

Influence of students' cognitive processes on physical education teachers' thought process

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Published online: May 31, 2019

(Accepted for publication April 05, 2019)

DOI:10.7752/jpes.2019.s3127

Abstract

Problem Statement: In recent years, several teaching models, which are designated as meditational integrative models, have emerged. These models advocate the existence of dynamic interactions between cognitive processes of teachers and students in the classroom.

Approach: However, these models still lack empirical validation and need to be further explored in a vast array of educational settings. This will help understand how physical education teachers perceive the existence of dynamic interactions.

Purpose: Therefore, this study aimed to determine whether physical education teachers acknowledge cognitive processes of students and if these cognitive processes influence their own thinking (e.g., planning, thoughts and interactive decisions). Four professional physical education teachers and 198 students from the ninth grade, who are part of the Portuguese public school system, participated in this study. The thoughts of the students were assessed through questionnaires. On the other hand, the thoughts of the teachers were analysed using the following investigation techniques: "thinking aloud" and through the processes of re-memory.

Results: The results show that pre-interactive thoughts and interactive thoughts and decisions made by physical education teachers are not influenced by the acknowledgement of cognitive processes of their students.

Conclusions: Teacher education can provide the necessary conditions for physical education teachers to learn how to develop reflexive skills and to consider teaching a dynamic process that is led by students' cognitive processes. Additional research is needed to further understand and map the relationship between effective physical education teachers' behaviours and students' cognitive processes/responses.

Keywords: teaching models, reflection, pedagogy, physical education.

Introduction

Research on teaching in physical education has been based largely on two paradigms, namely the students' mediating processes and the thinking process of the teacher. Thus, the research done within the field of the paradigm of students' mediating processes has as main aim the study of implicit processes that students use to mediate the instructive stimulus and to produce learning outcomes (Kirk, MacDonald, & O' Sullivan, 2006; Piéron, 1999). Heavily influenced by cognitive psychology, this paradigm is based on the premise that learning does not take place in an automatic way as soon as a content is taught. From the perspective of this paradigm, the teacher's behaviours are considered catalysts of the mediating responses of students and are not exactly the direct causes of learning (Doyle, 1986; Lee, Landin & Carter, 1992; Graber, 2001). It is accepted, therefore, the existence of a dual relationship: one between the teaching and the student's thoughts, and the other between the student's thoughts and their learning (Wang & Ha, 2009). This means that this research program assumes that teaching affects students' learning through their thought processes (Tinning, 2015).

Each of these paradigms seek to underline certain variables, relationships and dimensions of analysis.

In relation to the variables that have been receiving increased attention in the studies about the students' thought processes, we highlight the cognitive, affective and motivational aspects of their thinking (e.g., Scrabis-Fletcher & Silverman, 2017). The factor that distinguishes the research on the teachers' thoughts from the other models is precisely the concern that it has on knowing which are the reasoning processes that occur in the mind of the teacher during their occupation (Ezer, Gilat, & Sagee, 2010). The paradigm of the teacher's thoughts assumes that this is a reflective and rational subject who makes decisions, issues judgments, has beliefs and generates his own routines in relation to his professional development (Kirk, MacDonald, & O' Sullivan, 2006).

It is assumed that the thoughts of the teacher guide and lead the students' behaviours and that those are distinguished in three categories of thought processes: a) planning, b) the interactive thoughts and decisions, c) the theories and beliefs. It is also accepted that these three kinds of thoughts influence one another and have, in

turn, a relationship with the teacher's action. The actions undertaken by the teacher have their origin mainly in their thought processes that, in turn, are affected by actions.

More recently have emerged some research models on teaching nominated mediational integrative (Altet, 1994; Kirk, MacDonald, & O' Sullivan, 2006). These models attempt to integrate and reconcile the guidance of the mediator paradigms centred on the students and teachers. In these models it is advocated the existence of a bidirectional influence between information processing and the students' behaviour, on the one hand, and the teacher's behaviour and thinking, on the other.

Nevertheless, it is important to enhance that despite the integrators mediational models have permitted a more comprehensive conceptualization of teaching they still lack any empirical validation since there are practically no studies that have tried to test if there are mutual influences between information processing and the behaviour of the a teacher and the student.

This research fits the context of the mediational integrators models. Thus the first objective of this study is to describe the thoughts of the physical education teachers during the planning and interactive teaching. In the planning sphere we will try to know the main functions that the Physical Education teachers attach to it, the types that are normally held during the school year, the factors that influence its formulation, the models that they use in their educational practice and even the pre-active thoughts of teachers. We shall seek to identify the thoughts and concerns of physical education teachers during the interactive teaching, as well as the types of interactive decisions of teachers. Another purpose of the study is to verify whether there are interrelations between the thought processes of teachers and students during the teaching- learning process in Physical Education. We want to know specifically whether the acquisition of knowledge by the physical education teacher of the students' cognitive processes influence their own thoughts.

Materials and Methods

Sample

A total of four physical education teachers involved in the Portuguese public school system participated in the present study. These teachers had a degree in physical education and were certified to teach this discipline within secondary education.

Of these teachers, two had eight years of teaching experience, while the remaining two had started their teaching activity that year.

In addition, this study involved 198 students spread over eight classes of the ninth grade, 93 males (47%) and 105 females (53%). The mean age was 14.6 years.

Data collection

Initially the study examined the thinking processes of teachers of physical education during the pre-interactive and interactive teaching.

In collecting data on the planning processes of teaching in physical education we used the following research techniques: interview, document analysis and "thinking aloud". We conducted a structured interview to each teacher in order to obtain information on: key functions of planning in physical education, types of planning that teachers normally held throughout the school year and factors influencing its formulation. In order to better describe the types of planning that teachers realize we conducted an analysis of their written documents.

The planning models that the physical education teachers use in their educational practice, as their thoughts during the pre-active teaching, were examined through the technique of "thinking aloud". Each teacher was observed when planning a teaching unit and its first two classes. This unit and the classes would be developed by each teacher in two classes of students from the 9th grade. During these lesson plans teachers have been asked to "think aloud" so we could record the utterances of their thoughts in audio recordings.

After observing the teachers planning their teaching unit and the two classes, we examined the interactive thoughts and decisions of teachers in developing these same lessons (with one lasting 90 minutes and another of 45 minutes) in two classes of students 9th year. The teaching of the classes was recorded on video and audio. As a technique for gathering information on the interactive thoughts and decisions of teachers we chose the interview of "memory stimulation". We appealed to the effect of the audiovisual recordings we made. In a second stage of the study we sought to investigate whether the acquisition of knowledge of students' cognitive processes by teachers of physical education influences their own thoughts. This second stage took place in two steps. The first was to inform teachers about the thought processes of students in Physical Education (concentration during class, achievement goals orientation, perceived competence, causal attributions of results, attitude towards the subject, perception of the teacher's teaching behaviour, awareness of the objectives of the course and degree of satisfaction with classes). The data on students' thought processes were collected through questionnaires. In a second step we examined again the thought processes of the physical education teachers after acknowledging the cognitive processes of their students during the pre-interactive and interactive teaching.

We observed, in fact, teachers planning another teaching unit and its first two classes. Regarding the interactive thoughts and decisions of teachers, these were also analyzed in this second moment of the study in two lessons for each class of students. The techniques for collecting data on Physical Education teachers' thought processes (planning and interactive teaching) we used in the second time were similar to those we used in the first stage of the study.

Data analysis

In the implementation of all the techniques of gathering information about the thought processes of the physical education teachers the data were recorded on audio recording with the exception of the analysis of personal documents (written plans). The content of these recordings was transcribed into written protocols. The material achieved both from the written protocols and from the written plans, was subjected to content analysis (Sparkes & Smith, 2014). We performed this content analysis respecting the methodological guidelines suggested by various authors, among them Denzin e Lincoln (2011).

Results and discussion

Planning

Functions of planning

We realised that teachers plan their teaching primarily for three reasons. One is related to the fact that the planning ensures that there is a progression from one lesson to another. Another reason concerns the circumstances of the planning preparation to improve the management of the classroom, enabling students to be more time focusing on the tasks of the lesson. A third reason is related to the fact that the planning thereby meet the teachers' own personal needs, reducing their anxiety and reinforcing their confidence or self-assurance in the development of the teaching activity.

Our results are somewhat in line with those of Stroot and Morton (1989). The authors examine the planning strategies used by seven effective teachers of physical education on the elementary level and concluded that the main reasons that prompted the plan are: a) ensure that there is a progression from one lesson to another and that teachers are focused on the task, b) strengthen the confidence and self-assurance of the teacher, c) the pedagogical authorities demand a planning activity.

Factors influencing the planning

The teachers find that several factors influence their planning of teaching. Therefore, one element that most influences their planning is the Physical Education program. Another important factor they take into account when planning are the material resources and the schools' equipment. Students also represent a decisive factor in the planning of education, namely their level of skill and motivation.

Several authors have stated that some of the factors mentioned by teachers in our study influence the planning. In the context of physical education, Siedentop (1998) suggests that the characteristics of students and the material and equipment influence the planning of teaching.

Types of planning

We realized that teachers plan their teaching according to different planning cycles. Thus, during the school year, they use three distinct types of planning: annual, unit of learning (or teaching) and class.

The preparation of the annual plan is the first step of the teaching planning of teachers. The group of Physical Education teachers usually performs this planning before school starts. The annual plan is essentially a chronological map of the different educational activities or didactic units to develop during the academic year and it contains the hours allocated to each activity. This plan contains no information either on annual objectives to be attained either about the details of the action throughout the year.

Teachers undertake the planning of teaching units and their classes individually. We noticed that teachers beginning their careers plan these units in great detail, while teachers with teaching experience do not do it in such a comprehensive way. With regard to the information sources that teachers use to prepare the planning of the didactic unit the following stand out: the annual plan, the Physical Education program, the students, and the material resources available. In relation to its form the planning of these didactic units by inexperienced teachers are detailed listings: the objectives to be achieved in this cycle of education, the general content, the methods of organization of classes. In contrast, the didactic units of teachers with professional experience are composed only of a list or an outline of the general content to deal within each class.

Table 1 - Pre-interactive thoughts showed by teachers

Themes	Novice teachers		Experienced teachers		Total classes	
	N	%	N	%	N	%
1 - Objectives	25	15.2	6	7.4	31	12.6
2 - Contents	44	26.7	32	39.5	76	30.9
3 - Strategies	5	3.0	3	3.7	8	3.3
4 - Instruction	25	15.2	9	11.1	34	13.8
5 - Management	34	20.6	22	27.2	56	22.8
6 - Discipline	8	4.8	3	3.7	11	4.5
7 - Climate	4	2.4	1	1.2	5	2.0
8 - Students	11	6.7	3	3.7	14	5.7
9 - Assessment	5	3.0	0	0.0	5	2.0
10 - Others	4	2.4	2	2.5	6	2.4
TOTAL	165	100	81	100	246	100

It should be also noted that the didactic unit is the most important type of planning education for both groups of teachers (experienced and beginners). Many Physical Education teachers organize their teaching around didactic units. According to Siedentop (1998), the didactic unit is the main type of planning because of three key aspects. Firstly, because many teachers work daily from a unit plan without actually designing plans for each of the classes. Secondly, teachers who develop lesson plans for each lesson prepare a more general plan for the whole unit. Thirdly, the author states that the preparation of a unity plan demands a reflection on the progresses that must be proposed from one class to another in order to achieve the unit objectives.

Planning Models

On the one hand, from the data we observe that the teachers beginning their career follow a model in their teaching planning that relates in many ways to the linear model proposed by Tyler (1949). In fact, while planning the didactic units and lessons these teachers starting point is always the definition of objectives and only then they specify the content of teaching or the learning activities, how to organize students, the time required to perform the activities, the didactic functions of the lesson and the material needed. On the other hand the experienced teachers while planning their teaching do not follow the linear scheme suggested by Tyler (1949). They tend to use more informal planning strategies, with greater flexibility regarding the presence and order of succession of the several stages as it is recommended by technology education. In this way a more rational and rigorous planning should be obtained. In fact we realized that these teachers in their unit/lesson plans do not start from identifying the learning objectives. Otherwise they begin always by specifying the content of education. Regarding the lesson plans the element that teachers attach more importance to is the selection of the student learning activities. Most studies have demonstrated that the physical education teachers when planning do not follow the linear model of Tyler (Ruso Garcia, 1997; Goc-Karp and Zakrajsek, 1987; Placek, 1984; Twardy and Yerger, 1987).

The most frequent thoughts of teachers while planning their lessons are related to its content (30.9%). In descending order of frequency it follows that the teachers seem to focus their reflections of the planning of lessons on aspects concerning management (22.8%). Thirdly, the thoughts of teachers, throughout the planning focus on education category (13.8%). Subsequently, it is observed that the pre-interactive thoughts of teachers focus on the objectives (12.6%). The percentage of pre-interactive thoughts of teachers is relatively scarce and these refer to students (5.7%), course (4.5%), strategies (3.3%), weather (2.0%) and evaluation (2.0%). The data from our study seem to corroborate those obtained in other investigations (Diniz, 1997; Gouveia, 2002; Housni and Griffey, 1991; Gennaro, 1992; Moreira, 1998). These showed that during the planning the major concerns of the Physical Education teachers relate to the content. It has also been often suggested in literature that in the pre-interactive teaching the thoughts of the Physical Education teachers involved in management are the second most frequent category of thoughts (Diniz, 1997; Gouveia, 2002; Gennaro, 1992).

Comparing the profile of teachers thoughts with and without teaching experience during the planning of lessons we observed that the former have a lower frequency of thoughts than the latter. This result can be explained by the fact that teachers with no teaching experience carry out lessons planning much more comprehensive than the teachers with experience. However one must underline that these results are not consistent with those reported in the study by Gennaro (1992). In fact the research conducted by Gennaro (1992), with 22 physical education teachers found that experienced teachers demonstrate in the planning a greater number of didactic thoughts than teaching trainees.

Interactive thoughts and decisions

Thoughts during interactive teaching

The details contained in Table 2 allow us to confirm that the teachers' thoughts and concerns focus mainly on the teaching situation, in aspects related to education. In other words there is a focus on issues associated with the communication of information about the thematic or with the action to guide and monitor the activities of student learning. In fact of the 754 reflections recorded during all the memory stimulation interviews (corresponding to 16 classes, 4 per teacher) about 42% were coded as belonging to an education category.

It follows that during the interactive teaching it is management - referring to the organizational procedures of classroom activities - the content of thought that is the most frequent of the teachers (23.8%). Thirdly, in a view of decreasing frequency, the statements of teachers about their interactive thoughts appeal to elements associated to their content (12.6%). This means that teachers turn to the characteristics, sequencing and structuring of teaching materials or learning situations. In an intermediate position, in terms of how frequently they occur, appear teachers' interactive thoughts related to discipline (maintenance of students in appropriate behaviors, the occurrence of inappropriate behavior by students or the strategies to implement to increase the class appropriate behaviors) and students (student behavior in relation to activities in the classroom), respectively 8.9% and 5.4% of all recorded reflections. In a lower level of frequency appear the teachers' interactive thoughts that are oriented to objectives (1.9%), weather (1.3%), strategies (0.7%) and assessment (0.7%).

We observed that the profile of interactive thoughts of the two groups of teachers that we examined is very similar except in the case of the category "content" which denotes a higher frequency of such thoughts on inexperienced teachers. Our results are confirmed by those obtained in other studies (Gouveia, 2002, Moreira 1998).

Types of interactive decisions

In this study we consider the interactive decisions as deliberated and conscious choices similar to what others have done (Altet, 1994). With regard to its definition we adopted the Clark and Peterson (1986) who understand that interactive decision is a conscious choice from the teacher between acting the same as before and behaving differently. We found that teachers' lessons are generally what they envisioned in their planning. Therefore, teachers are characterized by not taking many decisions from the classroom interactions. Most of the teachers' interactive decisions are immediate (depend on quick judgments based on immediate understanding of the situation) and represent 47.7% of all decisions making in the classroom. Its immediate decisions often arise in reaction to the provision, contributions or student behavior.

Teachers' routine decisions in the interactive teaching are performed automatically and constitute a repertoire of internalized behaviors and occur less frequently than the immediate (40.9% vs. 47.7%). Regarding the teachers interactive reflective decisions it is noted that these are very scarce. Indeed, during the 16 observed classes (4 per teacher) we only recorded 15 reflected decisions (11.4%) that assumed a choice of alternatives and a change of planning in order to better adapt to the situation encountered.

Our results suggest an interpretation that goes in the line of thought and the data from Altet (1994). According to this author in the interactive phase of teaching, teachers are influenced by prior preparation or internalized routines. Teachers have strategies for not undermining their planning or to avoid having to interrupt it during the action because that would imply the "unknown" and "taking risks" and the possibility of facing an unplanned or unpredictable situation. In this regard it should also be underlined that several authors have stressed the need to include interactive decision-making in the programs of teacher training (Marcelo, 1987). In this context, the reflection of Altet (1994, p. 211) seems to us of great accuracy when she says: "To help a teacher to become a professional of interaction and interactive decision-making adapted to learners it will be necessary, above all, to develop from a variety of analysis and case studies, to reflect on the action, in order to become progressively able to perform a reflection of the action that takes into account the complex logic of the situation".

Table 2 - Interactive thoughts showed by teachers

Themes	Novice teachers		Experienced teachers		Total classes	
	N	%	N	%	N	%
1 - Objectives	9	2.4	5	1.3	14	1.9
2 - Contents	60	15.9	35	9.3	95	12.6
3 - Strategies	4	1.1	1	0.3	5	0.7
4 - Instruction	143	37.8	170	45.2	313	41.5
5 - Management	83	22.0	96	25.5	179	23.8
6 - Discipline	31	8.2	36	9.6	67	8.9
7 - Climate	7	1.8	3	0.8	10	1.3
8 - Students	25	6.6	16	4.3	41	5.4
9 - Assessment	5	1.3	0	0.0	5	0.7
10 - Others	11	2.9	14	3.7	24	3.2
TOTAL	378	100	376	100	754	100

We verified the inexistence of differences between the types of decision of Physical Education teachers with and without teaching experience. However it must be emphasized that the influence of professional experience in the content interactive decisions finds some echo in the literature. Marcelo (1987), for example, refers that teachers without experience face difficulties when teaching students because they do not know what their real characteristics are and how to motivate and orientate them.

The thought processes after the knowledge of students' cognitive processes

We conclude that teachers after knowing the thoughts of students do not change the way they plan their teaching. Similarly, we found that the profile of teachers' pre-interactive thoughts was very similar during the planning of the first and second teaching unit of lessons that is before and after learning of the cognitive processes of their students. Furthermore, we realized that in interactive teaching the thoughts and decisions (types) of teachers are not influenced by acknowledge of the cognitive processes of their students.

These results seem therefore not to support the perspectives of meditational models designed by Altet (1994) and Winne and Marx (1977). According to these models there are reciprocal influences between the processing of information and the behavior of the teacher, on the one hand, and the thinking and behavior of the student, on the other. It is likely that one of the justifications for the fact that student's cognitive processes do not influence teachers' thoughts is related to the circumstance of students already reflect suitable and learning facilitators thought processes in physical education. In fact the majority of students showed a good level of concentration during class, a high level of task orientation in physical education, a good sense of competence in this subject, a positive attitude towards physical education, a high degree of satisfaction in relation to the lessons and do not perceive differential treatment by teachers in relation to the best and worst students or boys and girls.

Thus one can argue that teachers faced with these favorable cognitive processes of their students have considered and become aware that they did not need to modify their own thoughts. Only in the case of students' cognitive processes being manifestly misfits is that, perhaps, teachers feel compelled to reflect and readjust their thinking to their experiences.

Conclusions

This study aimed to determine whether physical education teachers' acknowledge the cognitive processes of students and if these influence their own thinking (e.g., planning, thoughts and interactive decisions). The physical education teachers said that they plan their teaching for the following reasons: to ensure that the progression of activity is maintained over the lessons, to ensure better management of interactive educational procedures allowing thereby a more efficient use of the class time, to meet the teachers' own personal needs (to reduce anxiety and improve safety in developing of the teaching activity). Among the factors that influence the decisions on planning Physical Education teachers consider the students (performance level in skill and motivation), the Physical Education program, material resources and equipment. In addition, we observed that the physical education teachers with no teaching experience tend to be more systematic while planning the didactic units and lessons than teachers with experience.

On the one hand physical education teachers without experience in planning and teaching units of classes follow a model that resembles in many ways to the linear proposed by Tyler. On the other hand experienced teachers tend to use in the preparation of didactic units and lessons more informal planning strategies with a greater flexibility with regard to the presence and to the order of succession of different steps. Teachers' pedagogical thoughts with and without teaching experience during the planning of physical education classes focus more often on the teaching contents and on matters associated with the management. The thoughts and concerns of physical education teachers during interactive teaching focus more often on issues related to education. The two groups of teachers showed a profile of interactive thoughts very similar except in the case of the category "content" which denotes a higher frequency of such thoughts on inexperienced teachers. Teachers of physical education after acknowledging the thought processes of their students do not change the way they plan teaching. Teacher education could provide the necessary conditions for physical teachers with different levels of experience to learn how to develop reflexive skills and consider teaching a dynamic process that is lead by students cognitive processes. More research is needed to further understand and map the relationship between effective physical education teachers' behaviors and students cognitive processes/responses.

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