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JUST A MATTER OF CHOICE

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What is learning? What is teaching? What would be students and teachers' role regarding the process of learning and teaching? These are basic questions that have been answered in different ways throughout the twentieth century by various currents of thought in the field of education. As teachers we also tend to respond to them based on our past pedagogical readings and experiences, resulting in a plurality of positions where cognitivism, socio-cultural, behavioral, and political aspects can be appreciated jointly or to some degree polarized relative to each other.

In the early 1990s, Gerard Vergnaud also contributed to these questions in formulating The Conceptual Field Theory. Although the foundations of this theoretical body, in a first reading, are aligned with the Piagetian tradition, later developments contemplated the social construction of action schemes and, consequently, of the amalgam of concepts and thought operations that confer operability to human actions.

Vergnaud gives special attention to the processes of concept formation. For him, Piaget, even though has contributed fundamentally to developmental psychology in studying the logical structures of thought, he would not have paid attention to the contents that emerge from the school tasks in their didactic contexts.

The cognitive process is not only conceived as responsible for functioning in the face of the situation, but also as a generator of intelligent forms of human activity organization during its experience articulating concepts that are organized in a network.

The core of this theory rests on the idea of concept fields. A concept field is, at the same time, a set of situations and a set of concepts, all related to each other. The meaning of a concept cannot be analyzed through a single situation and, conversely, a situation cannot be analyzed by means of a single concept, but rather of several of them, forming systems. In this theory the formation of a concept is associated with the resolution of a given situation in an articulated way to the operations of the thought and the handling of symbolic representations.

Situations are understood as tasks in their circumstantial contexts. Thus, tasks should be considered not only in terms of their utterances, but also the way they were presented and conducted either by the teacher in the context of the classroom or by the researcher in broader contexts.

The group formed by the thinking operations (comparisons and construction of hypotheses, for example) and the conceptual contents is called operative-invariant. The way in which operational invariants interact with each other and with the symbolic representations characterizes types of conduct guided by internal representations while confronting situations. These behavioral forms are denominated by Vergnaud as accessible schemes to the subject, acting as effective organizers of conscious thought and action.

The action plans would be the conduct types which, saturated of conceptual content, would characterize the action of a subject given a class of situations, acting as the main designer of the human way of thinking.

Subsequent additions made by Bronckart, Marcel and Verdier concern about collective action and in building collective schemes. The collective activity of collective action stands out, taking as an example practice found with bees, what act collectively oriented only by their

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survival instinct, or towards a determined goal, which would be a collective activity. On the other hand, collective action would be linked to a conscious way of acting, that is, with goals and anticipations on which the members are aware of and, therefore, have control over their forms of participation in that activity. It seems acceptable, starting from this definition of collective action, that individuals who experience a particular situation in a group act according to their individual consciousnesses, or individual schemes, from which a "collective consciousness" or collective scheme originates, engine of action.

The patterns of organization of individual schemes constitute the specificity of the collective scheme, the last one with a cognitive surplus which, in turn, would also influence individual patterns back. That is, there would be an influence (and not a simple joining) of individual schemes in the constitution of the collective scheme and, reciprocally, the new individual schemes would have been influenced and modified by this collective scheme. It is assumed that students in a group situation, for example, when carrying out some proposed task may constitute, with their individual schemes, a collective scheme that, in turn, influences and modifies the individual schemes, causing a movement in their learning.

In face of these theoretical assumptions, I have been concerned about how students build collectively explanatory models related to structure and reactivity in chemistry, trying to understand which factors influenciated on its progress and regression in this concept field and which are the learning mechanisms, without despising the cultural aspects that influence the conceptualization process.

Considering that students can construct less labile, richer and more coherently articulated schemes of action in the field of structure and reactivity through action on problems combined with confrontation and integration of ideas, the following have as possible points of reflection:

- On aspects related to course management: how to manage infrastructure, considering the number of students per classroom without compromising the development of these schemes?
- How to manage human resources: should the collective construction of schemes be tutored? If so, what is the role of the most experienced subjects here understood as teachers and staff of teaching assistants in the classroom?
- On teaching strategies: what is the role of problem solving in the classroom and the role of mediations towards learning?
- Considering a world in rapid and constant transformation and the appreciation of interdisciplinarity: the idea of fields of concepts is especially useful for studies on how concepts from different areas can be articulated while focusing attention to the tasks that must be solved by those who learn without necessarily defining levels of interdisciplinarity in a formal way.

Back to the top: What is learning? What is teaching? What would be students and teachers' role regarding the process of learning and teaching? I made my choices as a researcher to try to answer those questions anyhow. I believe that one of the challenges of teaching research in this early 21st century is to narrow the dialogues between theoretical references. Let's all together and each one in his own way and with his set of references, advance on the most different issues and thus contribute to teaching and research.

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