those found in comparisons using context variables such as gender or grade level.

When dealing with pupils' thinking, researchers try to gather information through questionnaires, interviews, and critical incidents. It is evident that if we wish to enter the thought process of a teacher, a pupil and/or an athlete, there are no other means than asking questions. There are three main aspects to pupils' thoughts:

(1) General thinking (attitudes and motivation) related to school, physical education and sport, and a perception of their competence in PE.

(2) Thoughts related to the perception of the lesson. In this aspect, pupils are asked how they enjoyed the session, how satisfied they were, how intensive was the session, and how they perceived teachers interventions, what they got from the activities, and how competent they were in the skill practises.

(3) The thinking processes during the performance of motor and sports skills. Locke & Jensen (1974) gave a fine example of the development of research using personal reports to investigate thought process during a motor skill. The focus of the attention was allotted in mutually exclusive categories; (1) in relation to the task, to the ability to master; (2) in relation to the immediate environment, persons or things; (3) in relation to oneself, according to physical or emotional states; (4) without any direct relation to what was happening in the class.

It also seemed important to analyse the relationship between teacher thoughts and how pupils perceived their own actions and cognition. It could be that it differs from teacher's intentions. Nelson (1988) developed an interesting methodology based on the stimulated recall technique. The author asked teachers what they had in mind for pupils while teaching. Pupils were questioned on videotape at particular points selected by teachers for their meaning. Answers to three essential questions were sought:

1. What were the pupils thinking?
2. How did the teachers help them to learn?
3. Did the pupils think of an appropriate means to learn the skill practised?

The main categories of pupil thought were articulated around emotional thinking, reflections in relationship to the practised skill, the understanding of messages provided by teachers and ideas differing from tasks selected by teachers. Differences were singled out. Experts were mainly preoccupied by what their pupils were going to learn. Beginners were centred on processes and organization. Pupils of the experts were invited more often to understand skills and concepts taught. With both types of teachers, explanation and demonstration were the means most frequently reported upon. However, pupils of experts mentioned various teaching processes, mainly feedback and the gradual approach due to a task analysis.

The Presage – Process - Paradigm

The "Process – Product" paradigm relates classroom events, especially teachers' and pupils' behaviours to the results of teaching in terms of pupils' learning gains or achievement. It is tempting to ask a direct question in order to find answers as one looks at what is occurring during a teaching session:

«Among the behaviours and strategies observed during teaching, is there any difference between the most and the least effective teachers?» This question can be asked another way: *«Are there significant relationships between behaviours observed during teaching and pupil outcomes?»* Several answers, or plausible hypotheses proceed from process-product research. Its attempts to identify the most effective behaviours demonstrated in classroom, by teachers and/or by pupils, which influence teaching outcomes. A major concern of this paradigm is to help pupils in their learning endeavour. (Floden, 2001)

In physical education teaching, four variables seem to play a determining role in pursuing educational objectives: time spent by pupils in motor activities, feedback, class climate, and class management:

1. Motor engagement time and time spent on task. Results from process-product studies showed that motor engaged time should be specific (Piéron & Piron, 1981; Carreiro da Costa & Piéron, 1990 a, 1991) and that activities should be performed at a high level of success (Piéron, 1982) to induce significant learning gains. The importance of success is clearly shown in process-product studies completed in the classroom. Time spent on task is seen as the mediating link between instructional teacher behaviours and pupil learning gains. Activity time is also of prominent importance in other teaching objectives, for example those related to health effects. For a few years, the effectiveness of physical education teaching has been questioned in terms of its health effects, in several countries such as the United Kingdom, the United States and, Belgium... A minimum level of duration and intensity is necessary to improve endurance. Activity patterns of children and the youth move closer and closer to serious inactivity.
2. Frequent and quality feedback provided to pupils. In motor learning theory, feedback is seen as indispensable to a continuous progress. In teaching, feedback is far more complex than just knowing the results. Providing a better knowledge of pupils' performance is the main objective of feedback in any educational setting. It is a permanent concern in helping pupils move towards excellence.
3. Classroom management. Maximizing motor engagement time and, providing pupils with frequent feedback is unattainable without effective organization. It facilitates management and addresses discipline problems within a classroom.
4. Class Climate. Amongst its objectives, physical education intends to develop long-term favourable attitudes and behaviours toward physical activities outside the school environment. Such attitudes and behaviours have an opportunity to develop only when motor and sport skills have been practised within a reinforcing climate created by teachers.

Ecological paradigm and ethnographic observation

Qualitative research provides an alternative to the quantitative mode of describing and understanding what is occurring in a physical education class. In the naturalist paradigm, realities are multiple, holistic, and constructed by participants. According to the ecological model, the observer wants to enter deeply into the participant's world and understand the meanings and interpretation that he/she has developed. Under the qualitative label, one finds approaches pertaining to the same family: ethnographic, participant observation, case study, interpretative, symbolic interactionist, etc. One central concern is the nature of classrooms as socially and culturally organized environments.

The main objective of these research methods is to provide a coherent explanation of how the class and the school function in the setting in which the research is taking place. The intent is describing in global perspective, with a focus on participants' interpretations (Locke, 1986; 1989).

Qualitative research involves: (1) intensive long-term participation in a field setting; (2) careful recording of what happens in the situation (field notes and other kinds of documents); (3) subsequent analytic reflection on data gathered. Qualitative field work research involves being thorough and reflective in noticing and describing events in the field setting, and in attempting to identify the meaning of actions in the events from the various points of view of the participants. Fieldwork methods are thought to be inductive. Specific categories for observation are not determined in advance of entering the field setting as a participant observer. The researcher identifies conceptual issues of research interest before entering the

field setting. However, induction and deduction are in constant interaction. According to interpretative methods, using participant observational fieldwork is appropriate when one needs to know more about:

1. The specific structure of occurrences rather than their general character and overall distribution;
2. The meaning of the perspectives of particular actors in particular events;
3. The location of naturally occurring points of contrast that can be observed as natural experiments when we are unable logistically or ethically to meet experimental conditions of consistency of intervention and of control over other influences on the setting;
4. The possibility to search for hypothetical and specific causal relationships not identified by experimental methods, and the development of new theories about causes and other influences on the patterns identified in survey data or experiments (Griffin & Templin, 1989; Locke, 1986; 1989)

CONTRIBUTION OF THE MEDIATING PROCESSES PARADIGM TO THE UNDERSTANDING OF THE FINDINGS OF THE PROCESS - PRODUCT RESEARCH STUDIES

The focus of the mediating process research is on implicit processes that students employ to mediate instructional stimuli and produce learning outcomes (Levie & Dickie, 1973). Researchers interested in the role of mediating variables would study the motivational, affective, and cognitive aspects of student thinking during learning. Questions asked might include: What is the relationship between student attention and achievement? Why are some students more motivated to persist during practice? (Lee, Landin, & Carter, 1992)

Teachers' actions or interventions do not directly induce changes in pupils' thoughts or behaviours. The mediating process paradigm research focuses on implicit processes that pupils use to mediate instructional stimuli and to produce learning outcomes. A factor is introduced between the process and the product of teaching, allowing for the inclusion of mediating elements. In physical education, two aspects of mediation should be considered:

1. The pupil's motor activity and his/her motor engagement necessary to master the tasks set by teachers are a large part of research based on pupil observation.
2. The motivational, affective, and cognitive aspects of pupil thinking during learning where pupil information-processing responses to the instructional stimuli intercede in the direct link between teacher behaviour and pupil outcome assumed in the process-product paradigm.

Affective aspects of pupil thought influence the quality of the engaged time during the lessons. Ultimately, pupils' outcomes are affected by their thoughts. The mediating process implies that teachers do not influence achievement but cause pupils to behave and think in certain ways.

To understand the role of feedback it is necessary to go further than its simple quantitative aspect, (i. e. frequency) to tackle the qualitative aspect and the adequacy of the message to the pupil performance error. The appropriate aspect of feedback is assessed in relation with the motor skills taught, the subject matter and the development characteristics and learning possibilities of youth involved in the teaching – learning process

There is no doubt that providing feedback to pupils is a basic teaching skill. This competence depends on the profound knowledge of the subjects matter, the ability to detect performance errors (diagnosis) and the ability to emit an immediate and appropriate reaction (prescription)

For a better understanding of difficulties occurring in analysing the relationships between the teachers' message and the modification of pupil's performance, it is necessary to refer to the mediating processes paradigm. A study on the comprehension and the memorising of the teacher message by the pupil can illustrate the encountered difficulties (Carreiro da Costa, Quina, Diniz & Piéron, 1996). This study leads to several implications for teachers. Its purposes were:

*To assess what the pupil receives, processes, and keeps in memory from the information feedback provided by the teacher.
*To identify the influencing factors of the process of receiving, processing, and memorising of the feedback. They are related to the feedback and pupil's characteristics.

The main principle for gathering data relied on the need to compare the pupil's perception of feedback with the feedback effectively issued by the teacher. All lessons were videotaped. Recordings focused on the one hand upon the complete group of pupils and on the other hand on the teacher. Teachers' verbal interventions were recorded through a wireless microphone. Data related to pupils came from an interview and a questionnaire administered on two occasions during the lesson:

(1) Each time a pupil received feedback, he/she was immediately asked a question that was always the same: «What did the teacher tell you?». The answer was tape-recorded. It is thought that the intervention of the researcher, as discreet as it could be, was a kind of intrusion in the class. To keep the level of intrusion at a minimal level, pupils were previously accustomed to the technique during trial lessons. The researchers were introduced as temporary helpers of the teacher.
(2) At the end of the lesson, a questionnaire was administered on an individual basis to assess the level of pupil satisfaction. An interview aimed at collecting information to assess the capacity to evoke the information provided by teacher. The following question was asked: «When you performed the task [labelling the task]. What did the teacher tell you?»

Feedback characteristics were analysed under the three following points:

(1) Extent, i.e. the number of words in the message;
(2) Amount of information (ideas) related to critical components of the task contained in feedback;
(3) Density, the ratio between the extent and the amount of information in the message.

The level of retention varied from a minimum of 35% (delayed coherence of almost 35% for prescriptive feedback in gymnastics) to just under 80% (for the immediate coherence of descriptive auditive feedback in basketball). The immediate coherence of the feedback averaged 56.9% in gymnastics and 60.2% for the delayed measure. The total decrease in retention was 16.1% in gymnastics and 13.5% in basketball. The better retention of the message in basketball could be due to the feedback being less complex than data expressed in many ideas and words.

The average values amounted to 57% for the immediate coherence and 42% for the delayed coherence. So it can be seen that pupils retained between 40 and 50% of the feedback at the end of the PE lesson. It is understandable that there was a loss of information between the two occasions when data was collected on pupils' report of feedback. The extent of information lost varied largely according to feedback type and structure. Carreiro da Costa et al. (1996) observed that:

*The feedback whose loss of retention was the most limited, from 15 to 20%, was prescriptive-tactile-auditive feedback, immediately followed by descriptive-auditive feedback.
*Prescriptive structures were more rapidly forgotten than descriptive structures. The first decrease from 55.5 to 39.5%; i.e. a loss of 16%. Descriptive-auditive feedback lost 13.6%, decreasing from 68.4 to 54.8%.
*Simple structures (exclusively verbal) were forgotten quicker than mixed structures (auditive-visual and auditive-tactile feedback).

In the daily practice of PE teaching, we need to consider how we can achieve better understanding and retention of the feedback provided by teachers to pupils. Furthermore, in relation to pupils' perception of feedback, we need to remember that pupils frequently interpret the message differently from teachers' perspective. For example, descriptive feedback can become prescriptive in a pupil's mind. Pupils tend to emphasize the beginning or the end of the message.

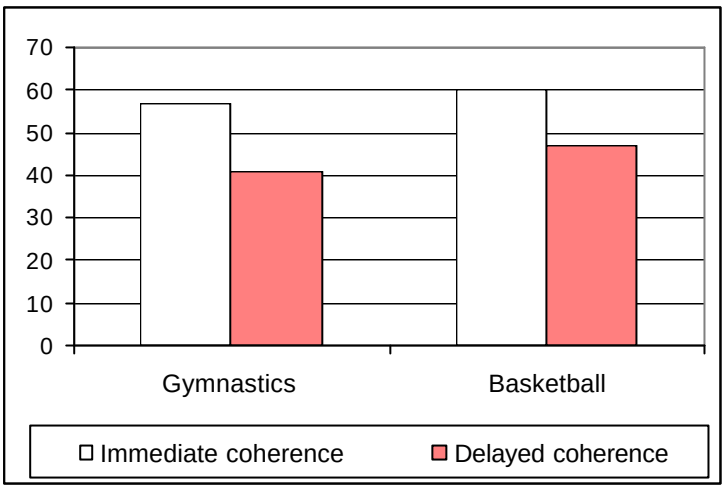

Figure 1 – Feedback coherence
(according to Carreiro da Costa et al, 1996)

A MULTIDIMENSIONAL APPROACH OF THE PEDAGOGICAL RELATION IN A THEME OF HETEROGENEITY OF THE CLASS: THE ATTITUDE – TREATMENT INTERACTION, A QUESTION OF EQUITY

Every pupil deserves an individualised pedagogical treatment. However, the number of pupils in a class, the heterogeneity of groups, and the many tasks to perform by teachers frequently makes this individualisation illusory. However, between a complete personalised educational approach and the same treatment for each one, there are a few intermediate solutions. Some pupils need particular help due to their weaknesses in motor tasks or due to unfavourable motivational or moral characteristics. Other, highly gifted and, motivated pupils who are conscious of the value of physical activity and exercise also deserve teachers' attention and help to perform to the best of their abilities.

Analysing how teachers distribute their interventions is a basic question when dealing with equity in teaching. We need to check if pupils, especially low and high achieving individuals, receives a fair share of teacher's interventions, especially when they are related to the content of teaching (Piéron & col., 1998).

In the Attitude Treatment Interaction (ATI) approach, explaining the effects of teaching by only the treatment (didactics, content and interventions) or by the unique pupils aptitude (a personal treatment related to success), should be replaced by the interaction of treatment and pupils aptitudes. We need to search for what the pupils consider as meaningful practice and find the interventions adapted to their individual qualities, interests and needs. In considering this, we meet a scientific justification combined with ethical principles (Cardinet, 1986). Each class or sports group is heterogeneous with peculiarities, differences in values, attitudes, aptitudes and objectives. Everyone is learning according to his/her own rhythm, more or less quickly. Several questions should be asked: Is it possible to account for these particularities? What happens in the daily reality of PE lessons? Do we find some differentiation in teacher's interventions according to their expectations from pupils?

In this respect, the teachers' role should be to:

*Differentiate and respect the learning rhythm of each pupil;

*Differentiate their teaching methods and strategies in such a way that every one will benefit to the best of their abilities;

*Develop positive expectations of all pupils and communicate these expectancies to each one;

*Give more support to those encountering learning difficulties, without forgetting that other pupils deserve the best opportunities to participate and improve their abilities and skills.

Instruments used in gathering data

I will take the example of a study of the individualized treatment of pupils by teachers to illustrate a multidimensional methodology of gathering data allowing the analysis of the reality of a class, under various viewpoints.

The teacher

The theme of equity was analysed in 60 teachers from elementary and secondary schools (Piéron & col., 1998). The following aspects were used in appraising the situation:

1. The short and long terms decisions taking by teachers.
2. The knowledge of individual pupils in relation to school characteristics (attitude towards school and physical education, perceived competence, the perception of an individualized relationship with the teacher) and in relation to their lifestyle (attitude towards competitive sports, motivation towards the regular practice of exercise during free time, goal orientation objectives).
3. Assessing behaviour during PE lessons and appraising out-of-school physical activities (frequency, duration and intensity)

This led to an awareness of the characteristics of pupils at various phases of teaching. It concerns the pre-interactive phase, when teachers are planning their sessions, identifying the pupils' needs and interests, i.e. in teacher's diagnosis. Later, they can use this knowledge for their prescription, for selecting the most appropriate activities for the lesson. During the interactive phase, when teachers and pupils are in the class, feedback is probably the best way to account for pupils' need in their search for excellence in performing the tasks.

Table 1 - The teacher: Thinking and Behaviour

Decision-making
Reaction when facing situations needing middle term decisions
Reaction when facing situations needing middle short decisions
Teacher thinking: Values, perceptions, and reflexion
Concept of teacher's expertise
Teachers' objectives and intentions
Perception of the lesson
Description of a misbehaviour incident
Teacher thinking in relation to pupils' characteristics
Teacher's behaviour
Time management
Organisation
Interventions
Individualisation
Feedback
Discipline

Teachers and their decision-making

Teaching is seen as a series of decisions, some of which are automatic and others need reflection (Doyle, 1986). Just as team sport player masters a repertoire of techniques and skills according to team strategies, teachers will select amongst their repertoire of pedagogical skills the most appropriate to a specific situation. Moreover the choice of a particular strategy depends on their convictions about PE teaching, their objectives for the present session and what they know about the individual pupils. However being realistic, there is a gap between values and behaviours observed in real teaching. A study of teachers planning showed that objectives are low in the priority decisions of teachers.

Data related to teachers' decision-making.

Teachers were asked about their choices for solutions in various situations presented in written scenarios. The data collection concerning teachers was distributed in two PE lessons. Table 1 summarises the tools, the variables and the chronological order of instruments utilisation.

Two aspects were dealt with in the personalised treatment of pupils according to individual characteristics:

- Teachers have plenty of time to think about the situation. In this case, they know the characteristics of pupils and they use this information to seek the most appropriate solution to the scenario. The decisions are mainly dealing with planning.
- Teachers should make decisions in situations needing quick reactions during the physical education lesson. In this case, teachers do not have much time to make their decision. They are confronted with sudden and unforeseen situations. They are asked to describe how they would react to the problem on the field, in a short-term strategy.

The principle of the technique of the script (scenario) comprises of: (1) selecting situation-problems; (2) presenting them to teachers through one or several supports (slides, text, videotapes); (3) collecting proposals of interpretation and/or solutions; (4) sequencing these last for analysis. Their interest is in the fact that every subject is placed in identical conditions. It becomes easier comparing the preferential strategies and identifying original teachers processes.

Table 2 - Sequence of using the instrumentation for data collection (Teacher)

Contact with teachers	
Sending the short term situation	
First session	
Interview (Scenario)	Pre-interactive decisions
	Interactive decisions
	Perception of pupils' characteristics (competence, motivation, behaviour)
Questionnaire	Meaning of the concept "Expertise"
Second session	
Interview	Objectives and previsions for the session
	Identification of target pupils
Observation	Class settings
Teacher-pupil relationship	Individualization of tasks
Questionnaire	Perception of the session
Critical incident	Description of a discipline incident

The medium-term educational situations

In a letter sent before the first meeting with their classes, we described five situations to which the teacher could be confronted. We asked teachers to think about their possible reactions in facing each situation. Teachers were informed that we would ask them about their reactions on the first visit.

One script dealt with a common problem for all teachers when they take a new class at the beginning of the year. The other situations required a good knowledge of the pupils. They concerned a pupil:

*Suffering from health problems;
*Living in an unfavourable domestic environment inducing behavioural difficulties
*Enduring a serious problem of self-image due to a physique which caused difficulties in performing motor skills.

The interviewer reminded, successively, the teacher the different situations presented in the letter and recorded spontaneous answers. For every situation, the teacher's initial answer was followed by a search for more precisions. The semi-structured interview was administered by the interviewer based on questions such as:

"Did you already meet this situation in your classes?
If yes, what was your reaction?
Do you think that your intervention was beneficial to pupils?
Would your intervention remain the same today?
If no, propose a solution to the problem you are facing"

The short-term educational situations

The member of the research team interviewing the teacher used a specific interview schedule. This precaution guaranteed the consistency in collecting data, whatever the investigator, teacher's reactions and working conditions.

Table 3 – Situations

Taking a new class

Situations needing middle term decisions:

Health problem
Motor and sport skills problem
Family and behaviour problem
Self image problem

Situations needing a short-term decision

Lack of interest of a good athlete towards the content of the lesson
Task modification by pupils of different skill levels
Motor and sport skills problem
Two groups of various levels of affinity, skill level and attitude towards physical education

---

An objective for teachers: getting a better knowledge of their pupils

Various motivational features play an important role in relation to involvement in PE lessons and out-of-school sports and physical activities. In classroom teaching, Bloom (1975) considered that approximately 25% of pupils' achievement was accounted for by their attitude towards school and by the subject matter taught. In out-of-school activities, motivation and enjoyment were significantly related to participation and its continuation.

Table 4 - Sequence of data collection concerning pupils

First session	
Questionnaire	Attitude towards PE lessons
	Perceived competence and perception of own behaviour
	Description of an event of teacher's individualization
Second session	
Video	Observation of pupils' behaviour
Questionnaire	Perception of the session
Lifestyle	Attitude towards sport
	Out-of-school sports participation
	Motivation toward practice of sports activities
	Achievement goals (Ego-Task)

In our study, several aspects were analysed: (1) attitude towards physical education and sports, (2) the importance of PE and sports and perception of PE objectives, (3) perceived competence in physical education and sports, (3) perceptions of PE lessons.

All these thoughts are strongly related to motivation. Motivation defined by Wittrock (1986) as the process of initiating, sustaining, and directing activities is perhaps the central cognitive process underlying the interwoven network of variables that impact learning. Predictions from theories of achievement motivation are that pupils low in perceived competence would likely have a corresponding low level of motivation.

Students enter classrooms with notions concerning their own abilities, ideas about the subject matter being taught, and attitudes about the class. These entry characteristics affect the nature of their interaction and participation during class and subsequently what they learn. A basic assumption of models formulated about the teaching-learning process from a cognitive perspective is that cognition governs action.

Research studies have focused on several questions such as: Is the pupil satisfied after the physical education lesson? What type of pleasure do pupils feel? How do they perceive their participation? Was the lesson intense? What is pupils' perceived competence in the activities during the lesson?

Piéron et al. (1998) have hypothesized that low skilled and high-skilled pupils will report different attitudes and perceptions of objectives of school physical education. Three aspects directly related with motivation are very important for their consequence on pupil's behaviour in classroom as well as in out-of-school sport activities: (1) Attitudes towards physical education, the importance of physical education lessons and the importance of being good at sport; (2) The perception of objectives assigned to school physical education; (3) Their perceived competence in physical education and sport. These variables were compared for low and high achieving pupils, using four-point Lickert scales and closed questions. Data collection were completed during physical education lessons. Pupils were selected in 39 high school classes (19 classes of boys and 20 classes of girls). 144 high achievers (76 girls and 68 boys) and 133 low achievers (70 girls and 63 boys) completed questionnaires.

Attitudes towards school physical education

High achieving pupils showed a more positive attitude towards school physical education than low achievers. More than 90% of high achievers had favourable opinions about physical education. In the whole group, the importance of school physical education received a lower percentage of favourable

opinions than the two other items (70%). The importance of being good at sport showed a profile similar to the results on attitudes. Even though this item was more important in high achievers, it should be pointed out that 75% of the low achievers considered that it is important to be good at sports. Pereira, Carreiro da Costa & Diniz (2000b) focused on the same variables related to the motivational aspects of pupil thinking, i.e. the motivation, the perceived competence, the perception of PE objectives and of the teacher's behaviour. This study confirmed that pupils from this study were highly motivated for PE (wish to be active, to learn new techniques, feeling good about attending PE lessons).

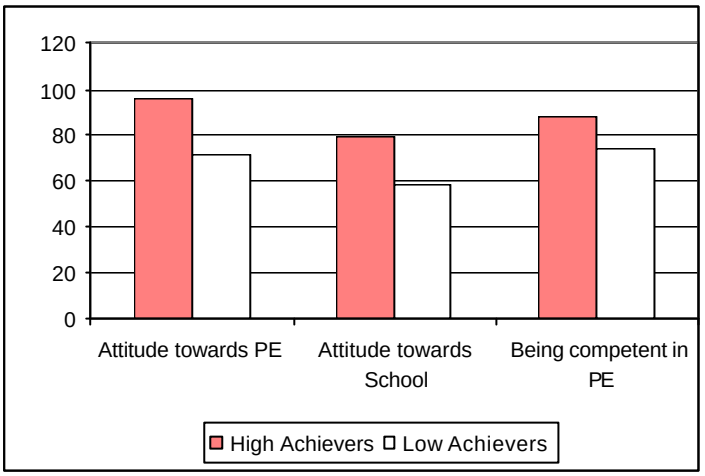

Figure 2 - Attitudes towards School and Physical Education

b. Perceptions of objectives assigned to physical education

Most pupils (46.5%) think that school physical education pursue goals related to maintaining or improving health (Piéron, 2000). The benefits of physical and sports activity on health were very often communicated in campaigns promoting physical activities or in campaign launched to defend the status of physical education in the school curriculum. Pupils were very sensible and knowledgeable of these arguments. Enjoyment and pleasure were ranked second in the hierarchy of school physical education objectives (27.2%). The learning objective ranked third and was reported by 15% of the pupils. Besides its recreational aspects, physical education remained in the pupils' mind as a school subject matter with its corollaries of learning and assessment being strongly associated. Social contact between pupils and the development of physical fitness were ranked far behind other objectives. In girls, the enjoyment found in the practice of physical education and sports was significantly greater in high achievers.

C. The pupils perceived competence

Several studies underlined the importance of perceived competence in adherence to a regular participation in physical and sport activities. One should realize the educational consequences of these findings in considering the positive relationship between perceived competence and intrinsic motivation (Duda, 1988; Gonzalez, 2001; Harter, 1978. In the same way, enjoyment and satisfaction experienced in engaging in physical activities could reinforce self-esteem, develop and enhance the will to be continuously involved in sport activities well beyond the school age. The quality of motor experiences and the success and failure of their participation are critical determinants of pupils' perceptions in relation to sports activities, practised at school or in sports clubs (Feltz & Petlichkoff, 1983).

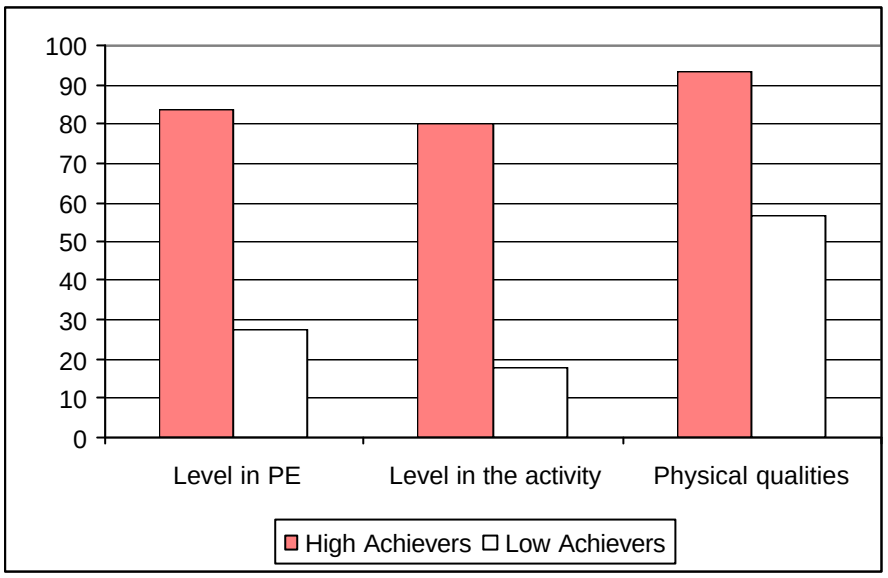

Figure 3 - Pupils' Perceived Competence

All composite variables (level of competence in physical education and in the subject matter taught during the observed lessons, and perception of physical qualities) or isolated items such as grace, flexibility, shape, speed, strength and courage were higher in the high achieving pupils self-assessment. Some of these qualities have a holistic character that corresponds to common sense (Piéron et al., 1998). It is obvious that physical education is affected by a large heterogeneity of pupils. It goes beyond the aspects of motor features of pupils. Pupils' motivation and perceived competence are amongst the features differentiating participants. These findings were in agreement with Carreiro da Costa, Perreira, Diniz and Piéron (1997) results showing that a group of pupils high in perceived competence were highly motivated. The pupils were characterized by psychological aspects such as high motivation toward school physical education and sport activities, and in their behaviour in classes (high engagement time). Moreover they paid more attention during the physical education lesson than pupils low in perceived competence. All these aspects appeared frequently in the descriptive aspects of teaching effectiveness or were related to learning gain achieved by pupils.

Carreiro da Costa et al. (1997) concluded also that: (1) the most motivated pupils were characterized by: a high level of self capacity; they considered that the aims of physical education were to promote the learning of sports techniques as well as enjoyment; high rate of time on task; less frequent deviant behaviours; frequently asked by the teachers to provide models of performance; (2) the least motivated pupils were characterized by a low level of self capacity; they considered physical education as an optional subject, the aims of which related to the improvement of the fitness and self image; they reported more deviant behaviours and less support from teachers.

d. Perceptions at the end of the lesson

At the end of a videotape-recorded lesson, a short questionnaire about perceptions on the lesson was administrated to all pupils. It focuses on several aspects closely related to motivation: satisfaction about the class, the intensity of the lesson, perceived competence, teacher's individual interventions to correct pupil's performance, attention, and progress in skills and abilities practised during the lesson.

1.Satisfaction related to the PE lesson. High achieving pupils were more satisfied than their counterparts, the low achievers. More than 85% of the high achievers stated that the lesson met their expectations. Approximately 7 out of 10 low achievers expressed the same feelings. It is worth reporting

that PE is well perceived by so many pupils. The differences according to the level of pupils abilities is coherent with their attitudes toward PE. Pupils enjoy situations where they are successful and when performance is valued.

2.Perceived competence. High achievers have a significantly higher perceived competence than low achievers. The relatively low level of perceived competence in low achievers does not induce optimism in relation to their motivation and to the probability of them continuing with physical and sports activities after compulsory schooling.

3. The progress. Approximately 70% of all pupils thought that they improved their skill after the lesson. This observation is particularly important when considering the learning objectives set for PE and more specifically during the lesson. It is also important that participants perceive the effectiveness of teachers' management of the lesson.

4.Enjoyment. Three quarters of the pupils stated that they enjoyed the lesson. Although we do not associate feelings of enjoyment with pure recreation, the climate in the class is key to pupils' motivation. High achievers reported having enjoyed more that low achievers.

5.Intensity of the lesson and pupils involvement. High achievers were significantly higher than low achievers in these variables.

6.Contacts with the teacher. Almost 50% of all pupils reported that they had individualized contacts with teachers, mostly through feedback.

The differences between low and high achieving pupils are quite clear. High achievers are leaving the PE class with every type of perceptions of their psychological features and their participation (Table 5)

Table 5 - Pupils' opinion at the end of the PE lesson

	Girls «+»	Boys «+»	Girls «-»	Boys «-»
Satisfaction	89,9	86,4	82,5	60,0
Competency	71,4	68,2	22,6	21,7
Progress	77,1	65,1	77,4	63,8
Enjoyment	87,1	78,8	75,8	54,2
Intensity	70,0	50,8	58,7	53,3
Corrections	35,7	36,4	71,0	65,0
Involvement	90,0	80,3	80,6	47,5

The pupils' involvement in physical activities in school and out-of-school

The effectiveness of pupils' motor engagement differed significantly in favour of high achievers. Ten to fifteen percent of low achieving pupils were performing successfully compared to 40 to 80% in high achievers.

High achievers reported to be involved in out-of-school competitive sports as much as double that of low achievers($P = .01$). A quarter of the sample stated that they were not taking part in sports activities. However the level of no participation varied from 32 to 40 in low achievers and from 7 to 15% in high achievers.

In girls, infrequent sport practice was significantly higher in low achievers: 30% of answers in comparison with only 8% in high achievers (figure 3). In boys the difference is less great between low and high achievers (18,4%). On the contrary, the very frequent participation is significantly higher in favour of high achievers in both sexes (4-6 for time a week and every day).

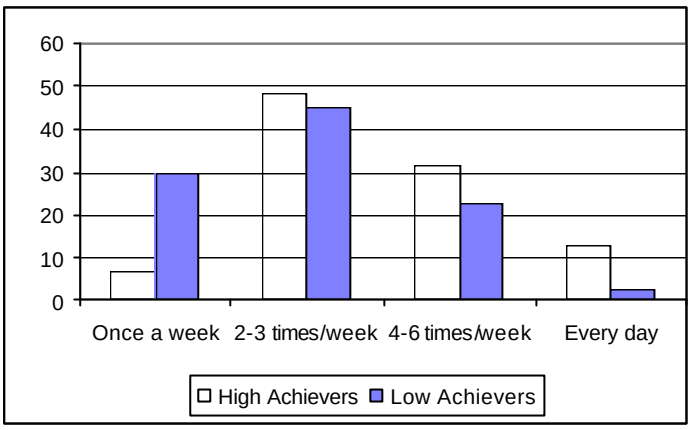

Figure 4 - Frequency of participation en out-of-school physical and sports activities

Synthesis

Since the early seventies, the methods used in gathering data in sport pedagogy research have considerably changed. The initial research centred on teachers' and pupils' behaviour used observation techniques based on category systems. The qualitative research with ethnographical methods allowed for better understanding of teaching and pupil behaviour.

Another descriptive approach aimed at analysing teachers and pupils' thinking in terms of values, motivation and perceptions. Research instruments, based on questioning, used various types of questionnaires, interviews, critical incidents, stimulated recall, thinking aloud, scenarios... Without any doubt the mediating processes paradigm contributed significantly to the understanding of findings from the process-product paradigm.

It should be pointed out that observation and questioning are complementary and it is useful to combine them to avoid problems of interpretation and credibility. Considering that teaching is characterized by constant interaction and reciprocal influence of teachers and pupils, it is indispensable to combine data gathered on teachers and pupils for a better understanding of the teaching-learning process.

Finally we need to be aware that pupils spend only limited periods in physical education lessons. A large part of their free time is spent in physically passive activities. Other youth's activities are related to movement and sport in organized or unorganised settings. As a consequence, sport pedagogy research should consider youth in their lifestyle. This implies collecting data in a multidimensional perspective including school and out-of-school settings

References

ANDERSON, W. (1975). Videotape data bank. Journal of physical education, & recreation, 46, 7, 31-35.

ARRIGHI, M., & YOUNG, J. (1985). Teachers' perceptions about effective and successful teaching. Journal of Teaching in Physical Education, 6(2), 122-135.

BENNETT, N. (1978). Recent research on teaching: a dream, a belief, and a model. Journal of Education, 160, 3, 5-37.

BERLINER, D. (1979). Tempus educare. In, P. Peterson, & H. Walberg (Eds.), Research on teaching: Concepts, findings and implications. Berkeley, Ca: McCutchan, 120-135.

BERLINER, D., & TIKUNOFF, W. (1976). The California beginning teacher evaluation study. Journal of Teacher Education, 27, 1, 24-30.

BLOOM, B. (1979). Caractéristiques individuelles et apprentissages scolaires. Bruxelles: Ed. Labor.

CARDINET, J. (1986). L'interaction entre caractéristiques des élèves et méthodes d'enseignement. In, M. Crahay, & D. Lafontaine (Eds.), L'art et la science de l'enseignement. Bruxelles: Ed. Labor, 129-147.

CARREIRO DA COSTA F, PEREIRA P, DINIZ J & PIÉRON M (1997) Motivation, perception de compétence et engagement moteur des élèves dans des classes d'éducation physique. Revue de l'Education Physique 37, 2 : 83-91.

CARREIRO DA COSTA, F. & PIERON, M. (1992). Teaching effectiveness: Comparison of more and less effective teachers in an experimental teaching unit. In, T. Williams, L. Almond, & A. Sparkes, Sport and physical activity. Moving towards excellence. The Proceedings of the AIESEP world convention. London: E & FN Spon. 169-176.

CARREIRO DA COSTA, F., & PIERON, M. (1990). Teaching learning variables related to student success in a experimental teaching unit. In, R. Telama, L. Laakso, M. Piéron, I. Ruoppila, & V. Vihko (Eds.), Physical education and life-long physical activity. Jyväskylä: The Founndation for Promotion of Physical Culture and Health, 304-316.

CARREIRO DA COSTA, F., QUINA, J. ,DINIZ, J. & PIERON, M. (1996). Feedback pédago-gique: Analyse de l'information évoquée par l'élève lors de séances d'éducation physique Revue de l'Education Physique, 36, 2, 75-82

CLARK, C., & PETERSON, P. (1986). Teachers' thought processes. In, M. Wittrock (Ed.), Handbook of Research on Teaching (3rd edition). New-York: McMillan, 255-296.

COSTELLO, J., & LAUBACH, S. (1978). Student behavior. In, W. Anderson et G. Barrette (Eds), What's going on in gym: descriptive studies. Motor Skills: theory into practice, monograph 1, 11-24.
DOYLE, W. (1986). Paradigmes de recherche sur l'efficacité des enseignants. In, M. Crahay, & D. Lafontaine, L'art et la science de l'enseignement. Bruxelles: Ed. Labor, 435-481.

DUDA, J. (1988). Goal perspectives, participation and persistence in sport. International Journal of Sport Psychology, 19, 117-130.

FELTZ, D.L., & PETLICHKOFF, L. (1983). Perceived competence among interscholastic sport participants and dropouts. Canadian Journal of Applied Sport Sciences, 8(4), 231-235.

FLODEN, R. E. (2001). Research on effects of teaching: A continuing model for research on teaching, In V. Richardson (4th Ed.) Handbook of Research on Teaching. Washington: American Educational Research Association 3-16.

FOX, K., GOUDA, M., BIDDLE, S., DUDA , J. & ARMSTRONG, N. (1994). Children's task and ego profiles in sport, British Journal of Educational Psychology, 64: 253-261.

FREEDMAN, M. (1978). Follow-up of physical education graduates from a teacher preparation program: a descriptive analysis. Unpublished doctoral dissertation, Ohio State University.

GONZÁLEZ VALEIRO M. (2001) Procesos cognitivos y afectivos en el pensamiento del alumno: autoconcepto, percepciones y motivación. In, Benilde Vasquez y otr. (Eds) Bases educativas de la actividad física y el deporte. Madrid : Sintesis, 137-156

GOULD, D. (1983). Future directions in youth sports participation motivation research. In L. Wankel & R Wiberg (Eds.), Psychology of sport and motor behavior: Research and practice, 137-145.

GRANT, B. (1985). The relationship between specialist training and effective physical education teaching in the elementary school. In, B. Howe, & J. Jackson (Eds.), Teaching Effectiveness Research. Victoria, British Columbia: University of Victoria.

HARTER, S. (1978). Effectance motivation reconsidered: Toward a developmental model. Human Development, 21, 34-64

HOUSNER, L., & GRIFFEY, D. (1985). Teacher cognition: Differences in planning and interactive decision making between experienced and inexperienced teachers. Research Quarterly for Exercise and Sport, 56, 45-53.

JANUARIO, C. (1992). O pensamento do professor. Relação entre as decisões pré-interactivas e os comportamentos interactivos de ensino em educação física. Doct. diss., Universidade Técnica de Lisboa.

LEE, A., & SOLMON, M. (1992). Cognitive conceptions of teaching and learning motor skills. Quest, 44, 57-71.

LEVIE, W., & DICKIE, K. (1973). The analysis and application of media. In, R. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally.

LOCKE, L. (1977). Research on teaching physical education: New hope for a dismal science. Quest, 28, 2-16.

LOCKE, L. (1986). La recherche qualitative au gymnase: Vieux problèmes et nouvelles réponses. In, C. Paré, M. Lirette, & M. Piéron (Eds.), Méthodologie de la recherche en enseignement de l'activité physique et sportive. Trois-Rivières: Département des sciences de l'activité physique, Univ. du Québec à Trois-Rivières, 37-61.

LOCKE, L. (1989). Qualitative research as a form of scientific inquiry in sport and physical education. Research Quarterly for Exercise and Sport, 60, 1, 1-20.

LOCKE, L., & JENSEN, M. (1974). Thought sampling: A study of student attention through self-report. Research Quarterly, 45, 263-275.

PARE, C., LIRETTE, M., & CARON, F. (1983). L'analyse du temps de pratique active chez des élèves du secteur adaptation scolaire. Revue des sciences de l'éducation. 9, 401-417.

PHILLIPS, D., & CARLISLE, C. (1983). A comparison of physical education teachers categorized as most and least effective. Journal of Teaching in Physical Education, vol. 2, 3, 55-67.

PIERON, M. (1982). Analyse de l'enseignement des activités physiques. Bruxelles: Ministère de l'Education Nationale et de la Culture Française.

PIERON, M. (1985). Pédagogie des activités physiques et sportives

PIERON (1999). Para una enseñanza eficaz de las actividades físico deportivas. Barcelona : Inde.

PIERON, M., CHEFFERS, J., BARRETTE, G. (1990). An introduction to the terminology of sport pedagogy (Vocabulary used in Research in Teaching and coaching). Liège: CIEPSS-AIESEP (1990), 32 p.

PIERON M, CLOES M, LUTS K, LEDENT M, PIROTTIN V, & DELFOSSE C (1998). Analyse de la prise en considération des caractéristiques individuelles des élèves dans les décisions et les comportements d'enseignants experts et débutants. Rapport d'une recherche réalisée dans le cadre d'une convention passée entre la Communauté française de Belgique et l'Université de Liège (157/96). Liège.

PIERON, M., & DOHOGNE, A. (1980). Comportements des élèves dans des classes d'éducation physique conduites par des enseignants en formation. Revue de l'Education Physique, 20, 4, 11-18.

PIERON, M., & EMONTS, M. (1988). Analyse des problèmes de discipline dans des classes d'éducation physique. Revue de l'Education Physique, £

PIERON, M., & HAAN, J.M. (1980). Pupils activities, time on task and behaviours in high school physical education teaching. Bulletin of the Fédération Internationale d'Education Physique, 50, 3/4, 62-68.

PIERON, M., & PIRON, J. (1981). Recherche de critères d'efficacité de l'enseignement d'habiletés motrices. Sport, 24, 144-161.

ROSENSHINE, B. (1980). How time is spent in elementary classroom. In, C. Denham, & A. Liebermann (Eds.), Time to learn. Washington: National Institute of Education, 107-126.

ROSENSHINE, B., & FURST, N. (1973). The use of direct observation to study teaching. In, R. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand Mc Nally, 122-183.

SILVERMAN, S. (1988). Relationships of selected presage and context variables to achievement. Research Quarterly for Exercise and Sport, 59, 35-41.

S ILVERMAN, S., DODDS, P., PLACEK, J., SHUTE, S., & RIFE, F. (1984). Academic Learning Time in elementary school physical education (ALT-PE) for student subgroups and instructional activity units. Research Quarterly for Exercise and Sport, 56, 66-72.

TELAMA, R., PAUKKU, P., VARSTALA, V., & PAANANEN, M. (1982). Pupil's physical activity and learning behaviour in physical education classes. In, M. Piéron, & J. Cheffers (Eds), Studying the teaching in physical education. Liège: AIESEP, 23-35.

WIDMER K. (1976). Zum Problem des Lehrer – Schüler – Verhältnisses im Sportunterricht. In, E. Beyer & P. Röthig (Eds). Beiträge zur Gegenstandsbestimmung der Sportpädagogik. 13-43.