The teaching of socioscientific issues in interdisciplinarity biology-philosophy, an ethical stake and citizenship issue

Saida Kacem[1], Laurence Simonneaux[2]

(1. ISEFC, University Tunis I, La Gazelle 2083, Tunis;

2. ENFA, Castanet-Tolosan Cedex 31326, France)

Abstract: This research starts from a relatively optimistic thinking based on the fact that the teaching of the socioscientific issues through the practice of argued debates can contribute positively towards education in scientific citizenship. The teaching of techno-sciences raises topical questions which interfere in the classroom and at the same time carry scientific and social controversies within which it is possible to anchor the construction of new knowledge and citizen's behaviours. These controversial issues raise more questions and motivate the pupils more. Setting these topics for debate in the classroom could "restore, if only a little, what" Astolfi likes to call "the taste of knowledge (savoirs) 'since the two words (saveur and savoir) come from the same Greek root' sapere", as Astolfi, 2006, marvellously put it in the foreword to the recent book *How to teach socially acute questions* (Legardez & Simonneaux, 2006). The present contribution is research in progress. It questions a protocol of training of future teachers. The principal objective is to train the pre-service teachers to teach socioscientific issues (SSI). Like Funtowicz and Ravetz (1992, 1993), we think that the SSI belong to "Post-Normal-Science". Accordingly, we will study the contribution of the training in epistemic, social and ethical values in the analysis of socioscientific issues by biology and philosophy future teachers. We will analyze the evolution of teacher trainees' decision-making after training on 3 socioscientific issues (the oncomice, the baby drug, the therapeutic cloning) and the impact of this socioepistemologic and ethical training on their teaching practices.

Key words: socioscientific issues; post-normal-science; values; citizenship

1. Introduction

The choices that our companies have and will have to make more and more, those to which the individuals are each day more closely confronted require that the education of the person and the citizen gives to each one the means of having its freedom. The democracy is at this price: without what the major decisions instead of being the business of all will be the privilege of some.

How consequently teaching could conceal this task? How, for example, the professor of biology who evokes his/her pupils, within the framework of the program, the genetic diseases, the new capacity offered by the genetic engineering, could it be unaware of the psychological impact and the moral stake of the training which it will give? Can it not indicate the individual and collective problems of choice and standards which are implied? On subjects where, very often, knowledge and the facts are the business of the only scientists, while the debate on the values is replaced by

Saida Kacem, Ph.D. candidate, ISEFC, University Tunis I; research field: socioscientific issues education.
Laurence Simonneaux, professor, ENFA; research field: socioscientific issues education.

the juxtaposition of judgements of “religious or moral authorities”. Is there not an invaluable lighting to bring?

But biology is not the only discipline where difficulties arise bioethic. The teacher of philosophy for example, who in his/her class would like to speak with his/her pupils about what to humanity can means belong to overlook the concepts of genetic inheritance, genetic practices of engineering? This brings us to the importance of this interdisciplinarity specific to the socioscientific questions in the ethical and citizen formation of learning.

2. Methodology

2.1 The preliminary study

A preliminary study with high school pupils in their final year enabled us to identify the opinions of the pupils on these technosciences and to see whether they base their positions on the scientific aspects or on values. The questionnaire used comprises a short presentation of the technosciences under study. The questions relate to:

(1) The legitimacy of research to produce oncomice.

(2) The animal on which they prefer that this experiment is made.

(3) The place of man in nature.

(4) The right to make a sorting among the embryos obtained by an IVF to choose a drug baby to cure a sick brother or sister.

(5) The research on therapeutic cloning.

(6) Life, its definition and the age when it starts in the human being.

(7) Who decides? Laws, or organizations independent of the law: families, doctors, researchers, politicians, philosophers, economists, patients, religious authorities.

2.2 The principal study

It related to pre-service teachers in biology (17) and philosophy (18) and comprises several collections of data. The following protocol was set up.

(1) Pretest on the technosciences: documents explaining the 3 selected technosciences were distributed to future teachers. After consultation and comments on these documents, the questionnaires were filled. These questionnaires aimed at knowing the opinions of future teachers concerning the selected technosciences, and at seeing whether they detected epistemic values and especially social and ethical values related to these knowledge under construction.

(2) Didactic intervention: future teachers of philosophy and biology took part in a socioepistemologic and ethical training, followed by a debate on the 3 technosciences.

(3) Post test: To measure the impact of the socioepistemologic and ethical training, as well as the interaction between future teachers of philosophy and biology, on the quality of their ethical reasoning and citizenship.

3. Results

The analysis of these questionnaires showed: the opinions with respect to selected biotechnologies are not homogeneous. Both the future teachers of philosophy and those of biology are very favourable to obtaining oncomice: 16/17 (94.11%) for biology teachers and 17/18 (94.44%) for philosophy teachers. They were a little less favourable to the drug baby (88% for biology teachers and 61% for philosophy teachers were for it).

However, therapeutic cloning was the least accepted by these teachers (more teachers of biology accepted this technoscience with 76% against 61% (11/18) of futures teachers of philosophy). The future teachers of philosophy

were more inclined to think that man is the Master of nature (44 or 44% against 23 or 53%). The future teachers of biology were more favourable to the laws than those of philosophy (89% against 77%). They were also in favour of stopping scientific research in certain fields for fear of misused discoveries (94.12% against 61.11%).

We distinguished 4 categories of responses according to frames of reference of arguments, which are primarily of ethical, or religious nature, or connected to risks or the status of science.

(1) For the ethical argumentation. This research used the method of ethical analysis used by Bayrhuber (1999). The analysis follows the two systems of fundamental justification of Western ethics, the naturalists reasoning (related to wellbeing) and the personalist reasoning (related to human dignity), which determine, according to Bayrhuber (1999), the public discussion on genetic engineering. Ethical analysis envisages various solutions to a moral problem. Bayrhuber, used it for the ethical analysis of the genetic therapy; we used it for other SSIs. What about justification systems in Tunisia?

Oncomice were accepted by the majority. Man is regarded as superior to all animals: “Agreeing with any practice on animals for the good of humanity”, “man has much higher position compared to the other animals, one should never compare a man with an animal, which prevents finding solutions (drugs) to human diseases through experiments on the animal” (B8), “research on animals are necessary for obtaining anti-cancer treatments” (B11)... Even when man is regarded as an element of nature, he is regarded as the most significant element, which explains the results concerning the oncomice. The future teachers who accepted the conception of the baby drug seemed to adhere to a naturalist ethical reasoning, related to the general wellbeing of those concerned, and with health: “because it (the drug baby) will cure his/her brother”. The future teachers who refused this practice adhered to a personalist reasoning related to human dignity: Each of us is entitled to originality “the child must be conceived and wanted for itself and not like a drug”.

(2) Religious arguments were also brought in: because we will not be Muslims, it is God who controls creation. Concerning research on the therapeutic cloning, future teachers who did not accept this practice argued that it affects human dignity. Those favourable to therapeutic cloning accepted it “provided that the therapeutic cloning represents the only way for possible cure”. But, future teachers also used religious arguments. They opposed, in a dialectical way, various ethical and religious arguments which raise the question of the status of the embryo and the conception of life.

(3) Life is defined primarily as of divine origin: a gift from God, a Divine present, to be satisfied with what God gives us, a stage (which presupposes another stage or life after death in reference to religion), but also like: “a right”, “the blooming of the individual” (happiness, the wellbeing of the man, health, or laws which makes it possible to live or a dogma to be deciphered). Life starts essentially “at the stage egg cell”. The human egg holds the absolute value of a person, an individual in power. This could be at the origin of the personalist moral reasoning. But life also starts at 40 days when the individual receives his soul (an animist conception but connected with the Islamic religion, the soul is given by God), or it starts with the first beats of the heart” (mechanism, cardiocentrism), or “with breathing” or “as soon as his/her parents want to have the baby”. In this case, it is a project. But there is a real difficulty in defining this concept.

(4) A certain perception of the risks but also a scientist representation of science appeared in the answers to the question: Who has to decide? For 82.86 % of the future teachers, the laws must intervene in sharp questions: “these subjects are really in vogue nowadays, we need laws to not mistreat the human being”. The laws should not intervene for 11.43 % (but in certain cases, they can be an obstacle for the evolution of science) (B1); because it is necessary to leave the matter to people who deserve it, science is the field of the researchers. The majority of

pre-service teachers are in favour of organizations independent of the law pronouncing opinions (80%), which involves the necessary “extended community of peers” required by Post-Normal-Science. However, the economic and political fields are ignored. All pre-service teachers and the pupils wished to continue activities of information and reflexion on the technosciences and found these subjects new and particularly interesting.

4. Conclusion

The first results show that these pupils and these pre-service teachers are very favourable to the oncomice considering the very significant and superior status they accord to the human being, but also because of cancer, which has been causing enormous devastation. The other technosciences are sometimes disputed but generally better accepted by the biologists. When they are accepted, it is because they are judged to be for the good of humanity, the general well-being and as a cure, which enters within the framework of the naturalist ethical reasoning. When these practices are rejected, it is for religious reasons or the need for the respect of human dignity, and thus on the grounds of personalist ethical reasoning. The majority are in favour of laws controlling these practices, they are anxious and especially fear the consequences in particular in the case of the therapeutic cloning; but they are enthusiastic about the oncomice which on the one hand do not involve man and on the other promise to cure cancer. But the most anxious are the pre-service teachers of philosophy. Simonneaux, et al (2005) already showed that the pupils following a humanity course are more anxious with respect to these practices than those following a scientific course.

Pre-service teachers are anxious about therapeutic cloning and fear the derivations of researchers. Their fears are in connection with moral values and religions and seldom with the social values of science. Among the latter, it is primarily the value of applicability to human needs which was mobilized. These teachers do not understand the complexity in the decision-making on the SSI and the various factors which come into play like the various stakeholders and those with economic and social interests, like the funding bodies of research institutions and the politicians whom they never wish to see intervene in laws concerning these socio-scientific questions. We trained pre-service teachers (future teachers of philosophy and biology took part in a socioepistemologic and ethical training, followed by a debate on the 3 technosciences) who then implemented a sequence of teaching in interdisciplinarity with the pupils. Although the transcription and the analysis are not completed yet, we could note after having attended a first sequence that pupils, even more than the teachers, seemed to refer to religion and boys even more than girls. For them the politicians did not have a point of view to give, they must only apply the will of the citizens. They were very motivated and glad to be able to express their opinions, and they wanted to continue the discussion and annoyed to have to attend the following course... In the continuation of this work, interdisciplinary sequences (philo-bio) are constructed and implemented in class with the pupils by the pre-service teachers in order to identify the possible impact of the training on their future teaching practices and analysis of effective practices of the future teachers and their impact.

References:

Astolfi, J. P. (2006). Préface. In: Legardez, A. & Simonneaux, L. (Eds.). *How to teach socially acute questions*. Paris: ESF.

Bayrhuber, H. (1999). Ethical analysis of germinal therapy. In: Simonneaux, L. (Ed.). *Biotechnology at school*. Dijon: Educagri, 97-108.

Funtowicz, S. O. & Ravetz, J. R. (1993). Science for the post-normal age. *Futures*, *25*(7), 739-755.

Legardez, A. & Simonneaux, L. (2006). *How to teach socially acute questions*. Paris: ESF.

Simonneaux, L., Ducamp, C., Albe, V., Simonneaux, J. & Hirtzlin, N. (2005, October 12-15). *Is students’ science perception changed by researchers’ presentation?* Lyon, 347-354.

(Edited by Max and Jean)