Responsibility of Teachers – The SSIBL model in Hungary

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Introduction

Society and scientific literacy

Education of responsible adults

• needs to address issues of social relevance
• encourage students to become responsible adults
• influence political decisions depending on scientific research

Social issues in science

• socially relevant topics motivate to learn science

Role of teachers

• science teachers shapers of the minds of young people and their families
• developing awareness in science teachers towards social issues
• that is emphasized as increasingly important all over Europe
The SSIBL framework of PARRISE

We joined the *Promoting Attainment of Responsible Research and Innovation in Science Education (PARRISE)* project, expand our perspectives and repertoire of socially responsive teaching.

The PARRISE team has developed a framework for *Socio-Scientific Inquiry-Based Learning (SSIBL)* based on Responsible Research and Innovation (RRI).

The pillars of the model:

**Socio-scientific Issues (SSI)**
- open ended problems
- hot topics: climate change, nuclear energy, raw material reserve, etc.

**Citizenship Education (CE)**
- educating children, to become clear-thinking citizens who participate in decisions

**Inquiry Based Science Education (IBSE)**
- traditions of Hungarian Physics education
- focus: students act as researchers

Interrelations of these pillars
source: http://www.parrise.eu/
Responsibility and Critical thinking
Responsibility suppose the adequate knowledge
The Knowledge about potentials and risks of scientific discoveries.
Probabilistic thinking
Critical thinking
Independency of thinking
deep understanding of the scientific ideas
protection against manipulation (internet, press etc)

Illustrations:
Average velocity
Parrondo paradox
Hysteresis of our brain
Manipulation – film –

Problem: Two escalators move paralelly. The average velocity of both escalator directs downward. Whether the person, who can only step from one escalator to the other, can move upward?

http://indavideo.hu/video/Mind_manipulation
Characteristic methods of SSIBL was applied in Hungary earlier

**Inductive and experiment-based teaching method**
Prerequisite of the IBL: inductive and experiment-based teaching

**Association of the social content and the physics**
Social content and physics: nuclear physics, environmental physics, sustainable development, risk estimation etc.

**Interdisciplinary character**
Environmental teacher training was launched at the ELTE in 1992.

**Critical thinking**
Risk estimation
The GLOBE (Global Learning and Observations to Benefit the Environment) program was launched 1994 in the USA. Hungary joined 1999, at present 30 secondary schools are participating. Goals: promote the teaching and learning of science, understand better sustainability, and improve Earth's environment. Tools: measurements (biology, chemistry, meteorology), project works.

University course on everyday physics

Explanation of everyday phenomena at secondary school level
In spite of its considerable antecedents in Hungary we think that it is very important to strengthen the application and dissemination of SSIBL. main participants: teachers

Main tools of mediating the elements of SSIBL (RRI, IBL, CE, SSI) toward teachers:

• a postgraduate teacher training course embedded into Physics Education PhD program
• an optional University course in teacher training
• a conference on Teaching Physics Innovately
The PhD program
Physics Education PhD program launched 10 years ago at ELTE
- tailored specifically for the needs of active in-service physics teachers
- candidates carry out their research at their own school
- research topic examples: Non-conventional modern physics in the classroom, Environmental physics in the high-school, Enhancement of the activity of pupils with interest in humanities, Teaching physics outdoors, ... etc

The TPD course
TPD course according to the Objectives of PARRISE:
„Current Contents and Methodology in Teaching Physics in the 21th Century”
- in-service teachers
- four modules of the Physics Education PhD program
- methodology focused on the pillars of the PARRISE framework
- good practice presentations on IBL, PBL, RRI
- educational interpretation of social sensitive scientific issues
Efficiency of the GLOBE program
many students have continued their secondary school education at the field of Science
Goal: to integrate the GLOBE program more deeply into the high school education. The base of this is yielded by young teachers familiar with the GLOBE program.

GLOBE in the teacher training
– one-semester optional course, main topics:
• environmental measurements
• societal elements of the sustainable development
• overview of predictions on the future (Malthus, Club of Rome, “Shaping the Future We Want”)
• pessimism or optimism (Olduvai theory)
Teaching Physics Innovatively (TPI-15)

Topics of the conference

- Inquiry Based Science Education,
- Science centres and other informal learning opportunities,
- Environmental issues,
- Our cosmic environment,
- Socially sensitive issues,
- Multimedia and ICT,
- Physics experiments and methodological innovations,
- Contemporary physics,
- Nuclear issues,
- Roundtable discussion about socially sensitive issues in physics education.

Venue: Eötvös Loránd University, Budapest, Hungary
Teaching Physics Innovatively (TPI-15)

- The separate papers are also accessible with their conference abstracts and presentation slides
- A discussion "forum" is associated to each paper [http://parrise.elte.hu/tpi-15/slides.php](http://parrise.elte.hu/tpi-15/slides.php)
- The final version of the proceedings will be generated and printed as a book soon

One possibility for completion of the TPD course is to write a pedagogical essay or to prepare e-learning materials on topics directly lead to the use of elements of the SSIBL at secondary schools. As examples of these works in the following some case studies is summarized:

**Renewable Sources in Use**
- general information about renewable energy sources, storage problems, pros and cons of their use;
- sustainability, facts about environmental problems;
- definition and calculation of ecological footprint;
- developing different skills (digital, communication and collaboration).

The logo of this project work, designed by the students.
SSIBL at secondary school level

Light Bulb Investigation in Grammar School

- four different light sources which used in everyday life (incandescent light bulb, halogen lamp, LED lamp, compact fluorescent lamp);

- measuring and comparing their relative light output and their thermal radiation;

- working in small groups, making measurement notes, and perform the results to each others.
SSIBL at secondary school

Water consumption and sparing
- the class was divided into groups, they made measurements of their own water consumption, and collected data and materials about the global problems with water,
- excel files with the data of the students, and their calculations, and presentations, classroom work.

Hydroelectricity
- study trip to a Hydroelectric Power Plant (HPP);
- a HPP in operation, the method of power generation, electricity production and transmission, the consequences of a flooding;
- socio-scientific issues, informal learning.

Source: report by a student, http://szentimre-nyh.hu/
SSIBL can be successfully disseminated in Hungary

The tools and methods of the GLOBE program are very useful in SSIBL

Project method fits extremely well to SSIBL

Discussion of social topics motivate students to learn science

Questions:

Do enough teachers feel competent to perform SSIBL-based educational programs in formal and informal learning environments?

Are there enough time in the Curriculum to use the method?
Thank you for your attention!

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