

NANOTECHNOLOGIES AT SCHOOL: A NEW APPROACH COMBINING SCIENTIFIC KNOWLEDGES AND ETHICAL ISSUES

Nathalie PANISSAL¹ and **Christophe VIEU**²

¹ Octogone-Lordat EA 4156 – Université de Toulouse, Pavillon de la recherche 5 allées Antonio Machado 31058 Toulouse, France

² LAAS – CNRS, Université de Toulouse, 7 avenue du Colonel Roche 31077 Toulouse, France.

A new educational strategy associating teachers of secondary school and researchers in sciences and human sciences is proposed. This pedagogical experiment in French secondary schools, based on interdisciplinarity, involves knowledges coming from nanotechnologies and also includes the organization of a debate in the school to inject ethical issues into science education, thus contributing to students' education in citizenship. The objectives, the implementation and the results of this experiment will be presented and discussed.

In current curricula, nanotechnologies are introduced at the university level when students have already chosen scientific carriers. With respect to the poor attractiveness of scientific and research careers in western European countries, like France, this implies that a very few amount of the population has been educated in the fields of nanotechnology. On another hand, in many countries of Europe, the development of nanotechnologies and their impact on our way of life is a controversial societal issue. In the perspective of a large debate involving citizens, it is of crucial importance to educate young people to this new emerging field of sciences in order they can participate to a democratic discussion with no misconceptions. In this work, we describe a French initiative aiming at teaching nanotechnologies to young students of ages 17/18 years before their orientation in universities or engineering schools. The challenge of this educational experiment is to provide some lectures and experimental workshops without conflicting with the knowledge listed in the official curricula; in other words to incorporate nanotechnology into existing areas of the curriculum. We will describe the scientific choices we have made for this innovative educational project, as well as the procedure involving young researchers and PhD students. Finally, we will show how this scientific training gains to be associated to a debate on ethical issues. We will present the debate protocol we have designed and the first analysis of the arguments exchanged by the pupils which reveals their capability to manipulate both scientific and philosophical concepts.

C. Vieu, C. Séverac, D. Pons, N. Panissal, The "open-lab" initiative or how to sensitize young French students to nanoscale research before the university, *Journal of Materials Education*, Vol. 29(1-2), 149-158 (2007)



Christophe Vieu, professor of physics at the National Institute of Applied Sciences (INSA), an Engineering school of Toulouse, is heading a research group dedicated to Nanobiotechnologies in the Laboratory of Architecture and Analysis of Systems (LAAS) of CNRS organisation. Main field of interests are: Nanopatterning, Biopatterning, Nanoscale devices and tools for biodetection and medicine, education in Nanotechnologies. He is also responsible for a bio-nanotechnological platform of the Institute of Advanced Technologies for Life Sciences (ITAV), recently created at Toulouse close to the Canceropole.



Nathalie Panissal, doctor in cognitive psychology is senior lecturer at the University of Toulouse. She is involved in the training of school educators. She develops a research in education sciences in the Laboratoire Jacques Lordat, an interdisciplinary research unit in cognitive sciences. Her main fields of interest are: Didactics of science, technology and French language.