ICMAT2011 EDUCATION FORUM AND OPEN DISCUSSION:
"Teaching the Nano Scale - A Global Revolution in Science Education"

Teaching the Nano Scale – A Singapore Perspective

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Nanotechnology is considered one of the most important growth areas this century. Nanoscience, the science underpinning nanotechnology, is a multidisciplinary subject covering atomic, molecular and solid state physics, as well as much of chemistry, with applications in biology. Nanostructures are known to exhibit novel and improved material properties. Fundamentally, these arise because the physical properties as well as chemical reactivity are very different when dimensions are reduced to the nanometre length scale.

Nanotechnology education is being offered by more and more universities around the world. Universities offer a range of nano-related degrees, for example, Bachelor of Science/Engineering in Nanotechnology, Master of Science/Engineering in Nanotechnology, and PhD in Nanotechnology. The fundamental scientific principles at the nano scale are grounded in physics and chemistry. For this reason, at the National University of Singapore (NUS), "Nanoscience" is offered as a Minor programme, as well as a “Nanoscience & Nanotechnology” specialization in the Bachelor of Engineering Science degree. The pedagogical issues and experiences teaching these courses at NUS are discussed.

Science is no longer studied solely within the traditional disciplines of physics, chemistry and biology; and scientific research today often requires contributions from two or more disciplines. The fields of materials science, biophysics and nanoscience are just a few important examples of interdisciplinary science, and our undergraduate curriculum needs to reflect this changing scientific landscape. In this context, I will also discuss the new Integrated Science Curriculum (ISC) offered at the National University of Singapore, intended for students considering a research career in science. The ISC, taught within the Special Programme in Science (SPS) at NUS, aims to encourage students to think across disciplinary boundaries, and to be able to address contemporary scientific problems from an integrated science perspective. Lectures and activities are organized around central themes in science, such as measurement, change, energy, materials, conservation, and information. The relationships between different disciplines are emphasized, and mathematical and statistical methods are applied to problems across scientific disciplines.