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HORIZONS IN PHYSICS EDUCATION:

A NETWORK TO IMPROVE THE ATTRACTION OF PHYSICS

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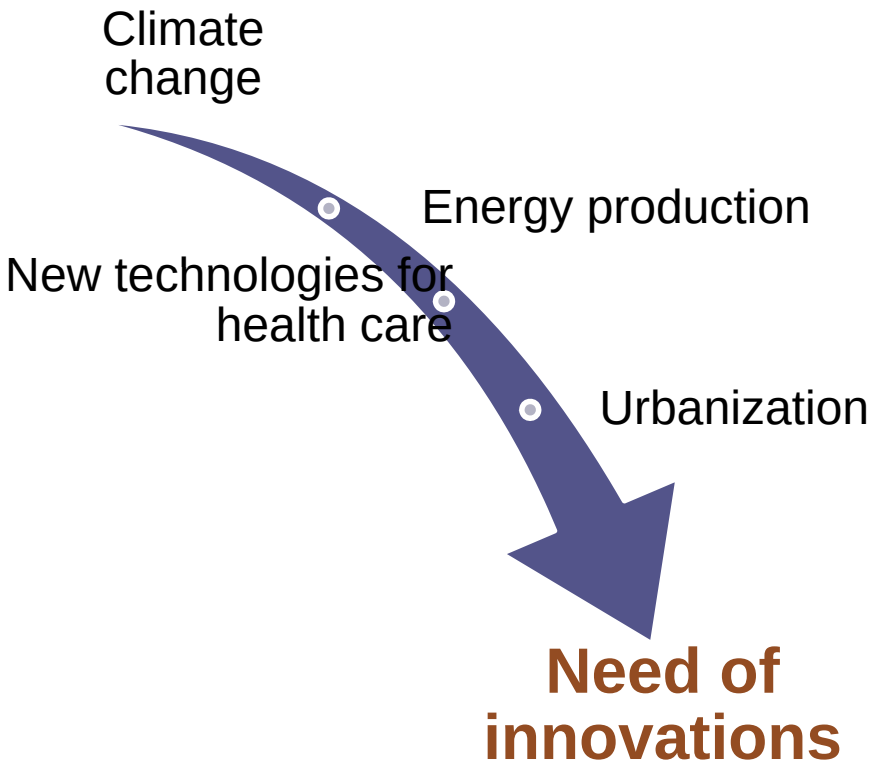
Lifelong Learning Programme

UPMC SORBONNE UNIVERSITÉS

HOPE network

Background

- Physics plays a vital role in our responses to the major challenges facing the world in the 21st century



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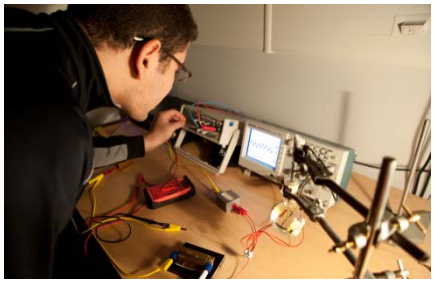
Background

Physics education is crucial

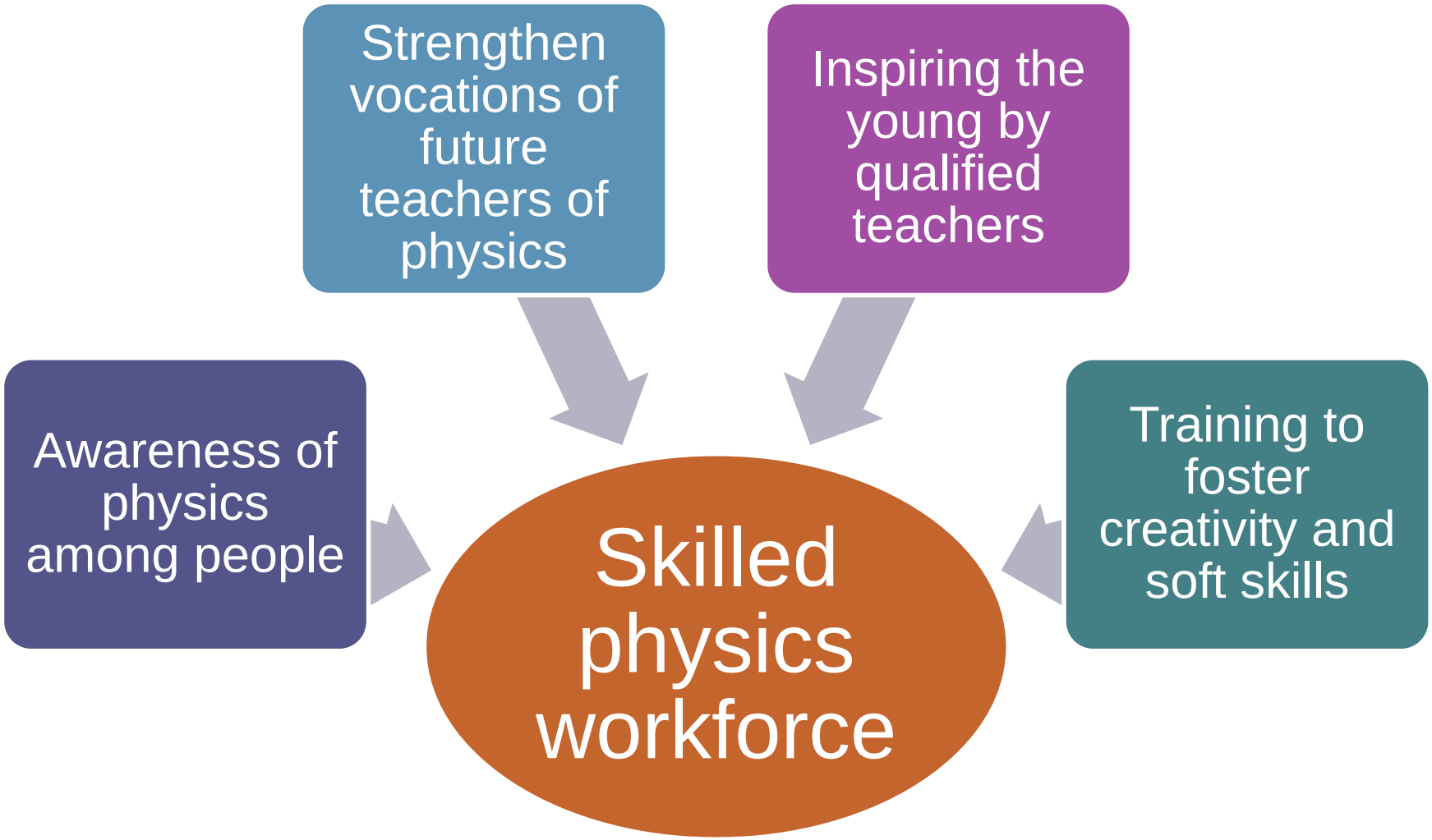
Understanding of the world

Producing graduates with creativity



Producing adapting graduates

Background


Strengthen vocations of future teachers of physics
Inspiring the young by qualified teachers
Awareness of physics among people
Skilled physics workforce
Training to foster creativity and soft skills

History

EUPEN : European Physics education Network

1996 - 1999	30 countries, 120 physics departments

EUPEN II

2000-2003	28 countries, 125 physics departments

STEPS : Stakeholders Tune European Physics Studies

2005 - 2008	37 countries, 171 partners

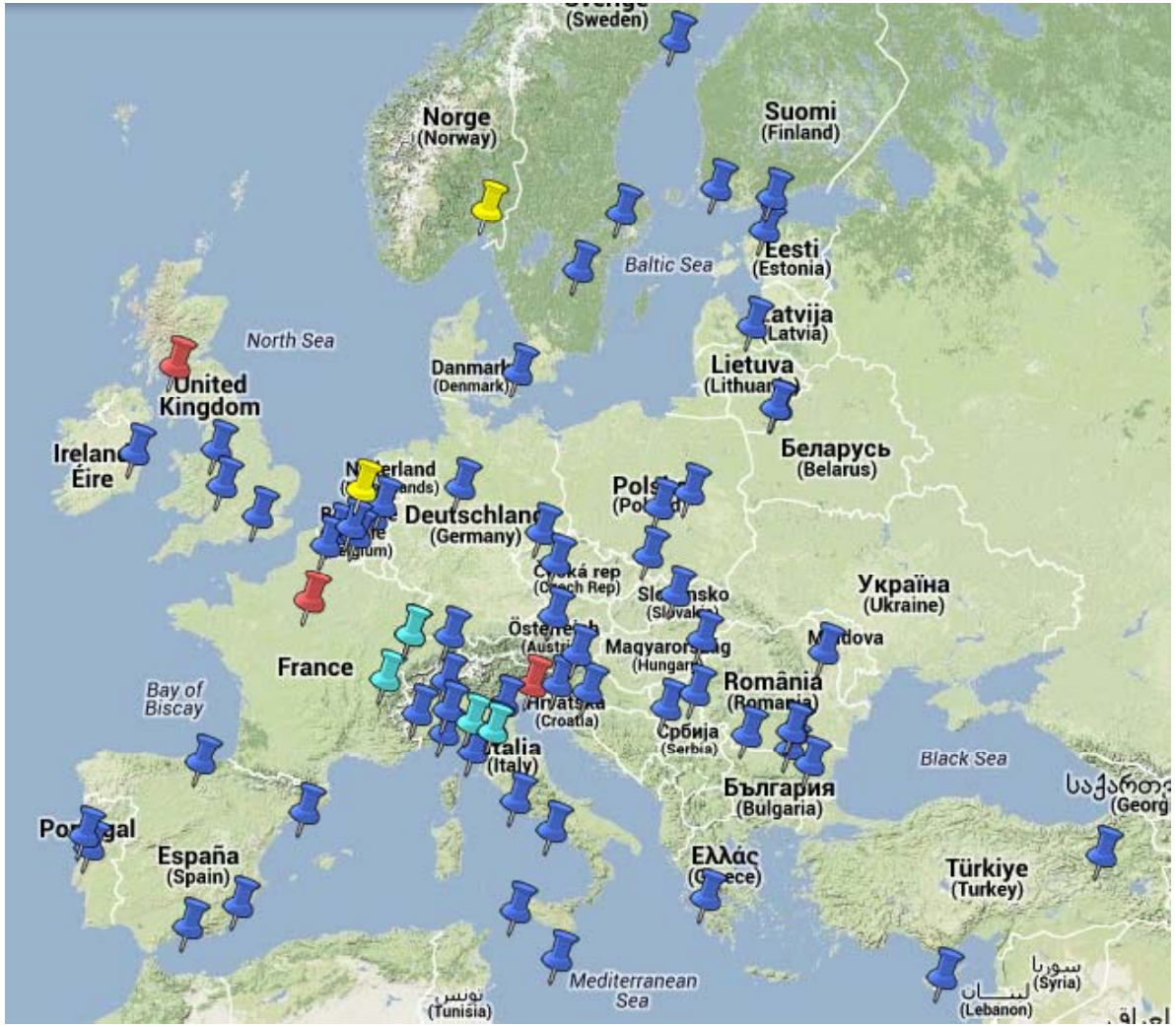
STEPS II

2008 – 2011	27 countries, 77 partners

HOPE : Horizons in physics education

2013 - 2016	37 countries, 171 partners

The network



71 partners in 31 LLP countries

- 65 academic partners (blue) incl. coordinators (red)
- Large/small; research intensive/teacher training/PER
- 3 associations (EPS, Italian Phys. Soc., Int. Assoc. Phys. Students)
- 1 large facility (CERN)
- 2 companies (yellow)

The network

20 associated partners incl.

- 8 universities in Europe (plus Russia)
- USA: APS and 3 universities
- Brazil: Sao Paulo University
- India: Museum of Science, Hyderabad
- Universities in Europe
- IBM Zurich
- Romania: National Institute of Physics and Nuclear Engineering
- GIREP, UK's IOP
- Argentina: Physics Teachers Association

The priorities

WG1

Inspiring Young People to Study Physics

WG2

New Competences for Physics Graduates – Fostering Innovation and Entrepreneurship

WG3

Improvements in Physics Teaching – Meeting Future Global Challenges in Physics Higher Education

WG4

Improvements in the Training and Supply of Physics School Teachers

Coordinators

Nadine Witkowski

General management

Aurora Sanseverino

Financial management/ communication

Université Pierre et Marie Curie

Marisa Michelini

Scientific management

WG1 / WG4

Università degli Studi di Udine

Ivan Ruddock

Scientific management

WG2/ WG3

Strathclyde University

Working groups

WG1

- **Trippenbach Marek**
- University of Warsaw
- **Madalin Bunoiu**
- West University of Timisoara

WG2

- **Hay Geurts**
- Radboud University Nijmegen
- **Jos Rogiers**
- Katholieke Universiteit Leuven

WG3

- **Eamonn Cunningham**
- Dublin City University
- **Fernando Cornet**
- Universidad de Granada

WG4

- **Mathelitsch Leopold**
- Karl-Franzens-Universitaet Graz
- **Mohoric Ales**
- University of Ljubljana

WG1 : Inspiring Young People to Study Physics

"To investigate and report on the factors that influence young people to study physics"

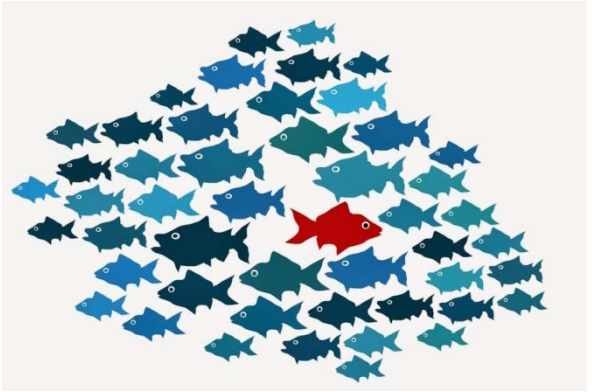
- The influence of the media, individuals, outreach programmes of universities and research organisations.
- Young people's perception of how physics explains the world around them.
- Special attention will be brought to study factors affecting the engagement with women, ethnic minorities and other under-represented groups.
- Among the objectives will be a survey of students in the first year of physics courses within the consortium.

WG2 : New Competences for Physics Graduates – Fostering Innovation and Entrepreneurship

"To recommend ways by which physics degrees can be enhanced so that graduates can contribute more effectively to new needs of the European economy and society, particularly through innovation and entrepreneurship."

This will involve the analysis and sharing of examples of good practice on:

- the application of new physics knowledge and technology transfer to the market economy.
- the integration of physics studies with the world of work.
- how basic physics knowledge underlies and contributes to technological developments.



WG3 : Improvements in Physics Teaching – Meeting Future Global Challenges in Physics Higher Education

"To improve the effectiveness and attractiveness of physics teaching in Europe's university physics departments to help ensure their competitiveness in the global student market."

This will be pursued through actions including:

- a survey of third country students in physics departments and strategies to attract them,
- a study of the impact of ERASMUS MUNDUS programmes in physics,
- an investigation into the use of innovative methods in physics teaching in a global context,
- a study of the application of the results of research into physics education, and weaknesses in current methodologies.

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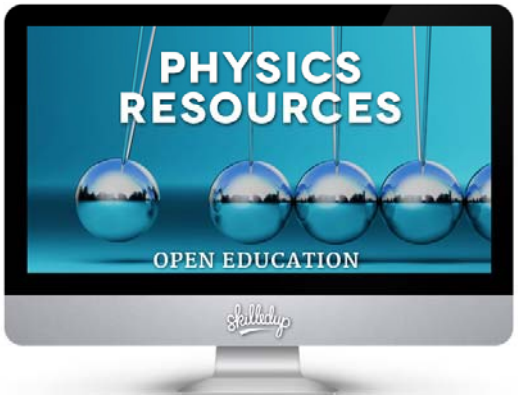
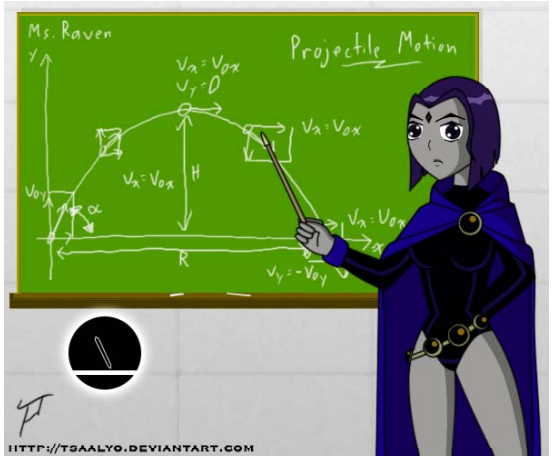


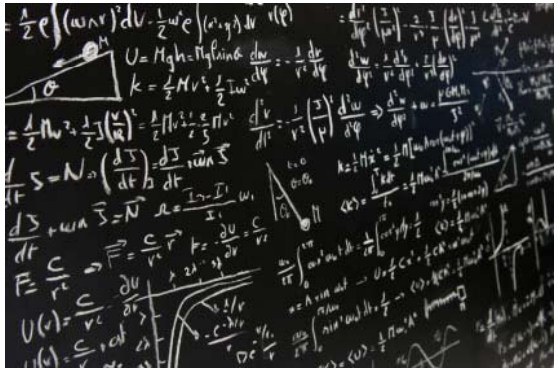
WG4 : Improvements in the Training and Supply of Physics School Teachers

“To recommend strategies for increasing the supply of well-trained physics school teachers and to enhance the role of university physics departments in helping the teaching of physics in schools.”

This will be met partly by objectives to:

- facilitate the training of future physics teachers,
- contribute to the professional development of existing school teachers,
- contribute more directly to physics teaching in schools, e.g. through ‘master classes’ and reach-out laboratories,
- help apply the results of physics education research.





Methodology

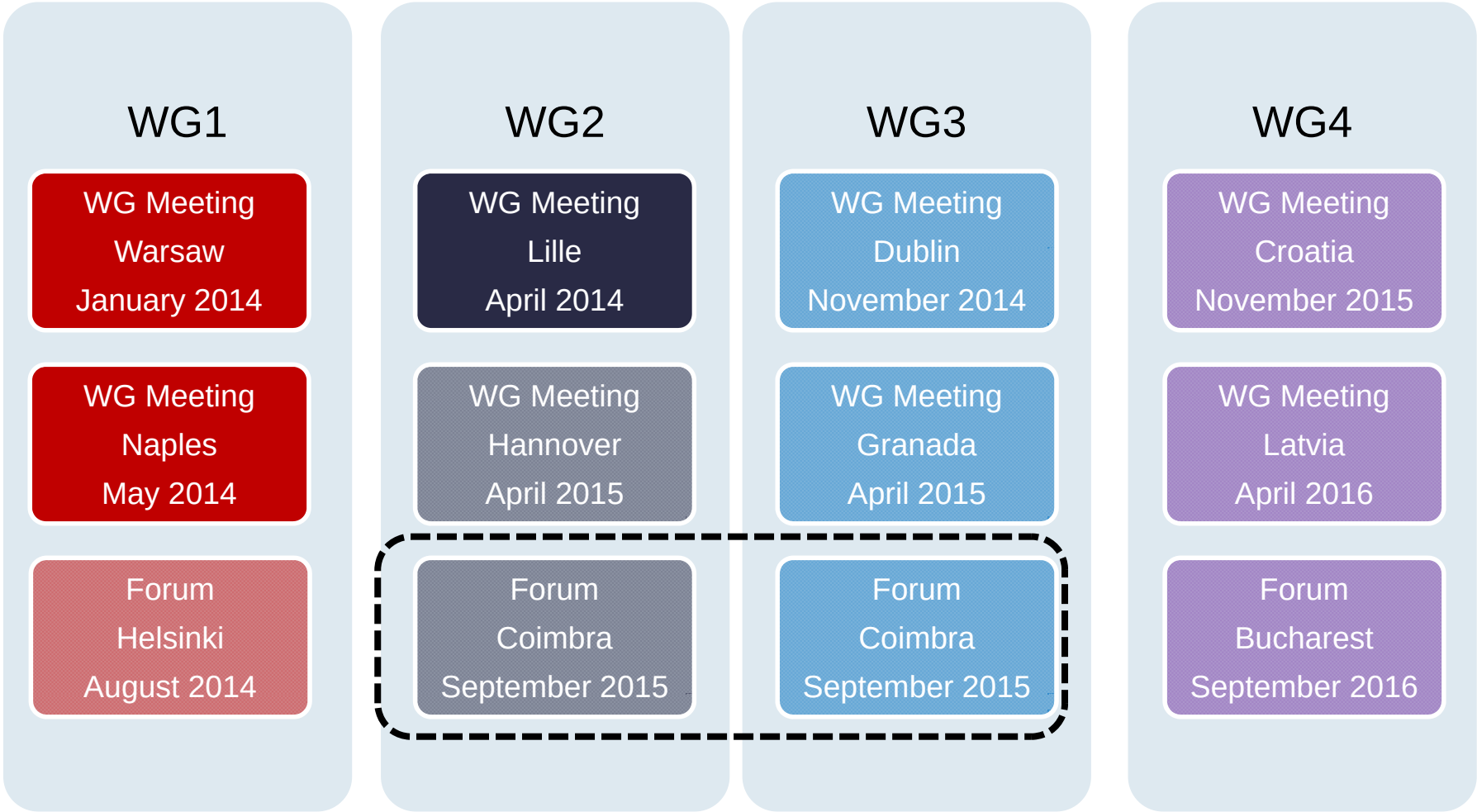
Elaborating questionnaires/templates/protocoles

Disseminating and collecting data from partners

Analyzing and publishing results

Advicing on best practices

Methodology



WG1 Inspiring the young : methodology

- Activities underway, June 2014:

i. Questionnaire for first year students in partner institutions - to identify the factors that inspired them to study physics.

ii. Interviews with students who completed the questionnaire in (i) - to probe some of the answers; to identify reaction to the chosen courses.

iii. Surveys of good practice among partners in outreach and competitions.

iv. Questionnaire for school pupils taking part in demanding Masterclass events.

v. Collection of national data on physics student recruitment trends across partner countries using physical societies, government departments.

WG1 Inspiring the young : methodology

External factors : score 1 - 5

Encouragement from parents or family	Being inspired by a real physicist you know or have met
Encouragement from friends/classmates	Visits to museums
A physics teacher in school	Visits to scientific laboratories, e.g. universities, CERN, etc.
Seeing TV documentaries on physics topics	Visits from university staff or students to your School
Reading books or magazines	Seeing things on the internet e.g. websites, YouTube

WG1 Inspiring the young : methodology

Internal factors : score 1 - 5

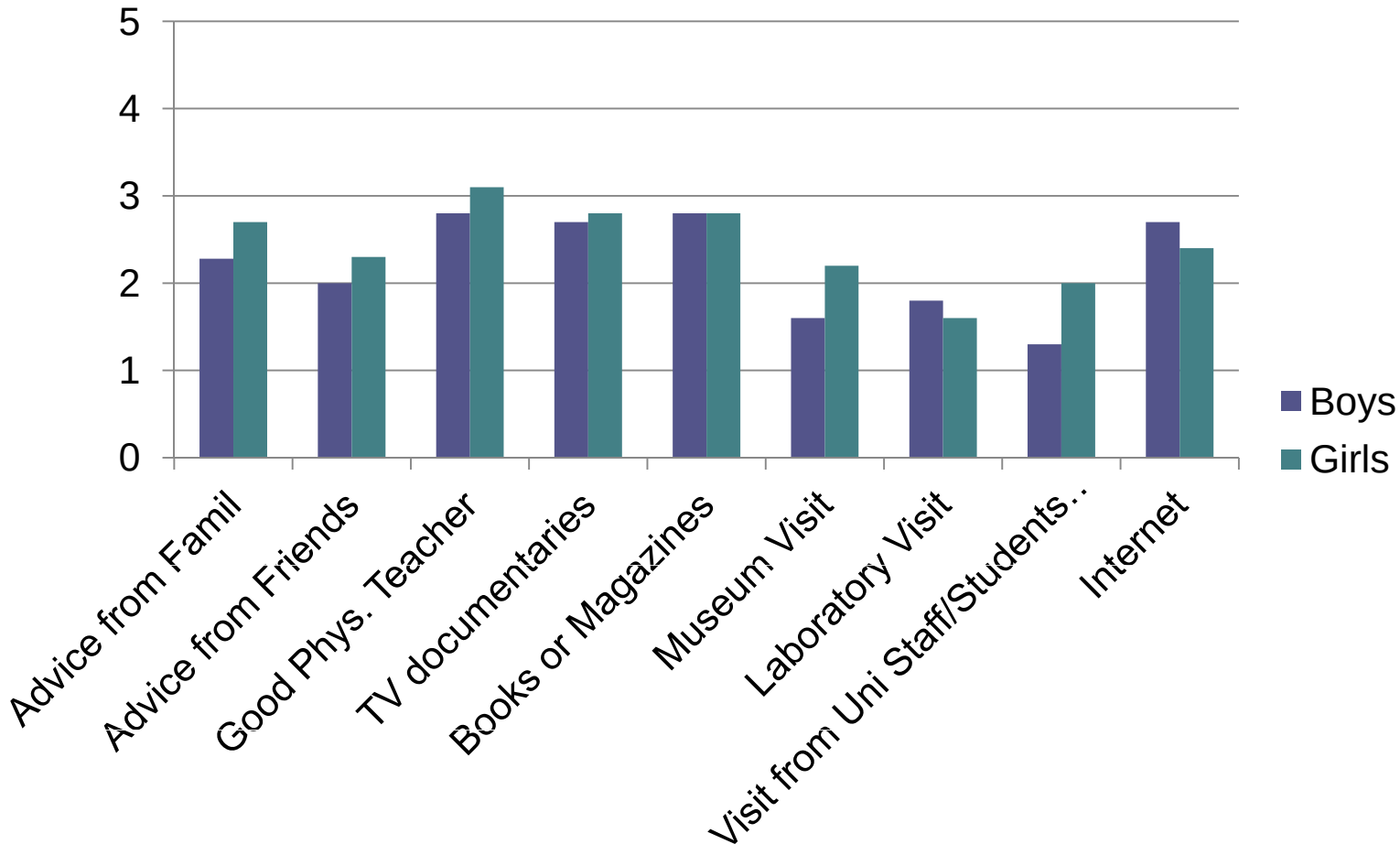
A wish to acquire a deep understanding of the universe	Making a physics-based device
Employment prospects	A wish to get an interesting job
A wish to understand the world around you	A wish to become a physics researcher
Wanting to understand how things work	A wish to become a physics teacher
A wish to learn advanced physics topics (e.g. quantum mechanics)	Physics was the school subject I did best at

WG1 Inspiring the young : preliminary results

	Responses	% Female
• Imperial College London, UK	43	33%
• Roma Tor Vergata, IT	61	25%
• Aveiro, PT	31	43%
• Patras, GR	71	49%
• Craiova, PL	40	74%
• Katowice, PL	22	32%
• Warsaw, PL	27	44%
• Novi Sad, RS	49	63%
• Pierre and Marie Curie Paris, FR	64	39%

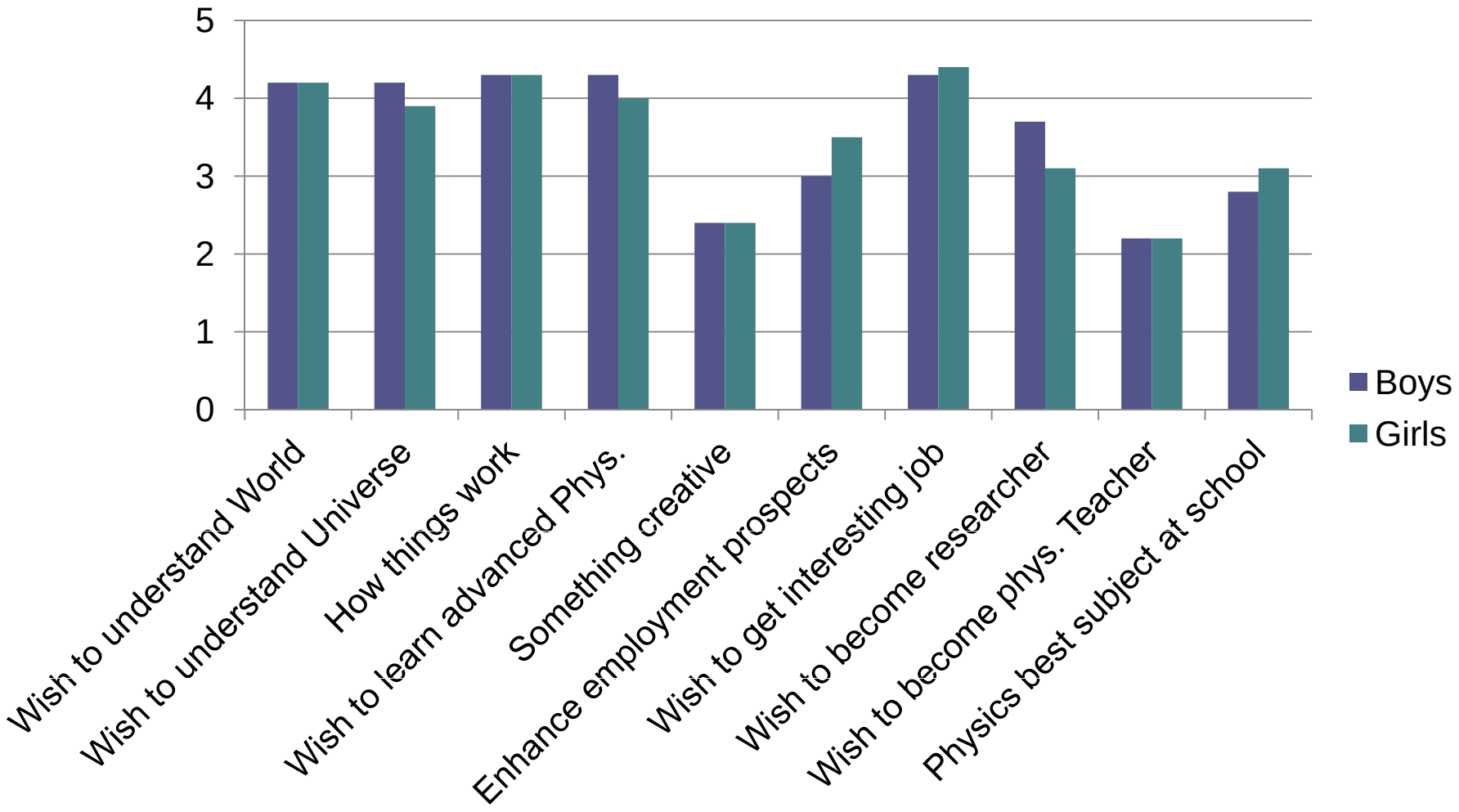
Preliminary results from Paris

- External factors :



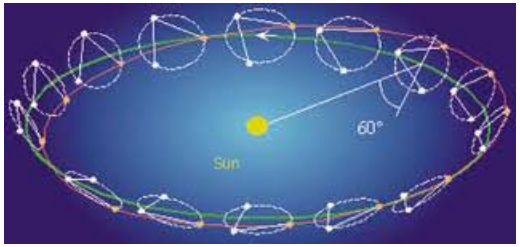
Preliminary results from Paris

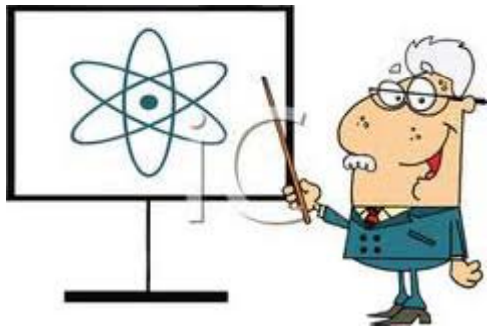
- Internal factors :



Preliminary results from Paris

- Same trend for boys and girls : no specific factors for girls
- External factor : small impact even for school teachers
- Internal factors : « understanding the world » is the highest score (comparable in other universities)
- Physics teacher career is not foreseen
- Age for being interested to physics in Paris
  - Boys: ~ 14 years
  - Girls: ~ 16 years





Keep informed on HOPE network

- Annual forum 27-30 august in Helsinki
  - http://www.hope-network-annual-forum2014.eu
- Newsletters
  - Progress/results about the network activities
  - Every 3 months
- Website : hopenetwork.eu
  - Best pratices
  - News