

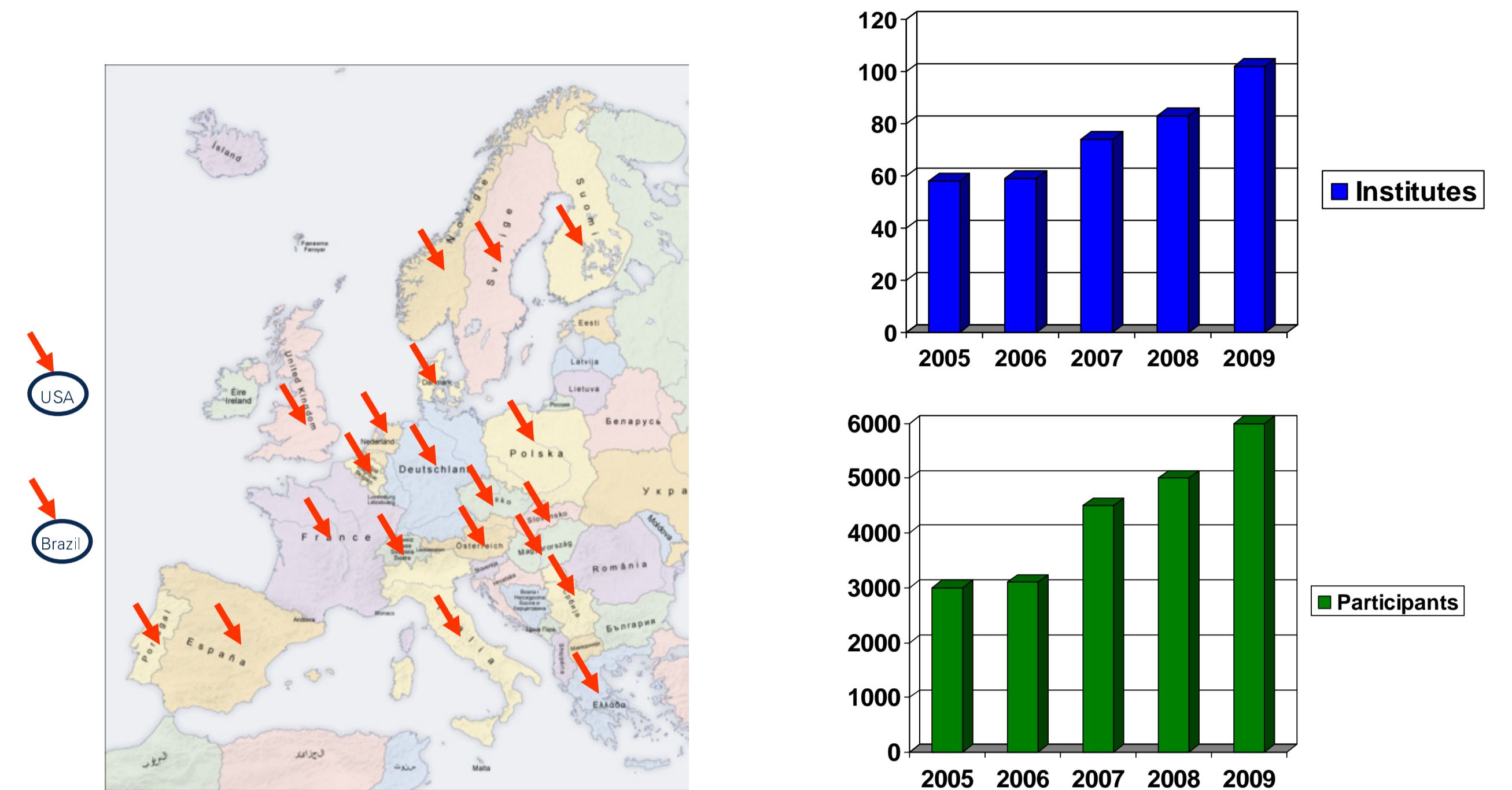
# Hands on Particle Physics Masterclasses

## Concept

- make students into scientists for one day
- 16 – 19 year old high school students
- get invited to a university / research institute nearby
- each year, 3 weeks in spring
- > 100 institutes worldwide
- 22 countries participating
- about 6000 high school students
- teachers' days in addition

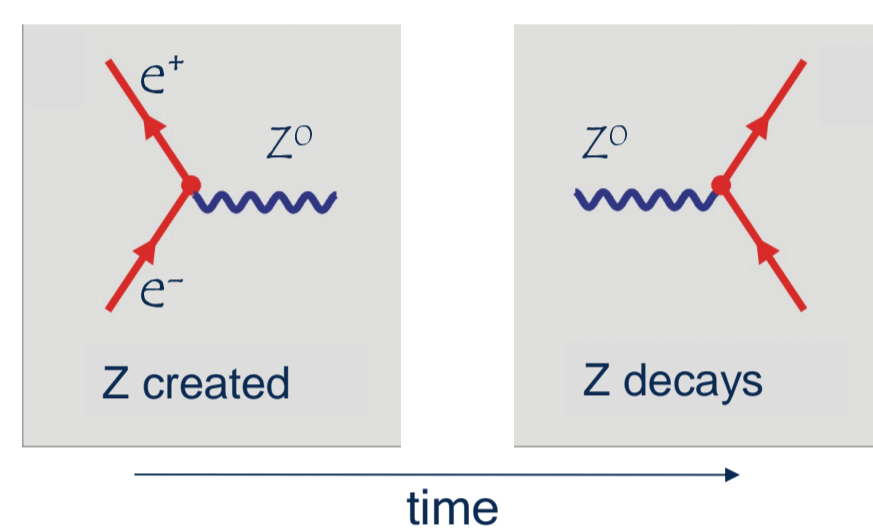


## Participation



## Hands-on Exercises

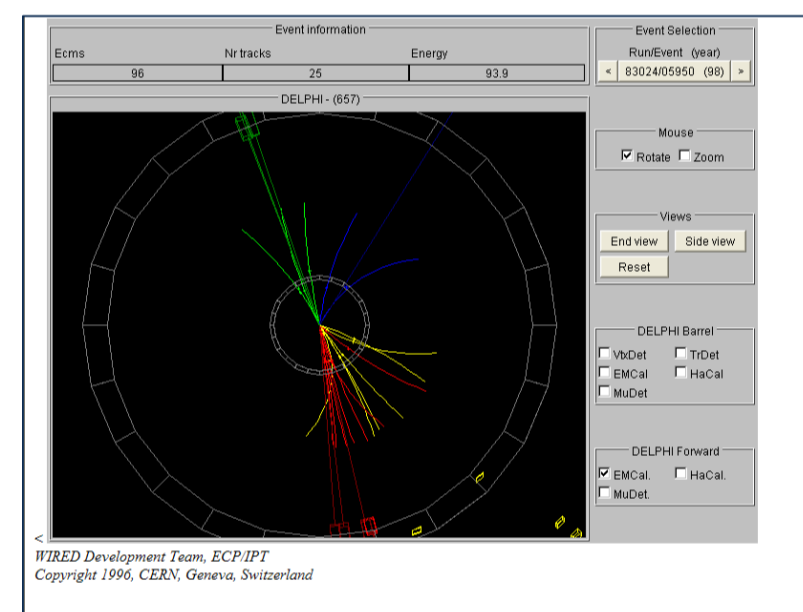
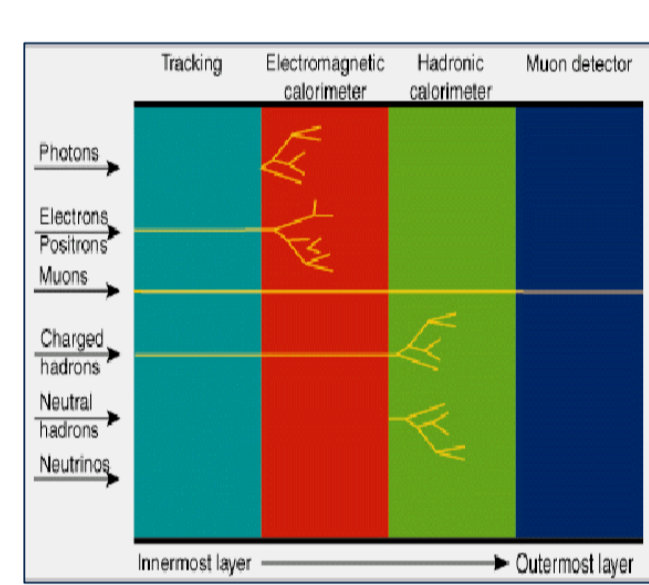
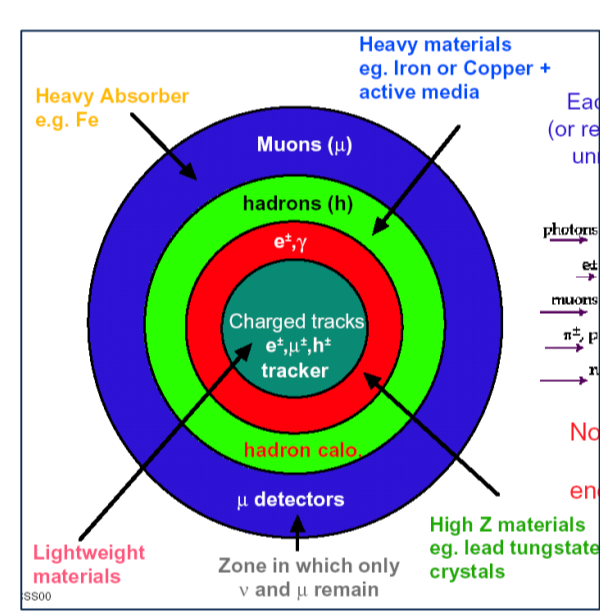
- Z<sup>0</sup>-decays at LEP



**2010:  
upgrade to LHC**

- Measurement of branching ratio

- $Z^0 \rightarrow e^+e^-$
- $Z^0 \rightarrow \mu^+\mu^-$
- $Z^0 \rightarrow \tau^+\tau^-$
- $Z^0 \rightarrow q\bar{q}$



- Confirm lepton universality
- Confirm 3 color charges
- Determine  $\alpha_s$

## Agenda

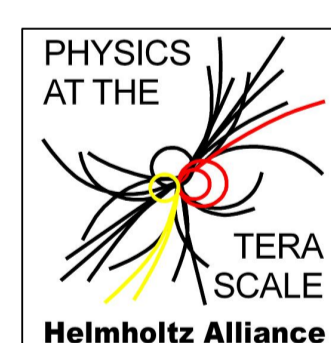
- Lectures
  - Standard model, Accelerators, Detectors
  - Institute's activities, cosmology etc.
- Lunch with physics students and tutors
- Hands-on Exercises
- Video conference = International collaboration of students
  - in English
  - Moderators from CERN
  - Combination of results
  - Discussion
  - Q&A
  - Quiz with prizes

## Future plans

- Upgrade to LHC
- Ph.D. thesis on new pedagogical and didactical concept in progress

## Funding

- Organisation
  - Helmholtz Alliance Germany (Coordinator)
- In-Kind
  - Personal (EPPOG, EVO-team, local institutes)
  - Prizes (CERN)
  - CDs, Brochures (EPS + national resources)

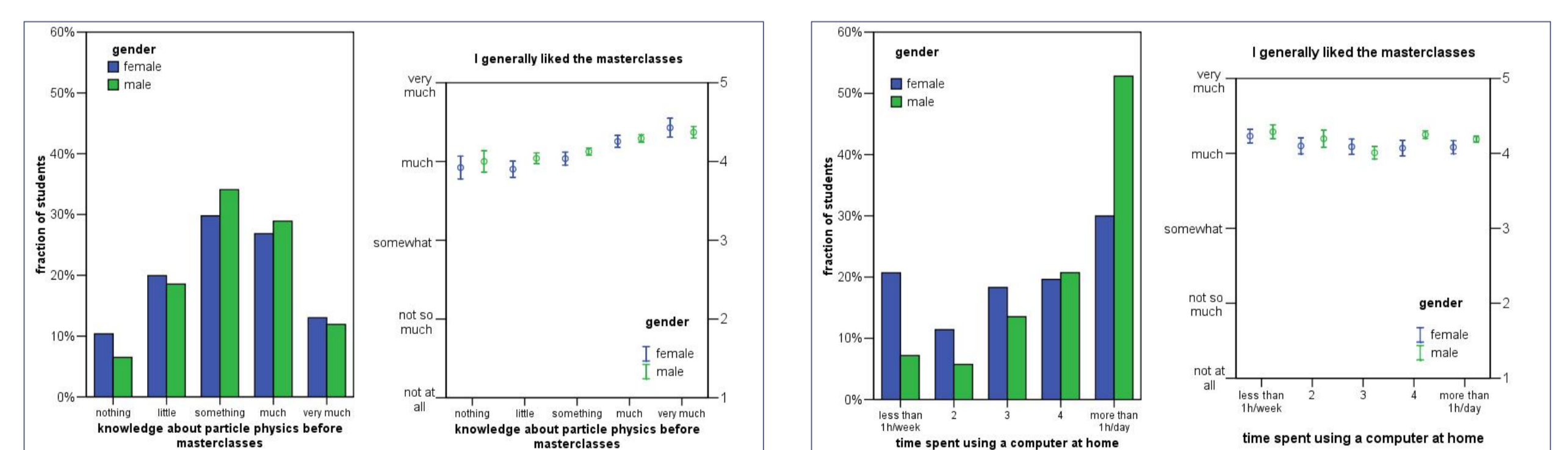


## Masterclasses...

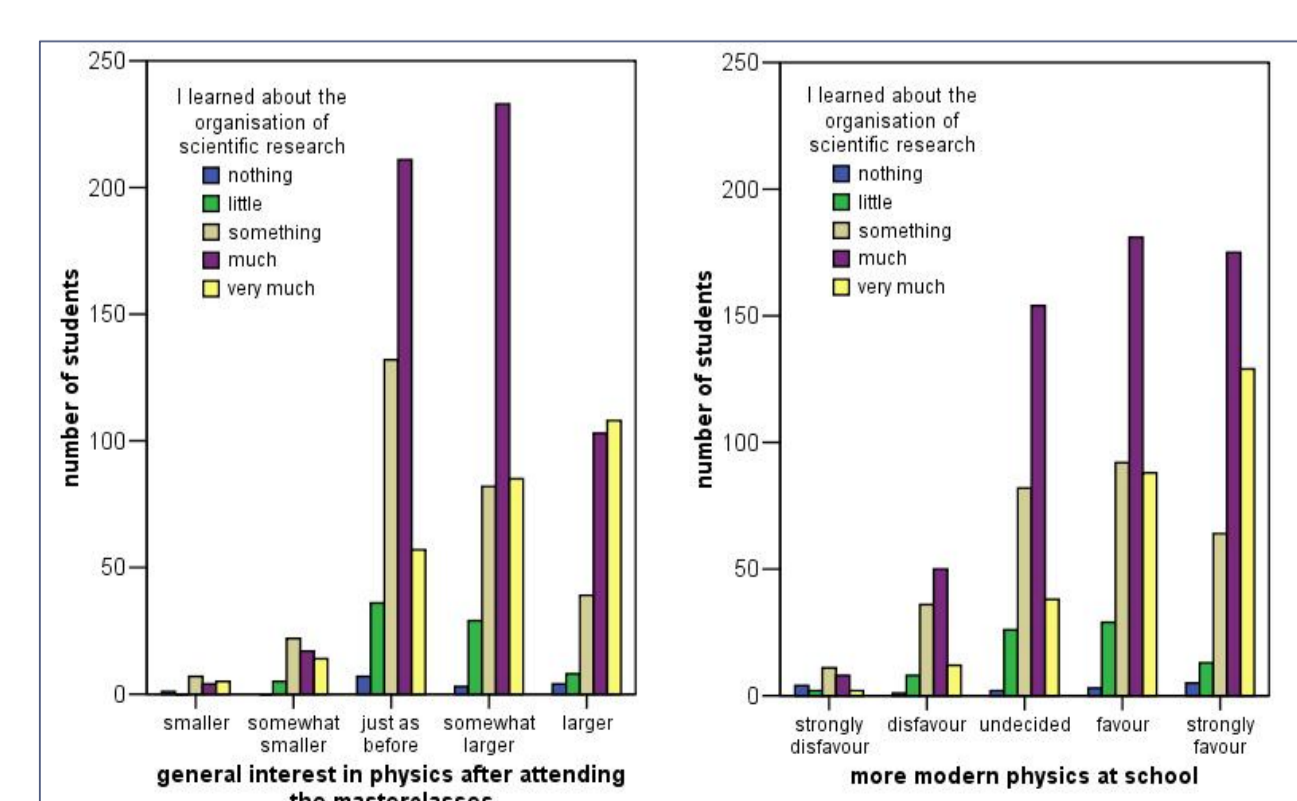
- provide authentic access and stimulating learning environment
- make modern particle physics data from LHC available to students
- stimulate interest in science
- demonstrate the scientific research process
- offer direct contact with scientists and students (→ career orientation)
- let students explore fundamental forces and building blocks of nature

## Evaluation

- Outstanding appreciation, 82 % like it (very) much
- Independent of gender, pre-knowledge and computer familiarity



- Motivation raised



- more interest in physics
- desire for more modern physics at school

Physics Education 42 (6), 2007, 636 - 644