



engage, excite, educate.



Vrije
Universiteit
Brussel



B-PHOT
BRUSSELS
PHOTONICS
TEAM



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Students are the future



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Poor science aptitude worries leaders

Test from page A1

lagging behind 43 jurisdictions — 42 states and the Department of Defense schools — on the science test and in a dead heat for last with three others: Hawaii, Arizona and Mississippi.

Four states did not participate in the voluntary testing, administered in 2009 by the National Assessment Govern-

ing Board. Bipartite secretaries called t

Challe San



Youths lagging in science

Low proficiency seen as putting students, nation at risk

Ingenieurstudies minder populair

- zondag 20 september 2009 Bron: belga

BRUSSEL - Het aantal studenten industrieel en burgerlijk ingenieur stijgt minder snel dan bij andere richtingen. Beide opleidingen zijn ook beduidend minder populair bij meisjes dan vorig jaar. De

Vrouwen in de wetenschap: minder zichtbaar in toppublicaties

De Zweedse onderzoekers Daniel Conley & Johanna Stadmark vermoeden een gender-bias in toptijdschriften op basis van hun analyse van de artikels die in *Nature* en of *Perspectives in Science* verschenen in 2010 en 2011.

Ze concentreerden zich specifiek op News & Views artikelen omdat hier de wetenschappers voor gevraagd worden en stelden vast dat vrouwen hier minder aan bod komen:

"We believe that fewer women than men are offered the career boost of invitation-only authorship in each of the two leading science journals.", stelt Daniel Conley. (bron)

Abstract van het onderzoek :

We have analysed the gender distribution of authors of News & Views articles in *Nature* and of *Perspectives in Science* for 2010 and 2011. Our numbers indicate that both journal sections under-represent women scientists.

4
09
2012

Downward mobility haunts US education

By Sean Coughlan

BBC News education correspondent



Alarming shortage of engineers

ARTICLE | FEBRUARY 19, 2012 - 8:05PM

Nobody learns to ride a bike...



© CORDIS

...by watching someone else

Photonics – our expertise



The Photonics Explorer: engage, excite, educate

A comprehensive, intra-curricular class kit



Goal:

To raise the interest of young people for science & engineering

↳ More students and later more skilled workforce in the field

Lasting impact

Method:

Supporting teachers with free educational material in conjunction with teacher training courses

Enhancing and complementing existing school curricula



tailored to target groups

Group 1: 12 – 14 years

is taught science mainly in interdisciplinary courses

has little to no background in physics, the scientific approach and conducting experiments

will decide soon for or against specializing in science subjects

↳ should experience hands-on the fun and fascination of scientific discovery

↳ especially girls need to gain more self-confidence in scientific matters

Group 2: 16 – 18 years

is taught physics in specialized, often more intense courses

knows usually about waves, electricity, magnetism, and Bohrs atomic model

will decide soon for a career path

↳ should know about the importance of photonics in society and current developments in the field

↳ clearly see that they can partake in shaping this key technology for the future



Conventional outreach

entertaining optics effects
to convey enthusiasm

relies on volunteering
photonics specialists

extra-curricular

components for one time use



engage, excite, educate
class set for hands-on experiments

equip and train science teachers
to convey enthusiasm

intra-curricular

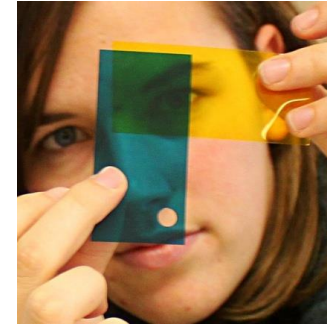
robust and versatile components
serving for several years



What is in the box?

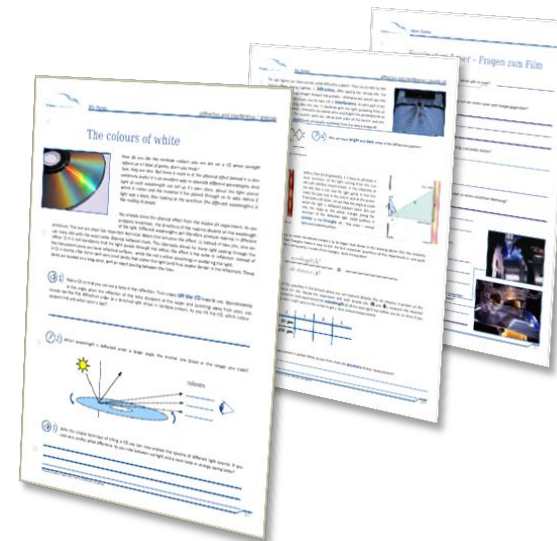
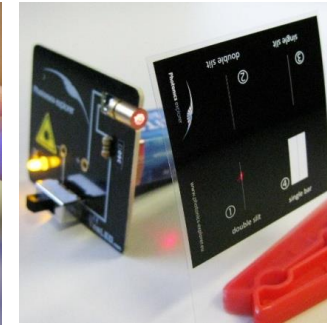
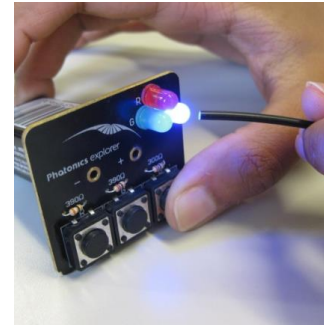
➤ Class set of experimental material

- Over 110 components
- 25-30 students at a time
- hands on, minds on!
- small groups



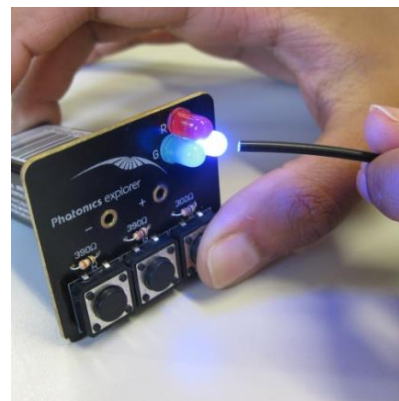
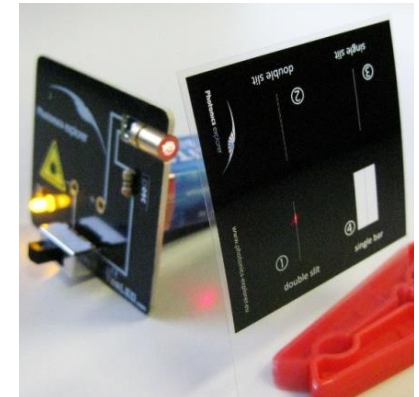
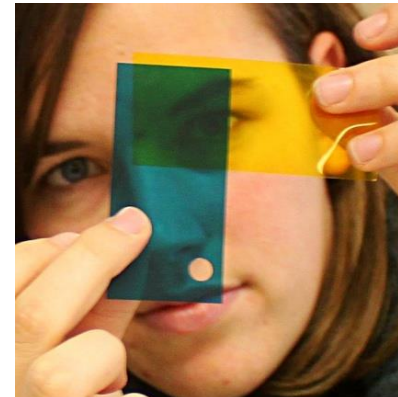
➤ Didactic Framework (8 modules)

- Worksheets, Factsheets
- Teacher-guides
- Multimedia Material
- Modular
- Adaptable



Experimental Components

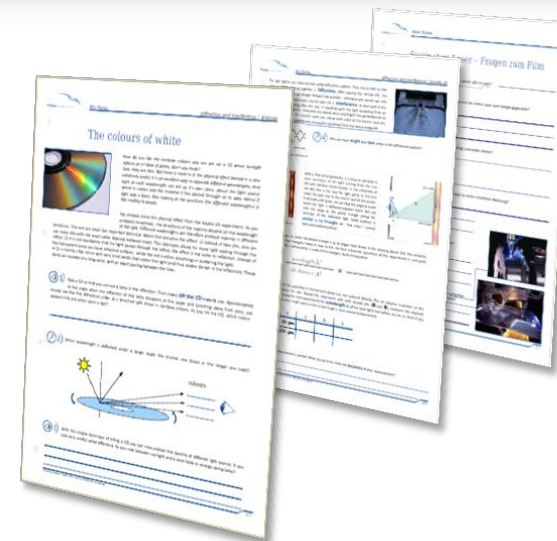
- 10 aluminium **mirrors** (7x7 cm)
- 20 **polarisers** (7x5 cm)
- 10 **colour filter** sets (7x4 cm) including red, green, blue, cyan, magenta and yellow
- 10 **LED modules** with red, green and blue LEDs
- 10 sets of robust plastic **lenses** with the focal lengths 30 mm, -30 mm, and 150 mm
- 10 foils with **slit and double slit** for optical diffraction experiments
- 10 **diffraction gratings**
- 5 m **polymer optical fibre**
- 10 eyesafe **Lasers**



The Educational Modules

Inquiry Based Learning techniques

- hands-on experiments
- links to current technologies
- scientific and analytical skills
- teamwork
- problem-solving
- critical thinking
- working as scientists and engineers



The Educational Modules

Lower secondary level (12-14 years)

- **Light signals** – the properties of light and its use in telecommunication
- **Colours** – colour perception, additive and subtractive colour mixing
- **Lenses and telescopes** – refraction and imaging
- **Eye and vision** – comparison between human eyes and digital cameras, learning about accommodation in the eye

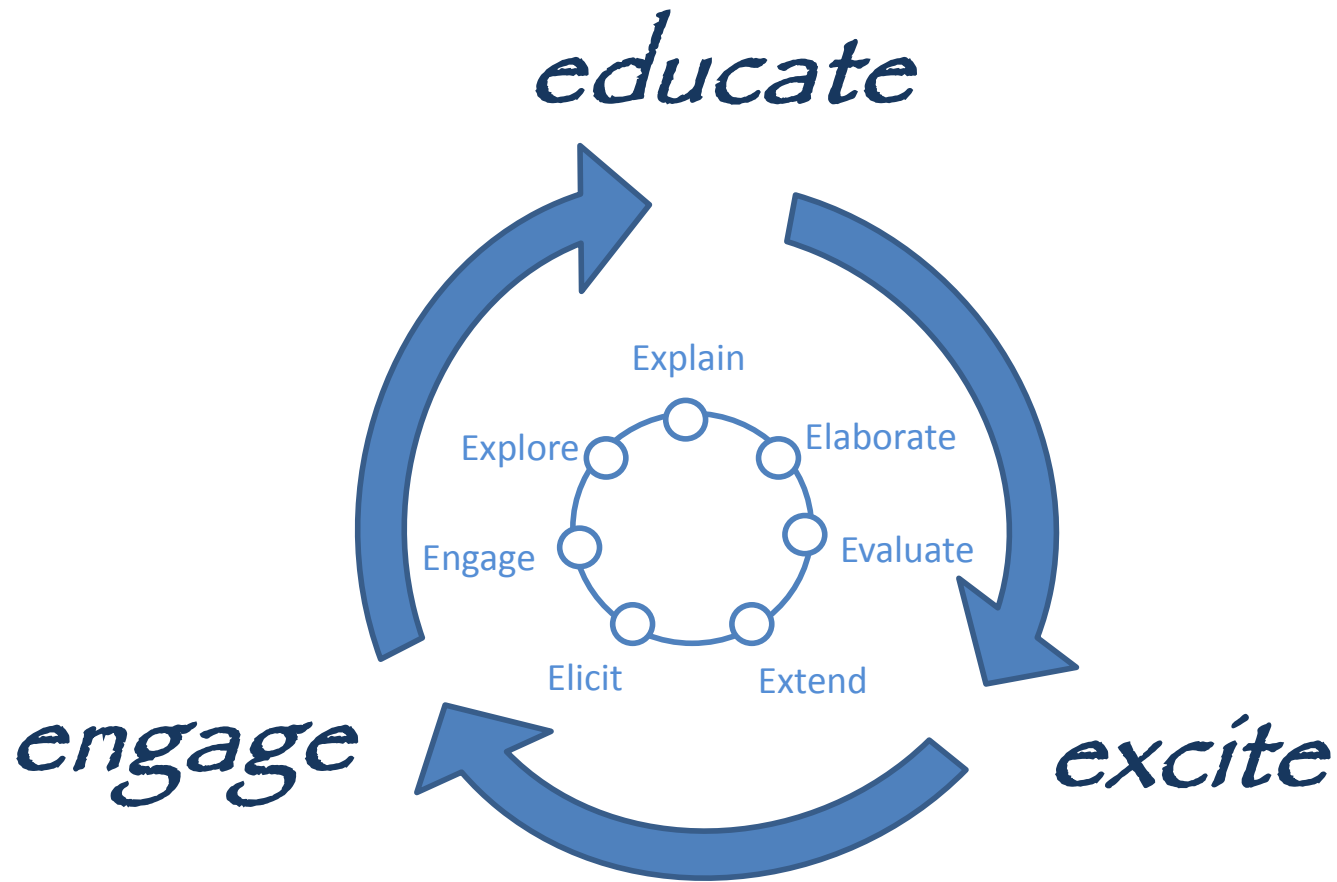
Upper secondary level (16-18 years)

- **Making light** – comparing different light sources, laser
- **Polarisation** – applications in displays and life sciences
- **Diffraction and interference** – diffraction on a slit, spectrometry
- **A scientist's job** – encouraging esp. young women to pursue careers in science and engineering



Three magical E's and more

Learning cycles - towards efficient orchestration of inquiry based learning processes:



© Karplus, Kolb, Eisenkraft

... and many more approaches (reform pedagogy & further developments)

Content developed by teachers for teachers

35 teachers, science education specialists and **> 200 students** in **11 EU countries** –
‘Review and Revise’
3 reviewers per module

1 Photonics Explorer

min. 2 classrooms per year

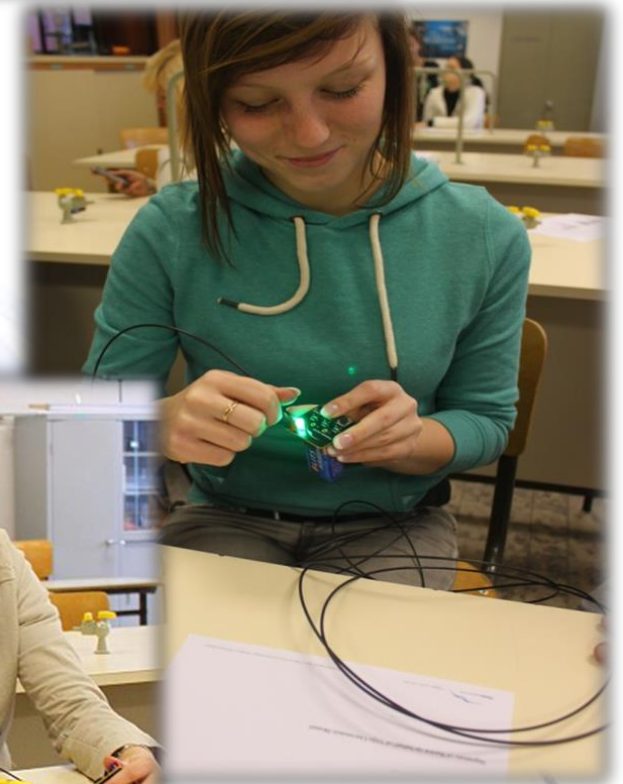
50 students

250 hands on lessons per year

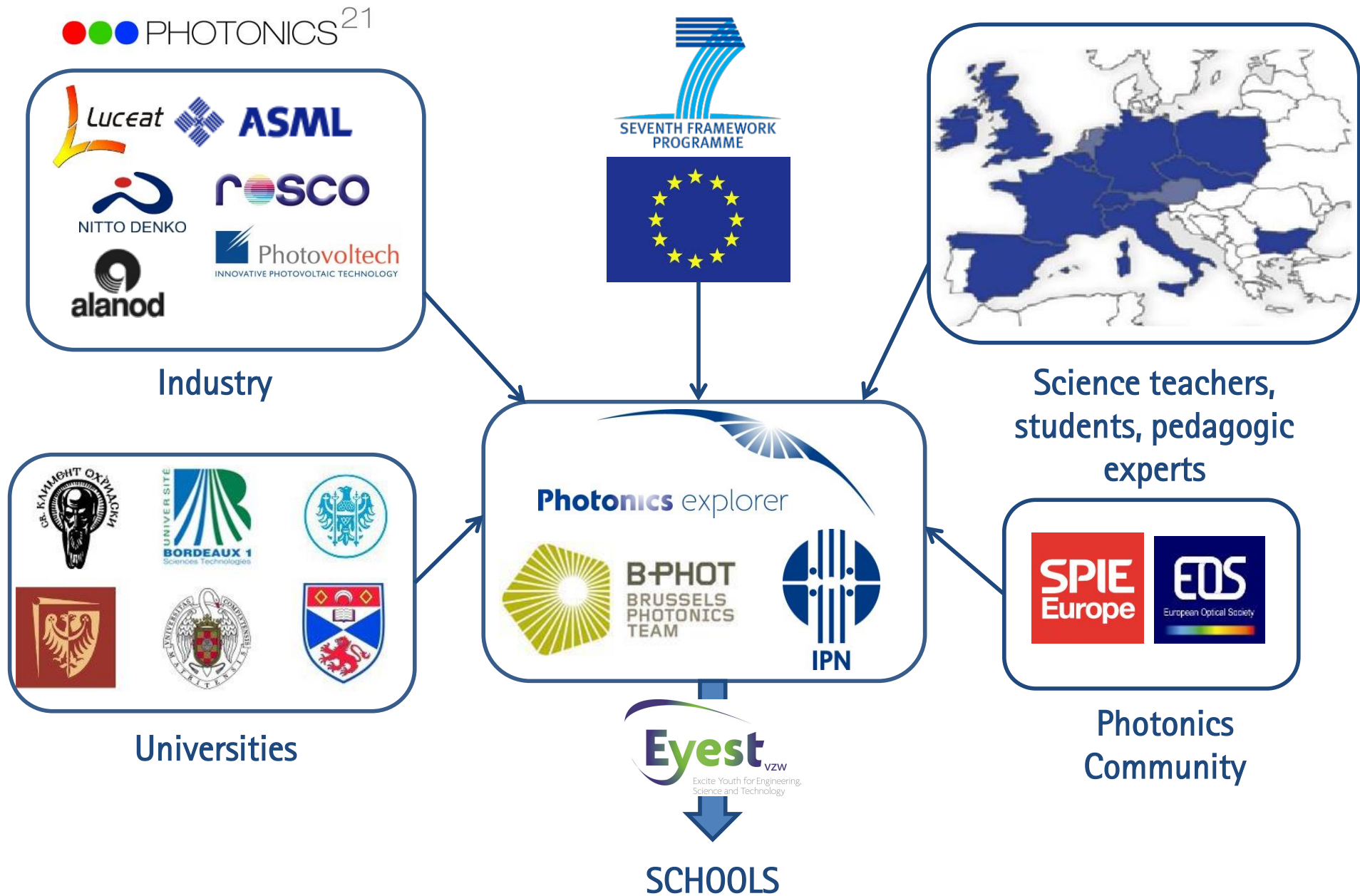
Kit lifetime 5 years

Available in **8 EU languages:**

Bulgarian, Czech, Dutch, French, English, German, Polish, Spanish.



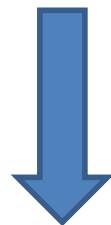
Pan-European Public Private Partnership



Successful EU wide field tests

50 kits successfully tested
with over 1500 students in
7 EU countries;

- Belgium
- Bulgaria
- France
- Germany
- Poland
- Spain
- UK



Scientific evaluation of Impact:
Qualitative and Quantitative



Main research questions

- To what extent does **interactive engagement** with the Photonics Explorer **promote interest and open-mindedness for science** and **improve the image** of physics?
- Are there any **differences** between the individual types of students or **gender-specific discrepancies**?
- What is the **students' and teachers' opinion** of the **applicability** and **feasibility** of the Photonics Explorer in class? Does the content of the Photonics Explorer cover the curricula of the participating countries?
- How strong is the **acceptance** of using the Photonics Explorer in class and how is the **implementation of IBL strategies** promoted by it? What changes do teachers notice in the students and themselves?



Scientific evaluation: Main Results

Quantitative

(Answers to questionnaire)

- **Improvement of self-efficacy and interest of students overall**
- **Girls feel more confident in their scientific ability and their self-efficacy rises.**
- **Interest of male students in physics rises**
- **The Photonics Explorer works especially well with lower secondary students.**



Scientific evaluation: Main Results

Qualitative

(Face to face discussions and visits)

- **High applicability, feasibility, acceptance and relevance** in the classroom
- Content **easily integrated** into various curricula
- Noticeable **positive changes** in the classroom
- Students **more engaged, curious** and questioning
- Teachers and students **eager to implement**





Photonics explorer

Our Ambition: Pan European impact

**10,000 Photonics Explorer
= half a million students per year
over 2.5 million students across Europe
over next three years**



Our Ambition: Pan European impact



- Kits free to teachers
- Sponsorships from industry, governments etc.
- Local Associated Partners: teacher training, distribution
- Partnerships with organisations
- Teaming up with initiatives worldwide



Where we are...

- Over 600 kits EU wide reaching at least 30000 students every year
- Additional countries: Austria, Sweden, Ireland, Czech, Netherlands, Switzerland.



Highlights

DMorgen.be
 NIEUWS SPORT GELD MUZIEK OPINIE PLANET WATCH TECHNOLOGY MAGAZINE CULTUUR & MEDIA
 BINNENLAND BUITENLAND WETENSCHAP GEZONDHEID STAND DER DINGEN

Photonics Explorer: experimenteerkit voor secundair onderwijs

Bewerkt door: redactie - 12/12/12, 20u09 - Bron: belga.be

Het educatief pakket 'Photonics Explorer' ee...

VERWANT NIEUWS

- Vlaamse scholieren bij slechtste van Europa voor wetenschap - 11/12/12
- "Belgie moet kwaliteit van onderwijs hoog houden" - 28/11/12
- KU Leuven maakt extra studieruimte vrij tijdens blokperiode - 12/12/12

MEER OVER

Onderwijs

Vlaamse scholieren bij slechtste van Europa voor wetenschap

DM VIDEO Het Photonics Team van de VUB heeft vandaag in het bedrijf TE Connectivity in Kessel-Lo haar 'Photonics Explorer' gelanceerd. Het betreft een kit met allerlei materiaal

FIRSTPOST.

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Photonics Explorer - Launch event at TE Connectivity - Teacher Testimonials

TE Connectivity Gallery >>

Technology Marketplace
 Connecting people to technology

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Feature Stories - A hands-on approach to physics in the classroom

Remember high school physics class? Trawling through text books, grappling with complex theories and little, if any, hands-on experimentation. Many students across Europe could be forgiven for describing physics as a boring subject. But that is now set to change thanks to an EU-funded project that is bringing 'industry-based learning' (IBL) to the physics classroom.

© Vrije Universiteit Brussel B-PHOT

Developed by a team of photonics researchers, teachers and experts in pedagogy from 11 EU countries, a new educational kit, filled with equipment for fun and interesting classroom experiments is being distributed free to schools across Europe. By 2015, its developers hope, the Photonics Explorer kit will be used by 2.5 million European high school students to conduct practical experiments in photonics - a key area of modern physics and technology - and raise their interest in physics and science in general. That, in turn, should encourage more young people to focus on careers in the sciences, helping Europe overcome a shortage of skilled workers in high-tech industries.

New ways to reach out

Physics outreach usually consists of appealing and fun demonstrations outside of the classroom, but **Anette Phassat** and **Hugo Thiébaert** argue that only "educational outreach" can have a deep impact on students' interest in science.

This approach is based on an entirely new concept of outreach: by the mere introduction of photonics into the curriculum, for example, by providing the tools of demonstration to teachers, the educational impact can be much deeper. The authors argue that this approach is particularly suited to the needs of the European Union, which is facing a shortage of skilled workers in science and technology.

They argue that photonics is a particularly good subject for this approach because it is both fun and interesting, and it has a wide range of applications in industry and everyday life. They also argue that photonics is a subject that is often taught in a way that is not very engaging for students, and that this approach could help to change that.

They conclude that this approach is a promising way to increase students' interest in science and technology, and that it should be widely adopted in schools across Europe.

Photonics Explorer: Working within the Curriculum to Engage Young Minds

Anette Phassat, Isabelle Delannoy, Johan Verbeke, Nina Conde, Marthe Ester and Hugo Thiébaert

Using a laser and light to study...

The Photonics Explorer teaching kit is designed to work within the European secondary school curriculum. The approach allows teachers to easily incorporate optics and photonics into their lesson plans and introduces more students to this exciting field.

A growing number of young scientists are showing a lack of interest in science. In this trend continues, we may face a shortage of skilled scientists and engineers worldwide. The dearth of skilled professionals could become the limiting factor to rapidly growing high-tech industries.

In 2010, the European Commission funded the "EXPERE" project to encourage young students to develop an interest in science. It resulted in the development of the "Photonics Explorer" - an educational kit designed to work within the established European secondary school curriculum. It was developed by photonics scientists at Vrije Universiteit Brussel, Belgium, with the support of a joint European partnership comprised of a lead teacher, experts in pedagogy, and secondary school teachers and comprehensive science centers, with a special focus on teachers. Teachers can get a complete list of a curriculum with lesson plans. Each kit requires an investment of 25 to 30 minutes to set up in class. The curriculum, lessons, and activities, manuals and user guides.

The kit is a multi-media effort to set up a laboratory classroom consisting of 25 to 30 activities. It was developed by Anette Phassat, Isabelle Delannoy, Nina Conde, Marthe Ester and Hugo Thiébaert. The kit is a multi-media effort to set up a laboratory classroom consisting of 25 to 30 activities. It was developed by Anette Phassat, Isabelle Delannoy, Nina Conde, Marthe Ester and Hugo Thiébaert.



INTERNATIONAL YEAR OF LIGHT 2015

EYESTvzw now a partner in UNESCO supported International Year of Light in 2015!

The UNESCO Executive Board has enthusiastically supported the proposal to declare an International Year of Light in 2015. With the initiative and support of Prof. John Dudley, European Physical Society President-Elect, EYESTvzw is part of the International Steering Committee for this global initiative.



The International Year of Light is an initiative developed from 2009 by the European and African Physical Societies, on behalf of a global partnership of over 40 scientific societies, academies and other institutions, in collaboration with the UNESCO International Basic Sciences Programme (IBSP). A resolution in favour of the proclamation of 2015 as the International Year of Light was unanimously approved by the International Union of Pure and Applied Physics

Looking ahead...

- Community of users
- Feedback
- Adding value to discussions

