



CusMiBio

Responding to the High School teachers' needs to receive training in the latest scientific developments, in 2004 the University of Milan has launched CusMiBio (Centre of the University and School of Milan for Bioscience Education), a project to improve Science Education in High Schools. Since 2009 CusMiBio has been appointed by the Italian Ministry of Education as reference centre for the valorization of talented High School students.

Aims:

- to provide constant scientific updating for High School teachers together with new stimuli for doing their work in a more motivated, creative and effective way;
- to promote a more participatory, inquiry-based approach in High School science education;
- to support students in conscious planning of their future studies and to ensure a new generation of researchers;
- to promote and favour the outgrowth of the most talented students.



Activities for High School Science Teachers

Workshops on advanced topics in biosciences, **Training courses in molecular biology and genetics** combining cutting-edge science with simple activities easily transferable to the classroom.

Lead teachers: a group of selected science teachers trained to run themselves the "Try the Biolab" activities, coordinate students groups and give the introductory lecture supporting the lab activities.

Activities for High School Students

Try the Biolab: visits of entire classes to a fully equipped University laboratory where students can perform hands-on activities in some hot topics of genetics and biotechnology under the supervision of a lead teacher and of young tutors.

Try the Biolab: Some of the topics of the molecular biology and bioinformatics lab activities

DNA profiling, on DNA analysis performed to obtain molecular identikit, i.e. for human genotypic identification.

Healthy or affected?, a simulation of genetic counseling and prenatal diagnosis of genetic diseases by means of RFLP (Restriction Fragments Length Polymorphism) analysis.

DNA cloning: white or blue? recombinant or not?, two genetic engineering activities on DNA cloning in bacterial cells and on the identification of recombinant DNA molecules.



Chromosome analysis, optical microscope observation to compare human and mouse metaphase chromosomes; cytogenetic analysis of human normal and pathological karyotypes.

Surfing among genomes, a bioinformatics module to discover how scientists use genetic information in databases and to become familiar with the main tools available online to ask (and answer) questions about the human genome.

Gene Hunting, online searching for genes, proteins and mutations associated with genetic disorders.

Invisible forms, lysozyme crystals can be obtained in short time and observed at light microscope; in a parallel bioinformatics module, students visit one of the major protein 3D structure database and experiment how 3D models of proteins are used to design molecules of medical relevance.

SOS environment: a reporter gene in transgenic plants (*Arabidopsis thaliana*) becomes an environmental bioindicator able to detect the presence of heavy metals in soil.

Identification of meat species: analysis of a mitochondrial gene, cytochrome b, to identify the species origin in a meat sample.

Genetically Modified Organisms, what, how and why. Analysis of corn flour to detect the Bt transgene from the bacterium *Bacillus thuringiensis*, coding for a protein which confers the GM plant protection against most insects pests.

Which plant is this? How can we identify a plant species starting from its DNA? An introduction to DNA barcoding, a new method for the definition, cataloguing and monitoring biodiversity.



CusMiBio laboratories are University spaces dedicated to High School, fully equipped with high-tech materials and instruments, usually not available in a school laboratory. The Biosciences laboratory has 48 equipped work stations, the Bioinformatics laboratory has 32 stations, each with computer and internet connection.

A week as a researcher



Each year CusMiBio organizes a competition, reserved to High School students, to select 20 excellent students who, at the end of their school-year, will perform the stage "A week as a researcher" in a bioscience research lab in Italy and abroad.

Wannabe a researcher: become a tutor and teach your peers



Talented students and motivated teachers, under the supervision of CusMiBio staff, design and set-up kits and learning modules adapted to be transferred to their schools. Students and teachers are trained to become familiar with the kit activities (Chromosome analysis, DNA profiling, Genetically Modified Organisms, what, how and why) and to be able to autonomously propose them to their peers.

City Barcode



A long term project in which students and their teachers are engaged in a meaningful experience with scientific research; participants are introduced in designing an open-ended experiment of DNA barcoding analysis to



explore the biodiversity in different contexts of their urban environment.

Contacts

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Centre of the University and School of Milan for Bioscience Education

CusMiBio, a joint project of the University of Milan and the Education Office of Lombardy, is specifically dedicated to science education in High School.

CusMiBio organizes training courses for teachers and hands-on activities for students to enhance their interest and knowledge in biosciences and their biotechnological applications.



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