ICT IN PHYSICS TEACHING FOR SECONDARY SCHOOLS AND COLLEGES

Beáta Jarosievitz Dr. Phd.

College associate professor

Educational advisor (Physics, Computing)

E-mail: jarosievitz@gdf.hu

Dennis Gábor College: 1119 Budapest, Mérnök u. 39.

and

SEK Budapest International School: 1021 Budapest, Hűvösvölgyi út 131.

Hungary

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Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

1. Premises

• 2000: mapping the crisis (e.g.: Physics, Chemistry, Mathematics…)

PHYSICS on State

Research activity related to:

• study of the students' attitude to physics

• study of students ' motivation and IT knowledge

Used method:

• questionnaire based on **9 hypothesises** (on-line and off-line)

• national and international level (between: **2002 – 2003**)

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Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

1. Premises

Conclusion of the survey analysis (total: **763**):

- use the advantage of **IT** and **multimedia**

  (text, pictures, animation, video, interactivity)

- more **fun and attractive activities** required
- science classes should be made **more colorful and interesting**
- use **project method** and **cooperation** method
- involve students to **national and international** collaborative **projects**

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Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

2. Recommendations (examples) to change the students' attitude

- use the advantage of IT and **multimedia**

Requirements:

- use of the computer room when needed
- Internet access be provided in the School
- the students are familiar with IT skills
- the students must share their experience in teams

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2. Recommendations (examples) to change the students' attitude

How ICT should be use ?

-students **search on the internet**

-students **prepare ppt or pps** slide show

-students learn how to **prepare a real lab. report** using editor programs

-students upload, **share their work** (E.g.: http://www.slideshare.net)

-students fill in some questionnaires

-create online quiz

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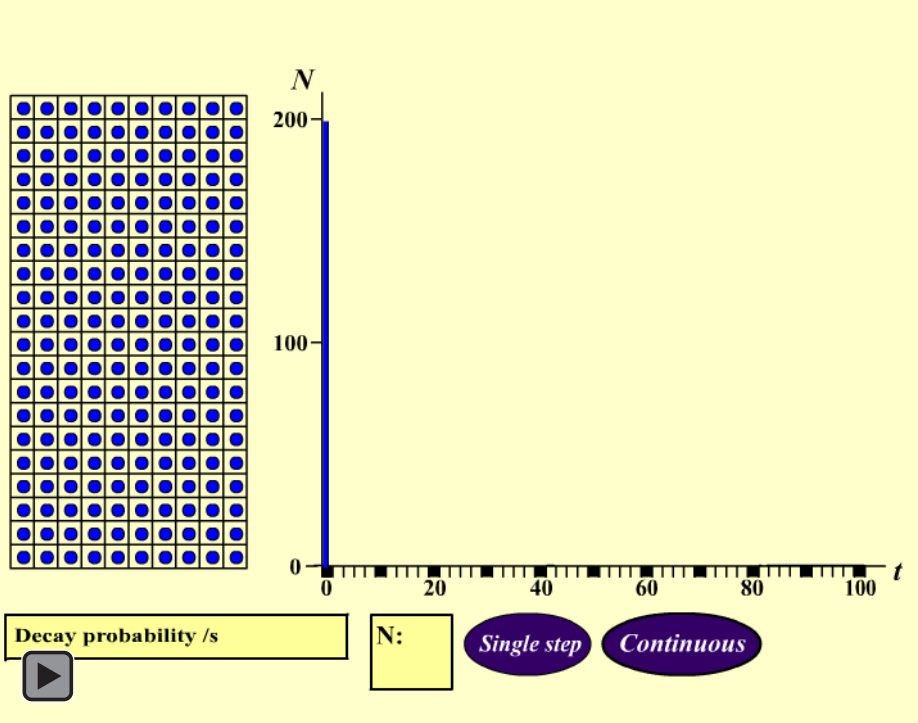
2. Recommendations (examples) to change the students' attitude

- use the advantage of ICT and **multimedia (interactivity)**



Simulation of radioactive decay

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Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

2. Recommendations (examples) to change the students' attitude

- more fun and attractive activities required
- performance written, directed by students, participation to SCIENCE ON STAGE MAGYARORSZÁG

ALICE IN CHEMISTRYLAND

Video: http://videa.hu/videok/tudomany-technika/alice-RwIroyV7cczIo68L

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Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

2. Recommendations (examples) to change the students' attitude

- science classes should be made more colorful and interesting
- hands-on experiments

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Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
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2. Recommendations (examples) to change the students' attitude

- use **project method and cooperation method**
- enroll students to **national and international** collaborative **projects**

Successful projects

Solar constant measurements

Observation of the Venus transit

The Day of Physics

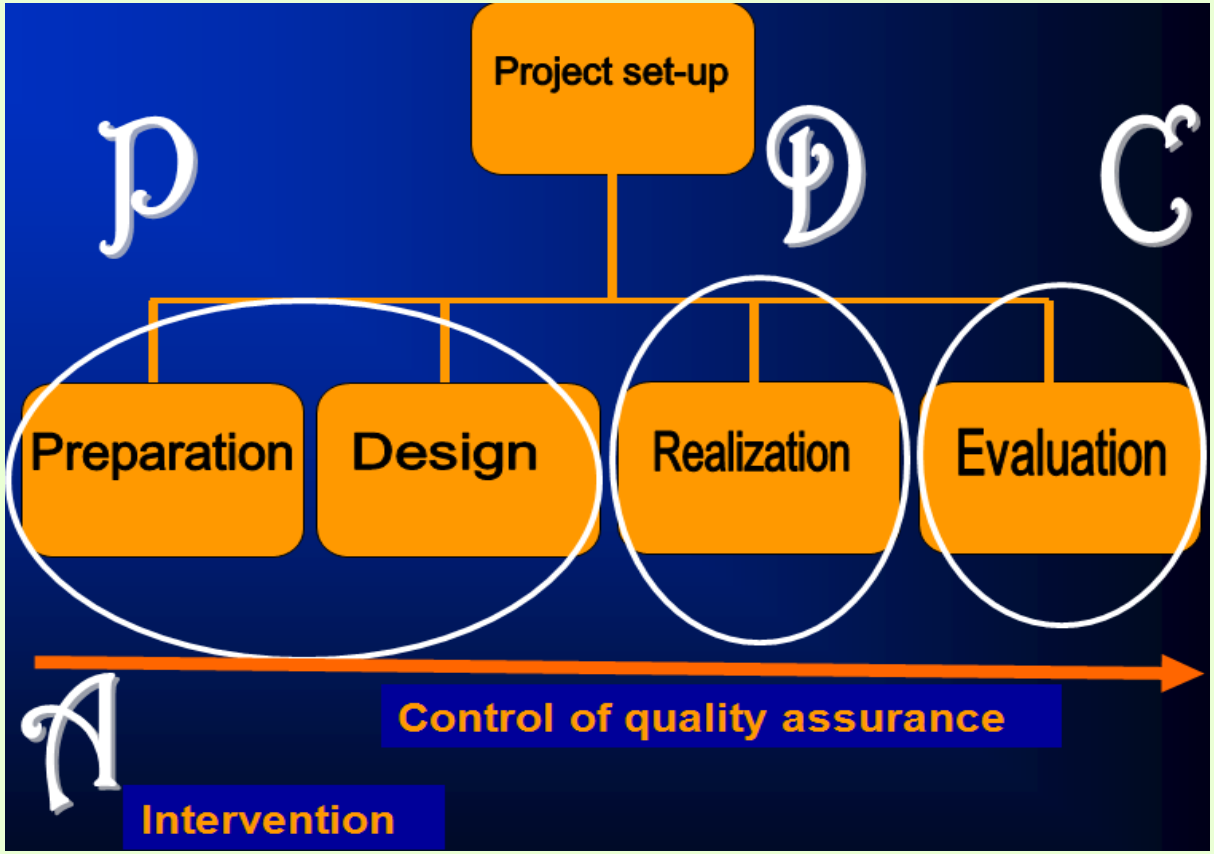
XPERIMANIA I -IV

SPICE, SCIENTIX

Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

2. Recommendations (examples) to change the students' attitude

All projects are set-up following the scheme



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3. SPICE project

AIM: to establish a ***Science Pedagogy Innovation Centre for Europe***

Duration: December 2009 – November 2011

Participants: 16 countries

Lifelong Learning Programme from DGEAC

Coordinator: **European Schoolnet (EUN, Belgium)**

Partners: Dum zahranicnich sluzeb MSMT (Cseh Republic)

Direcção Geral de Inovação e Desenvo (Portugal)

Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
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3. SPICE project

OBJECTIVES of the international project:

- to collect,
- analyze,
- validate
- disseminate

} **innovative pedagogical practice**

„Good Practices" = GP

- **GP** based on inquiry-based learning
- **enhance pupil motivation for science studies**
- to maintain quality control

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3. SPICE project

Subject Area: **Physics**

Other subjects involved: **ICT in Education**

Age of Students: **12-14 and above**

Topic: **Electricity and Magnetism** **Title: Electric motors**

Skills:

- work in teams (do the experiment),
- follow instructions,
- inquire about the real experiments,
- try to interpret the watched video
- predict the outcomes,
- prepare ppt presentation

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3. SPICE project

Aim:

- learn basic principles of electric motors,
- apply theory to everyday uses of electric motors

Duration:

- 60 minutes

or

- 5*60 minutes

can be choosen by the teacher

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3. SPICE project

Methodological aspects

How to proceed: raise student's interest working in teams

Preparation: groups 4-5 (depending of the number of students / class)

Resources needed:
- Multimedia computer
- E-learnig platform: Moodle open source
- Worksheets
- Experimental kit

Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
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4. MOODLE platform

http://moodle.org/ : free online course management system (open source)

- **designed to support** a social constructionist framework of education use in:
  - Primary education
  - Secondary education
  - Tertiary education
  - Adult education and training
- **designed** for e-learning
- CMS (Course Management System)
- LMS (Learning Management System)
- SCORM (Sharable Content Object Reference Model) compatible
- free (GNU GPL)
- PHP language

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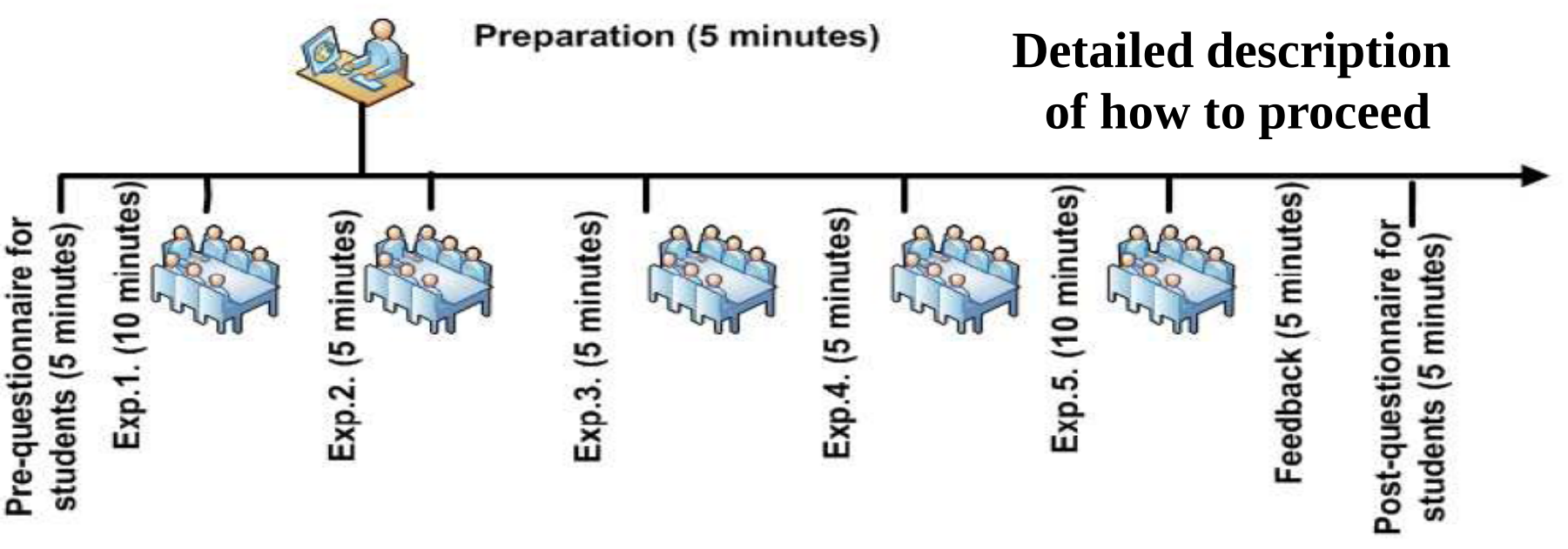
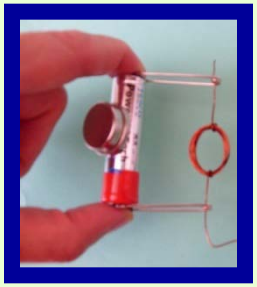
5. GP: Electric motors



Detailed description of how to proceed



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5. GP: Electric motors

Exp.1.: safety pin motor

Exp.2.: 1 minute motor

Exp.3.: electric motor

Exp.4.: homopolar motor

Exp.5.: electromagnet

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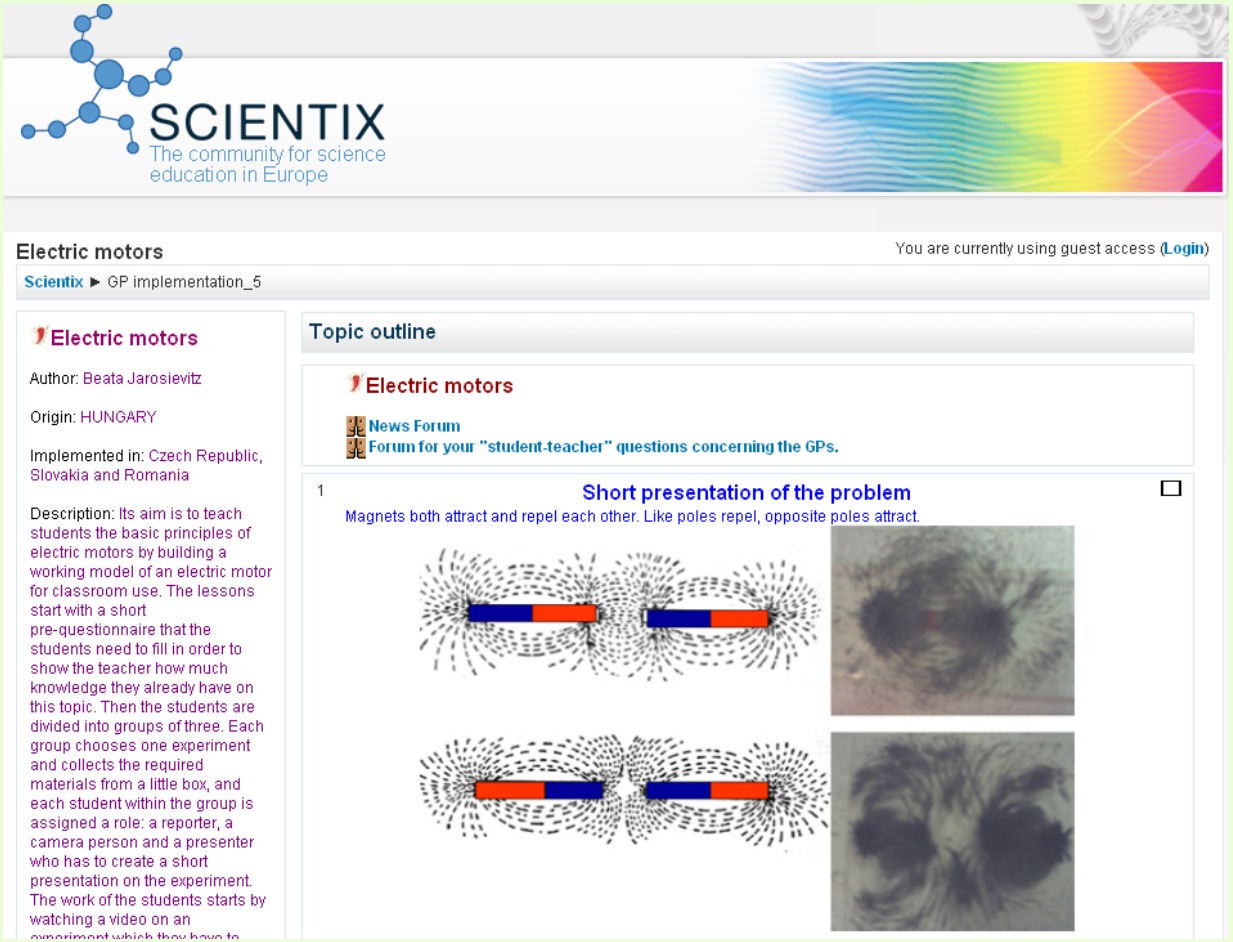
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

5. GP created

http://moodle.scientix.eu/course/view.php?id=26

Login as guest



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5. GP created

Spice

SPICE- Science Pedagogy Innovation Center for Europe

Use : **Worksheet for students** (group 2.)

Topic: Electricity, Magnetism

Title of the selected GP: **Electric motors**

Please use the following **materials**:

- ☐ Strong neodymium magnet
- ☐ Cu wire
- ☐ battery

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5. GP created

Activities:

Look at the video: on-line

Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

5. GP created

Reproduce the experiment seen on the video:

“**1 minute motor**”

1. Attach the magnet to one end of the battery

2. Press and hold the top end of the wire to the top end of the battery, making an electrical connection from the top battery end to the wire.

3. Lightly touch the free end of the wire to the side of the magnet

Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
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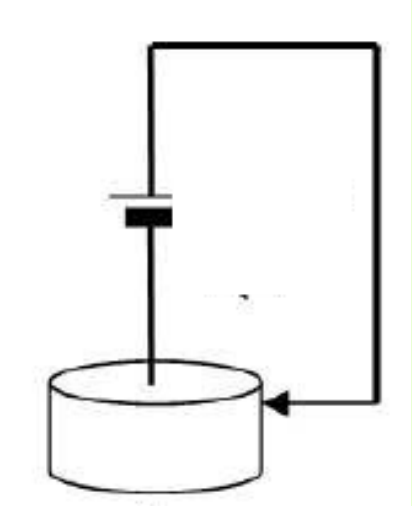
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

5. GP created

•Make a prediction. Use the right-hand-rule to determine the direction of the force and current draw in the picture



•Record your experiment using a digital camera.

All photos, and video files have to be used for a small report

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5. GP created

Power Point

View

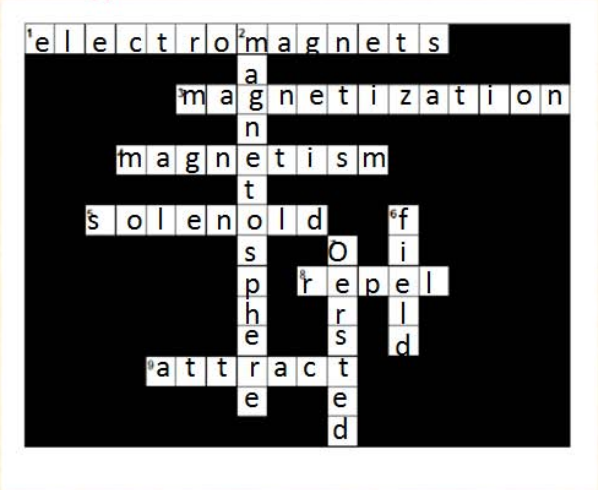
Report created

by student

Crossword puzzle

Across:
1. electromagnets
3. magnetization
4. magnetism
5. solenold
8. repel
9. attract

Down:
2. magnetosphere
6. field
7. Oersted



Berendi Dominik 14 years old 8th grade SEK Budapest International School
1021 Street Hűvösvölgyi 131

Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
Dennis Gábor College, SEK Budapest International School;
1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

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5. GP created

•can be extended for adults BSC education

Teaching Electricity at BSC level requires some minimum knowledge.

Unfortunately the majority of the students are not familiar with the basic phenomena etc.

This GP can also be used for review, at BSC level for the better understanding of the knowledge, as well, especially for students enrolled in distance education (e-learning materials are very handy) .

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Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
Dennis Gábor College, SEK Budapest International School;
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6. Summary - Conclusion

- hands-on experiments
- project method
- use of the multimedia, ICT
- Internet communication

❖ **modernize the teaching of physics**

❖ **rise up students' motivation, interest**

This method can be implemented,

GP can be translated in any languages.

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1119 Budapest, Mérnök u. 39.; 1021 Budapest, Hűvösvölgyi út 131., Hungary

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5. http://moodle.org/?lang=en ;

Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
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„Science is a common language”

(lecture given on 5 of June 2008 in Budapest, by George Andrew Olah (born May 22, 1927 in Budapest, as Oláh György) American chemist, awarded with Nobel Prize in Chemistry in 1994)

Thank you for your attention!

DENNIS GABOR COLLEGE
Author: Beáta Jarosievitz Dr.; E-mail: jarosievitz@gdf.hu
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