

Title : A Comparison of the French and Western Swiss Science Curricula as the First Step for Analyzing Classroom Practices

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This paper presents the first step of a doctoral thesis aiming at characterizing the transition between primary grades and lower secondary grades about science education, both in France and in Western Switzerland. At this stage, we focus on a comparison of the curriculum texts available in these two countries in order to provide the background of the actual classroom practices in these countries. This study also contributes to a broader international project investigating the role of teaching traditions in learning in physics, chemistry, biology, physical education and health in Sweden, Switzerland and France that aims to identify the teaching traditions in the classroom practices of three countries (France, Sweden, Switzerland) and to analyze the limits and possibilities of each of the tradition regarding learning (Almqvist, 2012).

According to Lidar and al. (2012) and Lundqvist et al (2012), a teaching tradition shapes the curriculum in the sense that it contains ideas about the goals of science education and therefore about the kind of skills expected from the students in order to achieve these specific goals. Östman (1996) has defined three different teaching traditions in science education: academic, moral and applied. The academic tradition spreads the idea that the mere products and methods of science (laws, theories, scientific method) are worth to be taught. Lidar and al. (2012) have split this tradition in two parts: one that integrates scientific methods and that includes the epistemological dimension of scientific knowledge (the academic constructionist tradition) and another one that only concentrates on the products of science (the academic positivist tradition). The applied tradition focuses on explanations about usual technical objects, so that could help to increase the student's autonomy in their everyday life. The moral tradition opens up to the relationship between science and society and makes students think about the decisions that they will have to make as future citizens.

In the light of the didactic transposition theory (Chevallard, 2007) and the joint action theory in didactics (Sensevy, 2012), Ligozat (2011) showed that the logics of the classroom actions in teaching mathematics rely upon certain pedagogical/ideological pre-constructs, beyond the mere teaching of the epistemic contents. In other words, the selection of what is to be taught in the classroom in a given country tends to be tuned by certain ways of teaching a subject, that are partially implicit in the curriculum texts and teaching materials.

Regarding science teaching in France, Venturini and al. (2014) showed the influence of the epistemological teacher's point of view about the knowledge construction on the development of an inquiry in the classroom. The teacher cannot help transforming the inquiry process into an inductive approach, on the basis that knowledge should be built from practical experiments and not from preconceived opinions. Thus what is implicitly taught about the nature of science is rather

shaped by personal beliefs than by the curriculum standards, even if the teacher feels concerned about the institutional requirements.

Against this background, we analyse both the French and the Western Switzerland curriculum texts with respect to the following questions:

- What do the French curriculum and the Western Swiss one have in common? In what ways do they differ, regarding the contents, the objectives of science teaching and the ways science should be taught?
- Can we identify one (or several) teaching tradition(s) in the text of each curriculum? Are these traditions more or less obvious between the primary school and the lower secondary school curricula?

Our study encompasses both the general recommendations about teaching science and the topics included in the syllabi dealing with physics and chemistry in the institutional texts available from the upper primary school to the lower secondary school (grade 3 to grade 9) in France & Western Switzerland.

The following criteria are used :

- The goals of science education as presented in the global recommendations
- The organization, planning and division of the content itself. Specific analyses are conducted about the topics of matter and energy that will be compared in the classroom practices, later on.
- The teaching methods of science and the description of the scientific method itself
- The learning outcomes expected from the students in terms of concepts, skills and/or scientific literacy requirements.

Through all these criteria, it is possible to identify certain teaching traditions in science education, in both French and Western Swiss curricula. Indeed, we could notice that the academic tradition is rather strongly embedded in both cases, whereas the applied and the moral traditions are more variably observed.

At primary school, the latter two traditions were found in some parts of both curricula, especially those dealing with matter, energy and technical objects. At lower secondary school, the situation is more subtle: in some cases, the relationship between science and society and the role of science in the public choices are highlighted in the global recommendations and then ignored in the detailed sections of the content to be taught. This inconsistency makes it very difficult to predict whether the moral tradition will be a part of the actual teaching practices or not. These first results which will be deepened in the presentation tend to confirm the importance of characterizing the transition between primary and secondary school from the analysis of classroom practices.

However, the occurrence of the teaching traditions in the curriculum texts will have to be considered in the light of classroom observations and the analyses of the teachers' actions. Indeed, on the one hand, the expected learning outcomes mentioned in the two curricula are not very clear regarding teaching traditions. On the other hand, we expect many gaps between institutional requirements and classroom practices, especially since these curricula are both

new. Our contention is that this curricular analysis is nevertheless useful to outline the backdrop of the next analyzes of classroom practices in both countries.

Almqvist, J. (2012). Teaching traditions and learning. Comparative didactic analysis of science education and physical education and health in Sweden, Switzerland and France - . Project funded by the Swedish Research Council (2013-2018).

Chevallard, Y. (2007). Readjusting Didactics to a Changing Epistemology. *European Educational Research Journal*, 6(2), 131- 134.

Lidar, M., Karlberg, M., Lundqvist, E., & Almqvist, J. (2012). Manners of Teaching and Teaching Traditions in Science Education: What Do Teachers Emphase? Paper presented in Network 27 Didactics / Learning and Teaching. ECER, 18-21 sept., Cadiz, Spain.

Ligozat, F. (2011). The Determinants of the Joint Action in Didactics: the Text-Action Relationship in Teaching Practice. In B. Hudson & M. A. Meyer (Éd.), *Beyond fragmentation: Didactics, Learning and Teaching in Europe* (p. 157- 176). Opladen & Farmington Hills MI: Barbara Budrich Publishers.

Lundqvist, E., Almqvist, J., & Östman, L. (2012). Institutional traditions in teachers' manners of teaching. *Cultural Studies of Science Education*, 7(1), 111-127.

Sensevy, G. (2012). Patterns of Didactic Intentions, Thought Collective and Documentation Work. In G. Gueudet, B. Pepin, & L. Trouche (Éd.), *From Text to « Lived » Resources* (Vol. 7, p. 43- 57). Springer Netherlands.

Östman, L. (1996). Discourses, discursive meanings and socialization in chemistry education. *Journal of Curriculum Studies*, 28(1), 37- 55.

Venturini, P., Tiberghien, A., von Aufsnaiter, C., Kelly, G. & Mortimer, E. (2014). Analysis of teaching and learning practices in physics and chemistry education: theoretical and methodological issues. In C. Bruguière, A. Tiberghien & P. Clément, (Eds.). *Topics and Trends in Current Science Education: 9th ESERA Conference Selected Contributions* (pp. 469-485). Springer Science+Business Media Dordrecht. DOI 10.1007/978-94-007-7281-6_29