



## Engaging discussion about climate change in a Quebec secondary school: A challenge for science teachers



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### ARTICLE INFO

Available online 1 August 2014

#### Keywords:

Agency  
Conflict of motives  
Double stimulation  
Environmental and science education  
Teaching practices

### ABSTRACT

The article analyzes the process of double stimulation in a two-year effort of two science teachers to create and implement a new approach in their teaching. Double stimulation was triggered by three types of conflicts of motives, the first one related to teaching strategies, the second one related to the concept of environment itself, and the third one related to values promoted at the school. The teachers constructed a second stimulus in the form of an open-ended teaching sequence to address the issue of climate change. This artifact enabled the teachers to take agentic actions and implement a novel instructional strategy in their classrooms. As the teaching sequence was progressively implemented and reformulated, pressures from the parents and the school management led to the emergence of new conflicts of motives.

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### 1. Introduction

There have been calls to reform curricula in Quebec, Canada, in order to promote environmental education (Barma, 2011). Since 2006, science teachers are expected to ask open-ended questions related to controversial environmental issues to foster learning science in context (MELS, 2007). Most teachers, however, are still struggling with the fact that they have to move away from a lecture-based teaching style (Barma, 2008). To actually implement such a practice in a classroom presents a challenge to the majority of teachers who focus on disciplinary content and evaluation (Barma, Power, & Daniel, 2010; Urgelli, 2008).

Two science teachers contacted our research team, asking for support at a time when new curricular prescriptions were being implemented and required important adjustments to their current practice. They appeared to be dealing with a conflictual situation at work. As we will document in the following sections, the science teachers were struggling with the way to implement an open-ended teaching approach, their conception of environmental issues and facing tensions coming from their school, where parents and the principal expected them to maintain tight control over their students.

Understanding the practice of science teachers is complex and at the heart of societal debates in Quebec (Conseil supérieur de l'éducation, 2013). Science teacher training in Quebec demands the acquisition of disciplinary knowledge as well as pedagogical skills. In our part of the world, there are two ways of obtaining a high-school teaching certificate. The most common is to enroll in a four-year university teacher-training program where students acquire competencies in their respective disciplinary fields and in pedagogy. The second possible avenue is to complete a strong disciplinary three-year university instruction and enrich it with courses in pedagogy. One of the participants, whom we will identify as Teacher A, did not yet obtain his teaching certificate but held a teaching position in a school; Teacher B, for her part, had just graduated and was fully qualified to teach.

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To put some of these elements in context, here is an excerpt of a conversation that took place at school in 2010. In the conversation, the researcher discussed with the two participants as they faced some difficulties in bringing forward environmental issues into their practice.

- Researcher: How would you define a controversial issue?
- Teacher A: Is it a question where there is no consensus to be found, on which there are opposing views? For example, shale gases, climate change. Do we have to do something about it? Are we responsible? Is it already too late?
- Researcher: Are you at ease talking about environmental issues?
- Teacher B: I am not at ease talking about politics... So far, I know there is interest in discussing the environment but unfortunately, I don't think there are projects available and ready to reach 36 students.

In the above, some conflictual issues were clearly spelled out by the participants. Although one of the goals is that teachers address environmental issues with their students, it seems that:

- Teacher A provided a definition of a controversial issue by asking a question himself and seemed unsure about his own conception of the definition;
- Teacher B was not at ease with discussing politics in a science class and was looking for some kind of a “fast track” teaching plan that she could use with her 36 students.

Both teachers were obviously not in their comfort zone when it came to defining controversial issues. “*I define myself as an environmentalist... no not true.*” Each of them was weighing opposing motives against each other as they hesitated about the way they could address the issue in their class: “*I am not sure I understand how, but I will do it anyway.*”

The teachers were also anxious regarding pressure from parents and the principal who wanted them to keep a tight control over their students:

- Teacher A: I would say that at the beginning of the year, when we talked about our project with the principal, we sensed that she was worried. We needed to reassure the principal about many aspects and especially on the issue of control. The vision of a teaching practice is a classic one, I would say, like making sure the students remain seated during the class.
- Teacher B: We have to make sure that we will not disturb the way things are done in this school. We must not bother students, or parents who will tell us that it is not the right way to teach their kids.

The impression we are left with after reading the excerpts is that both teachers felt that they were at the mercy of their work environment. At the beginning of the 2010 school year, the participants did not seem to know how to give meaning to the curriculum prescriptions. They had to address controversial issues, change their teaching approach in order to engage the students in open-ended questions and accept the principal's and parents' requests without knowing how to do so. Our first interactions with them led us to focus on a problematic situation emerging in the form of conflicts of motives they were facing at work trying to find out how they would break away from this problematic situation.

This paper presents how the principle of double stimulation, stemming from conflicts of motives, worked in the decision forming process and how a second stimulus was progressively redefined and reformulated over two years. That second stimulus would ultimately take form in a teaching sequence addressing the issue of climate change, meeting an educational challenge in environmental and science education. Interestingly enough, the resolution of the conflicts of motives they dealt with led to more acute ones at the end of the 2012 school year.

## 2. Conflicts of motives as key components of double stimulation

In addition to understanding the building of higher mental functions by means of two series of stimuli, Vygotsky's principle of double stimulation also refers to the way individuals may deal with a conflict of motives (Sannino, submitted for publication). The conflictual situation constitutes the first stimulus and is a necessary element to trigger transformative agency (Engeström & Sannino, 2013). For example, a teacher might employ a pedagogical strategy as a second stimulus, investing it with meaning in order to make and act on a conscious decision. As Vygotsky pointed out: “Duality is at the very foundation of the volitional act, and this duality becomes especially prominent and vivid whenever several motives, several opposing strivings, clash in our consciousness” (Vygotsky, 1997, p. 167–168). We borrow Engeström and Sannino's (2013) definition of transformative agency as a way of “dealing with contradictory motives by employing auxiliary cultural means to make conscious decisions and turn these decisions into action” (p. 3).

Building on Leont'ev's (2005) reflections on conflicts of motives, Sannino (submitted for publication) brings to our attention that engaging into volitional actions is more than just about choice and decision-making. These premises constitute a solid ground to investigate how agency emerges when teachers feel trapped in their practice as they address problematic issues at work and demonstrate a will to gain control over them. Amidst contradictory motives and choices to make, how do volitional actions take shape? How do individuals gain self-control over a difficult situation?

We will analyze our data following some key elements brought forward in Sannino's (submitted for publication) model of double stimulation as a mechanism of will formation. For example, a teacher could feel at the mercy of his or her working environment as he or she would not only be expected to have students discuss controversial issues and focus less on content but would also have to make sure that students perform at a mandatory certifying provincial exam assessing content only. Eventually, the teacher would engage in controlling his or her practice by resolving the conflicting motives for his or her own purposes, not yet knowing how he or she would

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