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European Physical Society

# EUPEN's 12'th General Forum EGF 2010

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# NEW WAYS OF TEACHING PHYSICS

## Paris 2-5 September 2010

EUPEN
The European Physics Education Network

epsi European Physics Students' Initiative

UPMC
PARIS UNIVERSITAS

## Contributions to the interactive sessions

**Saturday September 4th, 2010**

1. Anna de Ambrosis and P. Onorato; University of Pavia, Italy
   *"Magnetic damping: Quantitative experiments with MBL sensors.*
2. Mihaly Benedict; University of Szeged, Hungary
   *Animation of experiments in modern quantum physics*
3. Marion Birch; University of Manchester, UK
   *Mastering Physics: A commercial e-tutoring system*
4. Joan Borg-Marks; University of Malta Junior College, Malta
   *A focus on the four Ms to guide students understanding as they see the invisible*
5. Madalin Bunoiu, Septimiu Lica; West University of Timisoara, Romania
   *Experimentarium$^{tm}$ — a different way to learn and teach physics*
6. Lea Canella; Technical University Munich, DE
   *Interactive lecture on prompt Gamma Activation Analysis*
7. John Conway; Imperial College, London, UK
   *METRIC (Mathematics Education Technology Research at Imperial College)*
8. Gintaras Dikcius, Feliksas Kuliesius; Vilnius University, Lithuania *E-learning: solidifying practical skills in computer networking*
9. Fernande Frising, Robert Sporken; University of Namur, Belgium
   *Videos of physics lecture demonstrations*
10. Miroslav Furic, Darko Androic; University of Zagreb, Croatia
    *Interactive modes inspired by high energy physics*
11. Zoltan Gingl; University of Szeged, Hungary
    *Thumb-size USB-to-sensor interface supports efficient experimentation in multilevel education of physics and other disciplines*
12. Lucia Gutu; Colegiul Tehnic de Comunicatii Augustin Maior, Cluj-Napoca, Romania
    *Students creativity in teaching physics*
13. Kenneth Järrendahl, Linköping University, Sweden
    *A Software Application to Complement Experimental Problem Solving*
14. Hans-Jörg Jodl, S. Gröber; University of Kaiserslautern, Germany
    *Experimenting from a distance in case of (optical) Fourier Transformation*
15. Dimitrios Karageorgopoulos a.o.; University of Patras, Greece
    *An interactive Remote Digital Signal Processing Laboratory (R-DSP Lab)*
16. Violeta Karcnauskaite, Gintaras Dikcius; Vilnius University, Lithuania
    *A computerised audiometry module for testing hearing level*

17. Nigel Langford, Ivan Ruddock; University of Strathclyde, UK
*Skills training in Undergraduate Physics Degree Courses*

18. Bruce Mason; University of Oklahoma, USA
*The ComPADRE library*

19. Leopold Mathelitsch a.o.; University of Graz, Austria
*Mobile Phones as Educational Tools in the Physics Lab*

20. Marisa Michelini, University of Udine, IT
*Approaching processes in thermal phenomena by means of sensors*

21. Jan Naudts, Nick Schryvers, Etienne Cornelis, University of Antwerp, BE
*Real experiments remotely controlled*

22. Jana Raganova, Matej Bel University Banska Bystrica, SK
*Development of integration approaches in physics education through ComLab multimedia courses*

23. Vladimir Roubik a.o.; Czech University of Life Science Prague, Czech Republic
*Multimedia materials for students during semester*

24. Elena Sassi, Italo Testa; University Federico II, Napels, Italy
*Learning/Teaching Electromagnetic (e.m.) Induction: a MIT multimedia*

25. Maksym Sich, EPSI
*Virtual Lab and Classroom: Existing and Prospective Solutions. Students Point of View.*

26. Luigi Smaldone, Elena Sassi; University Federico II, Napels, Italy
*Eyes on Kepler laws: a multimedia based on data/images by a planetarium*

27. Miriam Spodniakova Pfefferova, Matej Bel University Banska Bystrica, SK
*Physics around us*

28. Erich Steinbauer; University of Linz, Austria
*Teaching Acoustics with the program MSAudio*

29. Teodorina Tibar, Monique Vindevoghel, JM Blondeau; Multimedia Service of Lille1 University and UNISCIEL (Université des Sciences en Ligne), Lille, FR
*Title to be announced*

used also in everyday life. There are numerous sites which are continuously emitting already prepared physics education supplies. Because communication linked with streaming concept is one directional, significant effort must be done by educators to choose suitable material assembling it to be appropriate for their courses. Samples as MIT OpenCourseWare and others will be discussed together with our, Croatian, experiences with streaming concept.
CONFERENCING: When an unexpected and/or crossroads dilemma occur within a large collaboration, geographically remote partners discuss the situation aiming at decision making. Equivalent model can be used in education where students, but also their teachers, can participate in global discussion related with selected problems. Required tools for such activities are also widely available as free or open source software. Our practice with Claroline will be shortly outlined.
VIRTUAL LABORATORY: This is a novel mode of experiment conduct. The person responsible (experiment operator/supervisor) for the data accumulation is not any more necessarily located in the experiments control room. Essential real-time data being accumulated by the experiment at one location can be accessible via Internet to the operator at another continent. The intervention into the experiment's operation can be done remotely. Teaching using virtual equipment is also very popular today. We are usually addressing that procedure as simulation training. Here we are not pointing merely about getting skills with virtual equipment but also using unique real apparatus at a distance.
Examples from the frontiers of physics should raise the interest and motivation of students. It is not surprising that analogue methods cover distinct areas such as particle physics and education. Scientific methods, especially those which come from natural sciences, represent ways through which civilization enlarges knowledge, so there is every reason to implement these methods in conventional education structure.

## 11 Thumb-size USB-to-sensor interface supports efficient experimentation in multilevel education of physics and other disciplines

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We have developed a small, very low cost yet precise USB-to-sensor interface and a graphical user interface software that helps the teacher to measure and show real-world physical signals in real time during experimentation. While the efficiency is kept high and many signals can be acquired with gluelessly connected sensors of temperature, acceleration, rotation, light, pressure, magnetic field, humidity, blood flow, etc., the use is still very simple in order to ease the understanding not only of the physical phenomena but also of the instrumentation basics as well. A single open-source software can be used for many kinds of measurements and it is simple enough to provide an efficient tool for teaching students from primary school to postgraduate level.
The lecturer can show how the sensors work, what their properties are, how to

calibrate and what the most common pitfalls of measurements and experimentation are. Since a single software is used for all measurements, the students will see what is common, they can make abstraction more easily and the measurement device will appear much less as a black box. The system and methodology have been tested in several secondary schools and in our undergraduate courses, and both the teachers and the students could easily use the system. The students were motivated by the simplicity and efficiency, impressed by the use of computer to acquire a very wide range of real-world signals. Many of them could use their creativity in carrying out experiments and most less-practiced students had success even though they were sceptic before.
The full development is open-source, and a dedicated web-page http://www.noise.physx.u-szeged.hu/EduDev/ provides documentation and example experiments, where the contribution of the teachers and the students are also presented.

## 12 Students creativity in teaching physics

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Different physics subjects are presented as podcast, radio broadcasting episodes. Teacher lessons or the skull sessions among the students are recorded thanks to appropriate radio equipment (pc, mixer, headphones, microphone) and specific software, then they are published on the web through an audio hosting. Subjects: Adverse effect of Artificial light (episode 1 and 2 ), Theories about the Universe Evolution, Science Dictionary, Multiple choice tests-Astronomy quiz. Is a new way of learning, a modern one with audio files, science documentary web-pages, media didactic materials made by students from on-line European collaboration. We made digital fichier as an archive with podcasting files for science curriculum lessons and we were in that kind of presentation teachers and students as lifelong learners.
PEDAGOGICAL VALUE: The podcasting idea was born to combine traditional teaching methods with new technologies, because nowadays young people have a natural inclination towards the various forms of media. Using these new didactic tools reawakens the students learning interest, at the same time they learn how to use in a critical way media and technology. Using that way of learning by collaborative students work we can increase children creativity, use science materials created by students (audio, questions, tests, quiz, description for podcast).
PEDAGOGICAL USE OF ICT TOOLS: Computer studies goals :

1. The students learn how to use specific tools such as mixer, microphone, recording techniques and handling audio files:
2. They learn how to create a radio broadcast;
3. They learn how to search something on the web; to take out a podcast subscription; to create a podcast - Becoming multimedia contents authors and editors; Interdisciplinary or indirect goals: Use of the English language, because this is the language used on the web and for some software;