

Global warming: a case study of eight French teachers' involvement in education for sustainable development

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Theoretical background and rationale

As Sadler and al. (2006) noticed, *part of the complexity inherent to socioscientific issues stems from their inevitable associations with ethical considerations [...]. Ethical concerns are among the most important factors for individual socioscientific decision-making.* Fixing attention on mediated and controversial discourses regarding the human responsibility on global climate change (GCC) shows that ethical and epistemological conflicts are expressed. That's why we consider connections between climatic risks assessments and the political project of sustainable development as a socioscientific issue. Because global warming is not a free-value issue, in an educational project for citizenship facing this topic, values should not be excluded: *values help establish how science is conducted and help determine how results are interpreted and used* (Sadler and al., 2006).

In France, ten years after the Rio summit (1992), the promotion of education for sustainable development (ESD) defined national standards (Ministère de l'éducation nationale, 2004 and 2007), perhaps with *the intention of persuading people [...]* to promote the policies that will help to alleviate socioscientific problems (Gayford, 2002) like GCC. But several stakeholders declared that the educational aim could not be teaching persuasive choices but rather an education for responsible choices, enabling the democratic empowerment of students. To solve this ambiguity, they suggested teachers maintain an attitude of neutrality in order to avoid students' indoctrination (Cotton, 2006). This neutral position was criticised by Kelly (1986) and Oulton (2004). According to them, if teachers make their own position explicit facing a socioscientific issue and encourage students to criticize them alongside other positions, then youthful citizens will be aware of potentials bias and encouraged to develop an independence of thought, understanding the complexity of the issue studied.

We consider that ESD must be a critical education *for democratic and transformative action* (Giroux, 1987) in which teachers could adopt *commitment impartiality* around democratic values, rather than the *myth and misguidance of a value-free and non disclosing neutrality*. The educational aim is to *catalyze the critical intelligence and civic courage of both youthful citizens and ourselves* (Kelly, 1986).

Purpose and research question

Our research aims to analyze and discuss this controversy regarding educational aims and teachers' attitudes. Through the proposition of including the GCC issue in French ESD program, our research question is how eight high school teachers deal individually and collectively with the complexity of a not-free value issue and with the expression of their own beliefs in an educative project.

Methods

Involved in an annual work contract with the French institute for educational research (INRP), two groups of four high school teachers (teaching natural science or social science) have accepted to develop resources related to GCC issues, in order to contribute to teacher training for ESD.

<i>Teacher Sex</i>	<i>Subject taught</i>	<i>Area of exercise</i>	<i>Highest degrees</i>	<i>Levels of experience</i>
<i>F</i>	Physics - Chemistry	<i>High school in Grenoble</i>	<i>Bachelor</i>	<i>15 years</i>
<i>F</i>	Biology - Geology		<i>Master</i>	<i>5 years</i>
<i>M</i>	History - Geography		<i>Master</i>	<i>4 years</i>
<i>F</i>	Economics - Social sciences		<i>Master</i>	<i>4 years</i>
<i>F</i>	Economics - Social sciences	<i>High school in Lyon</i>	<i>Bachelor</i>	<i>26 years</i>
<i>M</i>	Physics - Chemistry		<i>Master</i>	<i>12 years</i>
<i>M</i>	Philosophy		<i>Bachelor</i>	<i>12 years</i>
<i>M</i>	History - Geography		<i>Master</i>	<i>6 years</i>

Table 1: high school teachers' background information

For eight months, from November 2006 to June 2007, we interviewed them on *educational aims, mediated supports choices* and *socioscientific discourses* on their teaching proposals published on a public website for teacher training. Each teacher produced an average of nine proposals and was interviewed twice, for individual semi-structured interviews lasting about 90 minutes. For each group of four teachers working in the same high school, two workshops of two hours were organized in June 2007, an occasion to highlight the *dominant doxa* regarding ESD. All these exchanges were audio-recorded and transcribed to analyse the teaching model supporting proposals and the teacher's pedagogical involvement on ESD.

Results

According to the discipline they taught, teachers have produced disciplinary resources exploring concepts like the physics of the greenhouse effect, the global carbon cycle, the geography of climate risks, the demography, sustainable development and economy, or the philosophical analysis of the relationship between nature and technology.

But independently of the subject taught, different aims for ESD appear for each teacher. Adopting a neutral and balanced attitude (the mythic *neutral impartiality* according to Kelly, 1986), in order to avoid using their position of authority to promote their own opinions, teachers all declared they wanted to help students develop civic capacities critics.

For half of the teachers, convinced by man-made climate change, this socioscientific issue must contribute to make students aware of the environment, like a pretext-object used to achieve an *interventionist educational aim*. They used partial mediated supports like the documentary film *an inconvenient truth* (Guggenheim, 2006) where controversies are excluded. Medias are used like allies, especially when mediated beliefs about GCC are shared with the teacher. In this case, the teacher followed an *exclusive partiality* attitude (Kelly, 1986).

Some other teachers achieved a *positivist educational aim* when they considered that they were not able to deal with complexity and ethical considerations of the socioscientific issue. Because they exposed students exclusively to official and consensual disciplinary content, their attitude was an *exclusive neutrality* (Kelly, 1986).

In the same high school in Lyon, geography and philosophy teachers proposed a *critical educational model* where controversies of the question were not avoided. In an individual but multidisciplinary approach facing epistemological and ethical considerations, different mediated viewpoints were exposed. Both teachers adopted an attitude that could be qualified as *impartial commitment* (Kelly, 1986). But with an educational approach far from interventionist national ESD standards adopted by his colleagues, the geography teacher felt then a risk of marginalization.

During collective workshops, the individual tendency to maintain the integrity and the legitimacy of his/her own discipline lead to a pluridisciplinary fragmentation of socioscientific complexity. But in this context, all teachers adopted a common critical educational aim. They collectively decided to deal with topics related to political solutions presented like alleviations against GCC (nuclear energy in the high school of Lyon, and biofuels in Grenoble). Excepting the philosophy teacher who was convinced by the necessity of adopting an attitude of impartial commitment facing socioscientific controversies, they all supposed that they had to expose disciplinary and free-value knowledge, adopting a neutral attitude in debates, in order to leave students developing critical viewpoints by themselves about complexity and the values of the GCC issue.

Conclusions and Implications

It seems that many parameters must be taken into account to analyse declarations and teaching proposals of the eight teachers. In the teaching context, they dealt with the balance between their *ecological beliefs* of human responsibilities on socio-environmental crisis and their *epistemological viewpoints* of the scientific assessments. Their visions of the *teacher's attitude* facing a controversial and not free-value topic must also be taken in account. All these parameters lead to three kinds of educational aims, where different attitudes are related to the *supposed influences* that the teacher could have on students' viewpoints.

Even if the disciplinary fragmentation of complexity could be an impediment for integration of a socioscientific topic, we noticed that collectively a shared critical educational aim is expressed which erased the interventionist model. Through debates between teachers, the collective situation could indicate possible progress toward a democratic citizenship education.

For a teaching inclusion of complex data and ethical considerations, we have seen that *impartial commitment* attitude was not unanimously adopted and so probably controversial. If we refuse to debate collectively with ethical considerations that are among the most important factors for individual decision-making, especially around the perspective of a common future of humanity, we risk rendering the democratic project of a civic ESD insignificant. Because excluding complex and ethical dimensions from teaching lead to a depoliticization and a disempowerment of teachers' activities, and so impede the student's training for active participation in a society largely influenced by science and technology, a breakdown of the traditionally supposed free-value teaching is necessary. Today there is a need for debates on the professional ethic for teaching a socioscientific issue, in order to restore the global meaning of citizenship in science education and to unlock a potential for pedagogical innovation.

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