



NANOYOU Project- Deliverable D 4.1 WP4 (Task 4.1)

# NANOYOU

## Teachers Training Kit in Nanotechnologies

A comprehensive training kit for teachers of secondary schools pupils (14-18 years)

Written by Luisa Filipponi and Duncan Sutherland  
Interdisciplinary Nanoscience Center  
Aarhus University, Denmark  
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### ABOUT THE NANOYOU TEACHERS TRAINING KIT IN NANOTECHNOLOGIES

This document is Teachers Training Kit directed at science teachers of scholars aged 14-18 years. It is made of two modules: Module 1 covers “Fundamental concepts in nanoscience and nanotechnologies”; Module 2 covers “Applications of Nanotechnologies”. This kit constitutes deliverable D 4.1 of WP4 (Task 4.1) of the Project.

Module 1	Module 2
<b>Chapter 1-</b> Introduction to nanoscience and nanotechnologies	<b>Chapter 1-</b> Application of nanotechnologies: Medicine and Healthcare
<b>Chapter 2-</b> Nanoscience in nature	<b>Chapter 2-</b> Application of nanotechnologies: Environment
<b>Chapter 3-</b> History of nanotechnologies	<b>Chapter 3-</b> Application of nanotechnologies: Energy
<b>Chapter 4-</b> Fundamental “nano-effects”	<b>Chapter 4-</b> Application of nanotechnologies: Information and communication technologies (ICT)
<b>Chapter 5-</b> Overview of nanomaterials	
<b>Chapter 6-</b> Characterization techniques	
<b>Chapter 7-</b> Fabrication techniques	

Within Module 1 and Module 2 topics of **safety and ELSA** (Ethical, Legal and Social Aspects) relating to nanotechnologies are covered. NANOYOU has developed a number of tools for discussing safety and ELSA topics in class. Below is an overview:

Tool	Description
<b>NANOYOU Nano Role Play (Card game)-</b> download at <a href="http://www.nanoyou.eu">www.nanoyou.eu</a>	The dilemmas are discussed in the Module 2 of this Teachers Training Kit within the various application areas (“ <b>NANOYOU dilemma</b> ” <b>blue boxes</b> ).
<b>NANOYOU Virtual Dilemmas (Computerized animations)-</b> download at <a href="http://www.nanoyou.eu">www.nanoyou.eu</a>	These are computerized animations where students enter a virtual world and are confronted by different dilemmas relating to nanotechnologies applications.
<b>ELSA Topics in the NANOYOU Teachers Training Kit</b>	In this kit teachers will find ELSA boxes throughout the text of the chapters of Module 2 (“ <b>ELSA Topic</b> ” <b>orange boxes</b> ).

The following kit also includes an Experiment Module which includes four laboratory experiments that exemplify some of the concept of Module 1 and Module 2. The **Experiment Module** includes reading for teacher and protocol, as well as reading for students and laboratory worksheet. Some **videos** of these experiments are provided in the Module.

Experiment Module	
EXPERIMENT A- Natural nanomaterials	Module 1- Chapter 2
EXPERIMENT B- Liquid crystals	Module 1- Chapter 5
EXPERIMENT C- Plasmonic gold nano-sensor	Module 2- Chapter 1
EXPERIMENT D- Functional nano-coatings	Module 2- Chapter 2 and Chapter 3

The **experiments** cover fundamental concepts of nanoscience (Experiment A and B) and applications of nanotechnologies (C and D):

Experiment	Topic	Concepts
A- Natural nanomaterials	Fundamental nanoscience	- natural colloids - nanostructure→function
B- Liquid crystals	Fundamental nanoscience	- molecular self-assembly - optical properties of nanomaterials
C- Plasmonic gold nanosensors	Application of NT: medicine	- plasmonics (metal nanoparticles) - gold colloids as sensors
D- Superhydrophobic materials	Application of NT: Environment	- lotus-effect nano-engineered surfaces and textiles

Each experiment includes **several documents**:

- TEACHER BACKGROUND RESOURCES (background reading, protocol, etc.)
- STUDENT BACKGROUND READING
- STUDENTS LABORATORY WORKSHEET
- STUDENTS SYNTHESIS PROCEDURE (*where applicable*)

### ABOUT THE NANOYOU PROJECT

NANOYOU (Nano for Youth) is a project funded by the European Commission's Seventh Framework Programme that aims to increase young people's basic understanding of nanotechnologies (NT) and to engage in the dialogue about its ethical, legal and social aspects (ELSA). The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 233433.



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NANOYOU Teachers Training Kit in Nanoscience and Nanotechnologies- Overview

### DISCLAIMER (1)

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### DISCLAIMER (2)

The present NANOYOU Teachers Training Kit in Nanotechnologies includes an Experiment Module where four experiments are described. The experiments described in the training kit use chemicals which need to be used accordingly to MSDS specifications. Personal protection must be taken as indicated. As with all chemicals, use precautions. Solids should not be inhaled and contact with skin, eyes, or clothing should be avoided. Wash hands thoroughly after handling. Dispose as indicated. All experiments must be conducted in the presence of an educator trained for science teaching. All experiments will be carried out at your own risk. Aarhus University (iNANO) and the entire NANOYOU consortium assume no liability for damage or consequential losses sustained as a result of the carrying out of the experiments described.

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