

Theme :Citizens Science, Scientific Citizenship and Materials Research

EDUCATION OF STUDENTS AND CITIZENS FOR NEW MATERIALS

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ABSTRACT

Education may be a powerful and efficient tool to promote as well to enhance new material creation as well as new processes to produce them or training to increase society acceptability. New Information and Communication Technology in Education can help the promotion of the conception, the production and the use of new materials within society.

It has been a long time since teachers have been looking for new education methods to improve learner motivation and knowledge transfers and thus the acquisition of skills. Furthermore, new materials and new processes often need experimental and theoretical knowledge to characterize the searched properties of materials and then to design the material and the process to produce it. Fortunately, Information and Communication Technology in Education can help in improving the teaching content devoted to attendees such as (i) future or present researchers in charge of the conception of new materials as well as new processes to produce them; (ii) future or present engineers able to design the plants to produce these new materials; (iii) citizens that may enhance the acceptability of innovations and the use of them. Moreover, education to conceive, to design, to produce and to use new products can be helped and supported by massive open online courses (MOOC) or small private open classes such (SPOC).

This paper aims at showing the motivation and at demonstrating the effectiveness of new methods of learning that may serve the conception of products and processes that produce them. For instance, new methods and tools were used to improve thermodynamics teaching to avoid intrinsic difficulties of this matter and to take advantage of new generation appetite for new technologies. MINES ParisTech has thus conceived and managed several Massive Open Online Courses (MOOC) in Energetics (Problèmes Energétiques Globaux) as well as Thermodynamics (Conversion Thermodynamique de la Chaleur). This paper proposes firstly returns of experience from these MOOC, such as attendance distribution, examination attendance, successful student percentages and quality and effectiveness of learning experience. Then it describes the MOOC "Introduction to Experimental Thermodynamics" devoted to the teaching of experimental thermodynamics for attendants ranging from students from Masters or PhD classes, to personal or customer individuals of process design and maker companies or new fluid or product producer companies. Thus the MOOC "Introduction to Experimental Thermodynamics" may be particularly useful to consider the adaptation of infrastructures conceived for Liquefied Natural Gas to Liquefied Biogas or to characterize new materials issued from refinery of biomass to replace raw materials from petrochemistry. Moreover, another MOOC-SPOC entitled "Understand the process, design the plant" conceived by Paristech aims at teaching the fundamentals of design of a workshop or a plant to produce products with an improved societal acceptability given the production route.