

The socio-scientific issues (SSI) in the teaching of natural sciences (secondary education)



INSTITUT NATIONAL DE RECHERCHE PÉDAGOGIQUE

Objective of the survey

The project "Scientific Knowledges and Teaching" supported by the Institute of the sciences of the communication (ISCC) which is part of the CNRS (National Center for Scientific Research, France) is interested in disseminating scientific knowledges. The investigation carried out within the research team ACCES (Updating knowledges of sciences teachers) of the INRP (National Institute for Research in Education, Lyon, France) investigates the teaching practices which contribute to the "dissemination of scientific knowledges" in the teaching of the natural sciences to middle and high schools. We propose a focus on the socio-scientific issues in the training in natural sciences.

Problematic

Given the increasing importance of topical socio-scientific issues in the school field, the teachers are more and more faced with scientific knowledges not yet stabilized (Global climate change, GMO, etc.) and with social knowledges and concerns expressed by the pupils to the teacher in classroom.

- What are the perceptions of investigated teachers about disseminating scientific knowledge ?
- What are socio-scientific issues discussed in natural sciences learning ?
- What are the teaching practices to deal with socio-scientific issues in classroom ?
- What are difficulties met by teachers ?
- And what aids would they expect ?

Methodology of the survey

The methodology relies on a survey by questionnaire intended for the natural sciences teachers of the secondary education (Middle school and High school)

Various types of questions compose the questionnaire :

- ♦ Single or multiple choice questions including scales requesting a ranking or rating
- ♦ Open end questions to collect some elements about teaching practices and the expectations of the teachers investigated (answers were the object of an analysis of thematic contents)
- ♦ Lists of propositions concerning representations, attitudes and opinions for which the respondents were asked to position themselves on the Likert scale ("Agree", "Disagree", etc.)
- ♦ Grids self-assessment of skills with scales to estimate the "feeling of competence" of the teachers and to identify difficulties met in teaching and training needs

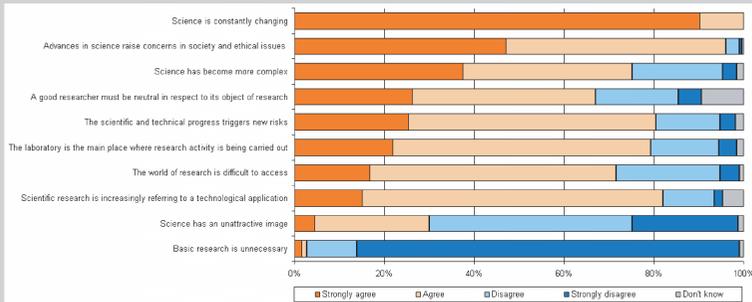
530 answers to the questionnaire were obtained.

Socio-demographic characteristics of the investigated population

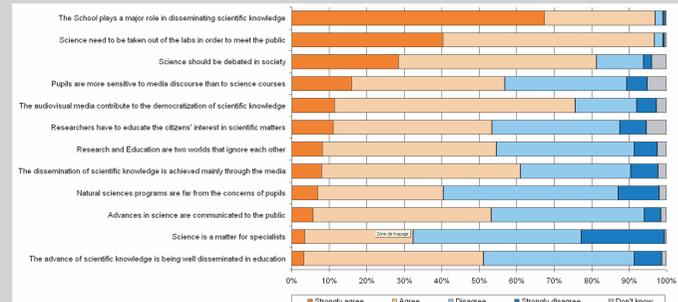
65 % teachers are women
The average age is 39, 5 years
55 % of the teachers are in middle school, 37 % in high school and 8 % are in two types of schools
Nearly 50 % of the teachers are in a school located in urban areas and 30 % are located in rural areas

Some perceptions of teachers

About science in society



About disseminating scientific knowledge



Perceptions of the teachers of SSI

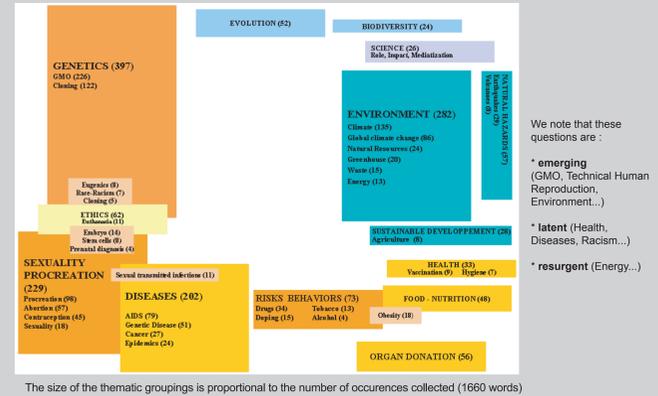
According to teachers, these issues are :

- containing social and subjective implications by their positive or negative consequences on individual, social, economic and environmental levels
- raising ethical issues
- typically related to Health and Environment
- controversial among scientists and actors of society
- subject to extensive media coverage

Furthermore, the teachers consider that the acquisition of a scientific culture would be necessary for citizens to facilitate their understanding of science issues.

According to Legardez & Simmoneaux (2006), such issues raise debates because of controversies (conflicting scientific evidence) at the level of scholarly knowledge and social practices ; they are pervasively present in the social environment and media, and school actors (pupils and teachers) are confronted with these issues, and teachers often feel unprepared to address them in the classroom.

Topical socio-scientific issues in the classroom

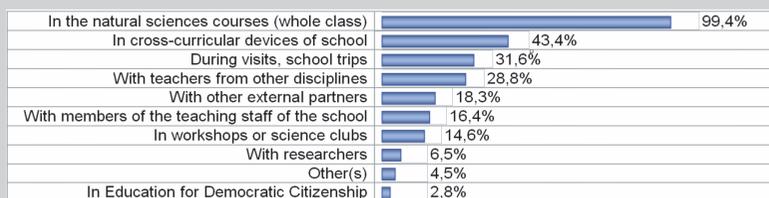


We note that these questions are :

- * emerging (GMO, Technical Human Reproduction, Environment...)
- * latent (Health, Diseases, Racism...)
- * resurgent (Energy...)

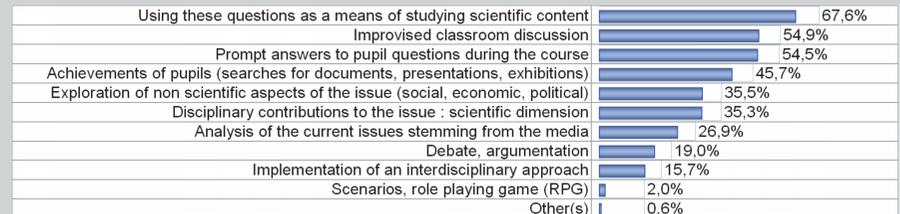
Contexts in which SSI are discussed in natural sciences teaching

The context of the whole class prevails over other work contexts proposed in the survey to address these issues. The cross-curricular devices of National Education and extra-curricular activities (visits, school trips) represent other opportunities. Workshops or science clubs seem to offer little place to these issues. Education for Democratic Citizenship is rarely used. Teachers from other disciplines and members of the school staff are occasionally involved as well as external partners. The cooperation with researchers is rare.



Methods for studying SSI in courses

Teachers often use SSI as a means to study science content. They also approach them in the form of prompt answers given to pupils and improvised classroom discussions. 35 % remain centred on the disciplinary aspect of the issue by presenting complementary contributions on the scientific dimension. In an identical proportion, the teachers declare that they investigate the non-scientific aspects of the issues (economic, social and political dimensions). Only 16% of them set up an interdisciplinary approach. Therefore, the disciplinary approach seems to prevail.

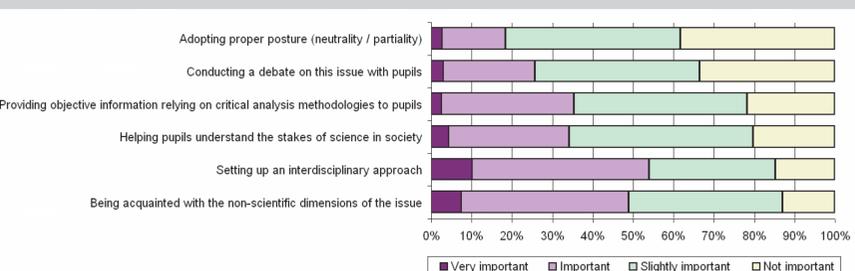


Impact of SSI on pupils

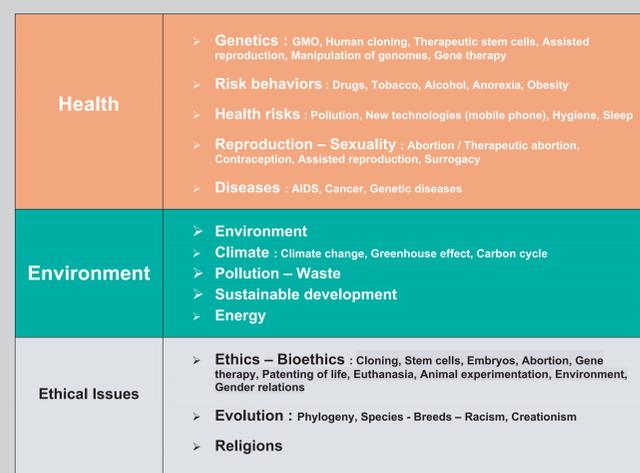
The teachers consider that modifications are especially noticed about attitudes in front of media and social skills and citizenship of the pupils (to form an opinion, to consider the problems of science, to develop critical thinking). In second position, it is recognized to facilitate understanding of the Science and appropriation of the scientific knowledges. Some teachers emphasize the educational value of socio-scientific issues in classroom that can generate reflection, debate, argumentation, and help to understand the world's complexity or learn how to make the "right" choice as a citizen.

Difficulties met by teachers in respect to SSI in natural sciences teaching

If 29 % of the teachers declare feeling "completely" comfortable with socio-scientific issues in science teaching, they feel "well enough" comfortable for the majority (61 %) and 10 % declare "not really" comfortable with these issues. For about 30 % of the teachers, to lead a debate in classroom represents a difficulty. To help pupils understand Science and setting up a critical approach of topical scientific information do not constitute easy tasks for a third party. To possess knowledge other than scientific to approach social, ethical, economic and political dimensions of a scientific issue as well as set up an interdisciplinary approach represent important difficulties expressed by half of the teachers.



Which thematics related to SSI appear to be difficult for teachers ?



How to prepare teachers to handle socio-scientific issues ?

Some of their expectations :

- ✓ Being acquainted with scientific controversies and risks linked to science advances
- ✓ Having objective and regularly updated sources of information
- ✓ Learning specific teaching strategies as conducting a debate in classroom
- ✓ Training in Health Education (knowledge about addictions)
- ✓ Possessing multidisciplinary knowledge : History - of Science, Religion, Psychology, Economics, Laws

Muriel POMMIER, research officer
Valérie FONTANIEU, statistical analyst
Réjane MONOD-ANSALDI, natural sciences teacher
Charles-Henri EYRAUD, physics teacher
Séverine BRESCHIANI, International Affairs Department
Françoise MOREL-DEVILLE, project officer

Contact
muriel.pommier@inrp.fr
19 allée de Fontenay
69007 Lyon, France

International Conference " Environment and Health in Science Education " in Zürich 18. - 21. August 2010

