MPTL-12 Conference Wroclaw

Teacher training of pupil-active learning in superconductivity and electromagnetism with interactive animations, simulations and minds-on simple experiments

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Project participants at MPTL-12

SUPERCOMET 2 Project, Leonardo da Vinci pilot project N/04/B/PP/165.008

P01 Simplicatus	Vegard Engstrøm
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P05 U of Antwerp	Wim Peeters
P07 U of Rousse	Nadezhda Nancheva
P09 U of Ostrava	Libor Koniček
P11 U of Ludwigsburg	Raimund Girwidz
P15 U of Munich	Bernadette Schorn
P17 U of Murcia	Jose Miguel Zamarro, Francisco Esquembre
P23 U of Udine	Rossana Viola
P28 AMSTEL Inst.	Peter Uijlings, Frank Schweickert
P31 U of Torun (UMK)	Grzegorz Karwasz, Jozefina Turlo, Grzeg. Osinski

MOSEM Project, Leonardo da Vinci Transfer of Innovation project 2007 (?)

U of Wroclaw	Ewa Debowska, Tomasz Greczylo

Project philosophy

- ✓ **Purpose:** Implement best practice methods & pedagogy
- ✓ **Concept:** Teacher training & networking
- ✓ **Aim:** Active, exploring learning style for pupils
  - ✓ Traditional content connected to new physics
  - ✓ Minds-on experiments
  - ✓ Interactive animations, visualisation
  - ✓ Measurements, modelling, simulations
- ✓ **Need:** Develop materials
  - ✓ Teacher support (guides, seminars, online community)
  - ✓ Practical collections (kits) of experimental materials
  - ✓ Pupil learning materials (e-modules with theory, explanations & videos of minds-on experiments)

A network of active learners

Teacher training seminars

Pedagogical methods
(modelling, simulations, investigation, minds-on exper., scenarios, etc.)

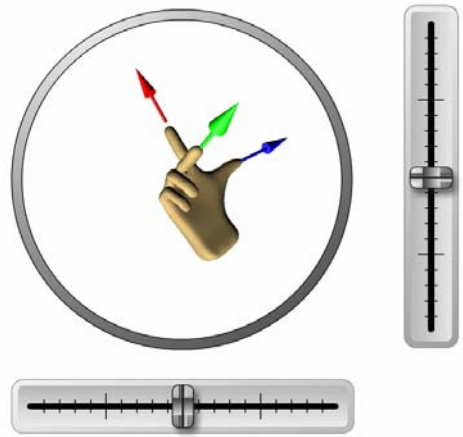
Online community
with repository of learning objects and support materials

Physics subject contents
(new and traditional)

Minds-on experimental kits
(materials for simple experiments)

Project results and future plans

- ✓ **Overview of development activities**
  - **SUPERCOMET Project** 2001-2004 (€500', 7 partners, 4 countries)
  - **SUPERCOMET 2 Project** 2004-2007 (€400', 40 partners, 14 countries)
- ✓ **Examples of developed materials**
  - **Electronic – Interactive animations**
  - **Support – Teacher seminar, guide**
  - **Hands-on – Shown by Wim Peeters**
- ✓ **Testing in upper secondary schools**
  - **Summary of SC2 reports Nov 2007**
- ✓ **Plans for future projects**
  - ✓ **MOSEM Project** 2007-2009 (€300', 27 partners, 8 countries – not started)
- ✓ **Publications / references**



2001-2004 SUPERCOMET Project

SUPERCOnductivity Multimedia Educational Tool

Teacher seminar	First version in 4 languages, UK, NO, IT, SI
Computer application	1st & 2nd version in 4 languages, UK, NO, IT, SI Second version with 5 modules: Magnetism, Electromagnetic induction Electrical conduction Introduction to superconductivity History of superconductivity
Teacher guide	First version in 4 languages, UK, NO, IT, SI Some teaching activities, physics curriculum
Classroom poster	Nobel Prizes, History of superconductivity
Intranet	Project management tool used by partners
www.supercomet.no	Website for communicating project results

2004-2007 SUPERCOMET 2 Project

SUPERCOnductivity Multimedia Educational Tool 2

Teacher seminar	Expanded to 4 half-day modules in English Will be translated to 14 languages
Computer application	Reimplemented with new online platform Flash 7→9, corrections, design improvements 3 new modules: Superconducting materials Explanation & Applications of superconductivity
Teacher guide	Updated and expanded version in English Will be translated to 14 languages More activities, modelling, assessment
Minds-on kits	Tried out activities, materials → MOSEM project
Online community	Prototype framework online → Physible project
Simulations	Prototype EJS model → Simulation project(s)

Examples of developed materials

Teacher seminar

Several source files, e.g. on teaching methods
Demo 2 April at Science on Stage 2, Grenoble


CHAMBRE DE COMMERCE & D'INDUSTRIE
GRENOBLE

Examples of developed materials

Teacher seminar

Several source files, e.g. on teaching methods

Demo 2 April at Science on Stage 2, Grenoble

Demo 9 September at Annual Meeting of Polish Association of Science Teachers, Torun

Examples of developed materials

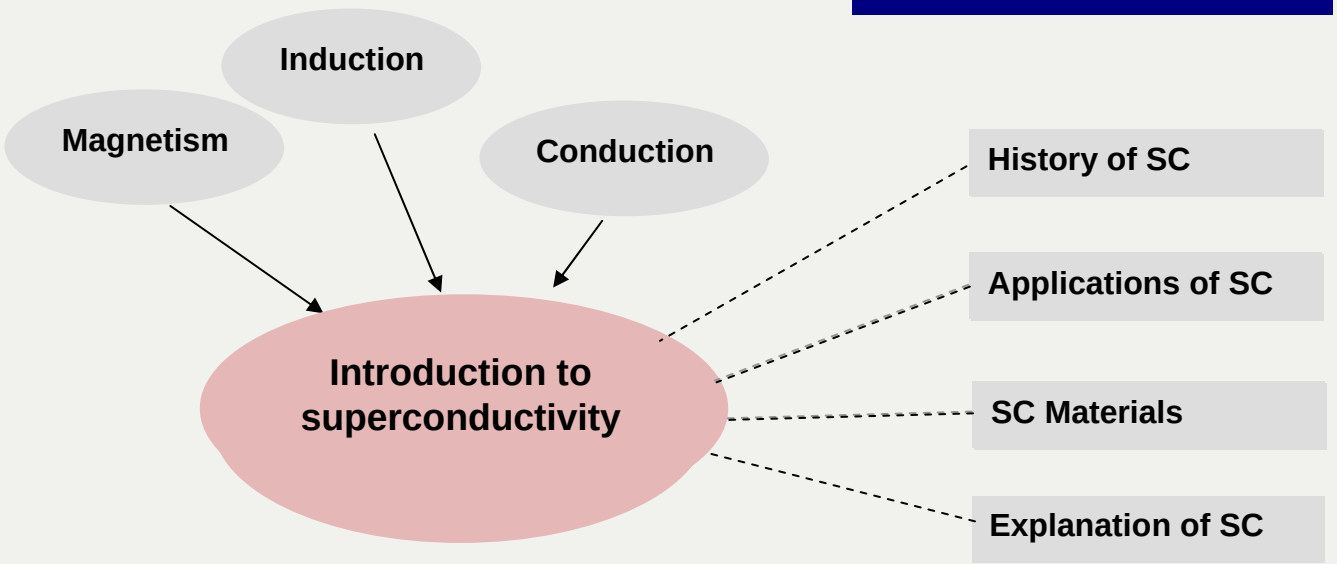
Teacher seminar	Several source files, e.g. on teaching methods Demo 2 April at Science on Stage 2, Grenoble Demo 9 September at Annual Meeting of Polish Association of Science Teachers, Torun
Computer application	First version 2002, Second version 2005 Third version October 2007

8 e-modules in superconductivity & EM

Active Learning

Background Information

Active Learning??



Several generations and new features

Computer application

Superlab version 2001 (Norwegian)
1st SUPERCOMET version 2002 (1-4 lang.)
2nd SUPERCOMET version 2005 (4-13 lang.)
3rd SUPERCOMET 2 version 2007 (14 lang.)

What is new in 2007?

Online or offline versions
New content modules on superconductivity
New Graphical User Interface (GUI) design
Bookmark expanded to “Favourites / Playlist”
Improved navigation, language change
Online FAQ, Glossary – hyperlinked from text
Localization settings (magnet colours)
Language admins can update text directly
Global admin can add modules/slides
More user-friendly, easier to develop further

Examples of developed materials

Teacher seminar	Several source files, e.g. on teaching methods Demo 2 April at Science on Stage 2, Grenoble Demo 9 September at Annual Meeting of Polish Association of Science Teachers, Torun
Computer application	First version 2002, Second version 2005 Third version October 2007
Teacher guide	Printed edition March 2005 New electronic version (draft) September 2007
Minds-on experim. kits	MOSEM prototypes expected November 2008
www.physible.eu	Online community prototype 2005
www.supercomet.eu	Project website with more information
Simulations	Prototype EJS models by Francisco Esquembre

Testing in upper secondary schools

SUPERCOMET version

2004 Teacher Seminar, Teacher Guide and Computer Application

- Formative expert review of English version (e-modules) spring 2005
- Translations in 2005 and 2006, Testing in 2006 and 2007
  - Formative, summative (e-modules with animations, support materials),
  - Illustrative (teacher seminars and classroom trials)
- Italian partners led by the U. of Udine: Trials with ~350 students
  - 3 approaches, 2 research oriented; action research, teaching-learning
  - Ph.D. thesis Rossana Viola

SUPERCOMET 2 version

2007 Teacher Seminar, Teacher Guide and Computer Application

- Completed and translated by November 2007
- Pilot use/further trials in 2008 by SUPERCOMET 2 and MOSEM partners
- **Interested in running a student research project? Please contact us!**

SUPERCOMET Project Hierarchy

Projects

2 PP → 3 LdV ToI (products)
→1 ToI (geographical)

SUPERCOMET 3 (2010)
Cover the rest of Europe

Modelling & Data (2009)
Use Coach for measurements (data video) and modelling

Physible (2008)
Establish online community with models/simulations

MOSEM (2007)
Produce / test Minds-On kits

SUPERCOMET 2 (2004)
Expand concept and products

SUPERCOMET (2001)
Initial development of Teacher Seminar, Teacher Guide and Computer Application

Products

Prototype → **Full**

Translate and adapt all products

Physible
MO **TS** **TG** **CA** **MD**

Physible
MO **TS** **TG** **CA** MD

Physible
MO **TS** **TG** **CA** MD

Physible
MO **TS** **TG** **CA** MD

TS **TG** **CA**

MO: Minds-On kits
TS: Teacher Seminar
TG: Teacher Guide
CA: Computer Application
MD: Modelling & Data

Footprint

SUPERCOMET 3 covers all European countries not previously covered

17 countries (13 new)
50 partners

6 countries
15 partners

15 same countries
60 partners

8 countries
27 partners

15 countries (12 new)
40 partners

4 countries
8 partners

2007-2009 MOSEM Project

Minds-On experimental equipment kits in Superconductivity and Electromagnetism for the continuing vocational training of upper secondary school physics teachers

Teacher seminar	Will adapt to Minds-On experiments
Computer application	Possibly update some animations
Teacher guide	Will expand with Minds-on experiments
Minds-on kits	Produce and distribute prototypes Conduct trials with pupils Disseminate project results (PSNPP and others) Collaboration with local authorities

2007-2009 MOSEM Partners, Poland

ASC-TCH	Polskie Sowarzyszenie Nauczycieli Przedmiotów Przyrodniczych (PSNPP)
EDU-UNIV	**Uniwersytet Mikołaja Kopernika (UMK), Torun**
EDU-UNIV	**Uniwersytet Wrocławski**
EDU-VET	Akademia Pomorska, Slupsk
EDU-VET	Centrum Kształcenia Ustawicznego w Gdansku (CKU)
EDU-VET	Liceum Ogólnokształcące nr 8, Torun
ENT-SME	Soliton
PUB-REG	Urząd Miasta Sopot, Wydział Oświaty

GIREP-MPTL 2008 Nicosia

MOSEM Project	Covers all conference domains SIG 1, SIG 2, SIG 5
Suggested Workshop	Prototype MOSEM Teacher Seminar MOSEM experiments with SC2 animations Using SC2/MOSEM Teacher guide
Suggested Symposium	Project proposals for Physible & Modelling Present plans, discuss details & partners SIG 1, SIG 4
Suggested Posters	Results from SUPERCOMET 2 MOSEM partners presenting their work
Project meeting	One-day satellite meeting before MPTL-12 MOSEM project partners prepare workshop ++

Publications / references

R. Viola et.al. (2007), The secondary school experimentation of SUPERCOMET materials in Italy, GIREP-EPEC Conference 2007, Opatija

G. Ireson (2006), Measuring the transition temperature of a superconductor in a pre-university laboratory, *Phys. Educ.* **41** pp. 556-559

B. Schorn et.al. (2006), SUPERCOMET 2 – Modelling superconductivity, GIREP Conference 2006, Amsterdam

L. Konicek et.al. (2006), Models and Real Experiments about Electrical Conductivity – SUPERCOMET 2, GIREP Conference 2006, Amsterdam

G. Karwasz et.al. (2005), Hands on experiments on magnetism and superconductivity, GIREP Workshop 2005, Ljubljana

A. Earle et.al. (2005), SUPERCOMET Teacher Guide, Simplicatus, Trondheim
ISBN 82-8130-045-0

V. Engstrøm et.al. (2004), The SUPERCOMET Project – animating electricity and magnetism for upper secondary school, GIREP Conference 2004, Ostrava

V. Engstrøm et.al. (2003), The SUPERCOMET Project – developing new educational material for upper secondary physics, MPTL8 Workshop, Prague

V. Engstrøm et.al. (2002), Comparing national physics curricula for the SUPERCOMET project, GIREP Conference 2002, Lund