Evaluation of Particle Physics Masterclasses

(left-over from our „INTERACT“ project)

D: “Schnuppertag“ at Bonn University
UK: “Masterclasses“ in London (RH,IC),Birmingham
Sample: about 100 students in D and UK, each

Evaluation: Isabell Krämer, Student teacher, Uni Bonn
Consultants: Manfred Euler, Katrin Engeln, IPN Kiel

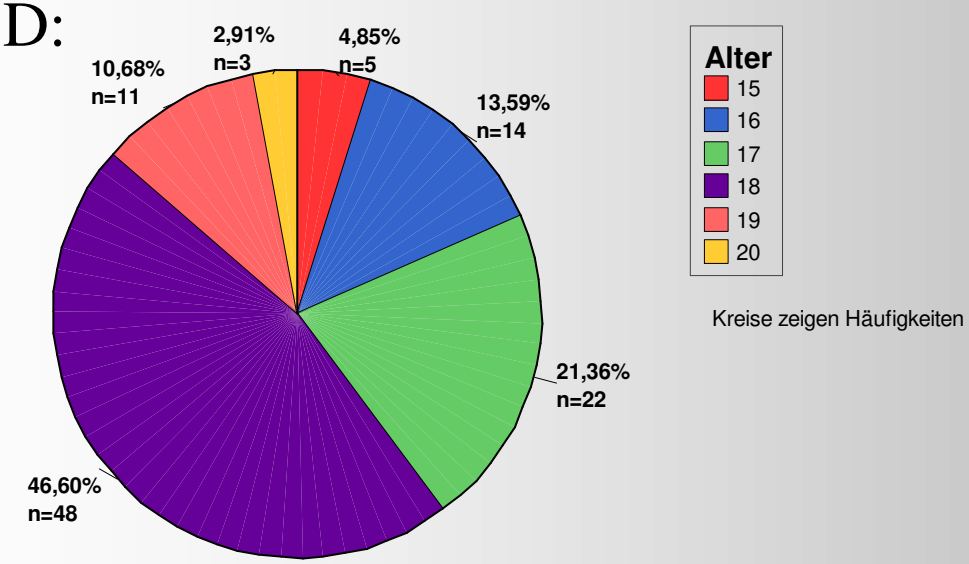
Michael Kobel
Uni Bonn

EPOG meeting, CERN, 4.-5.4.2003

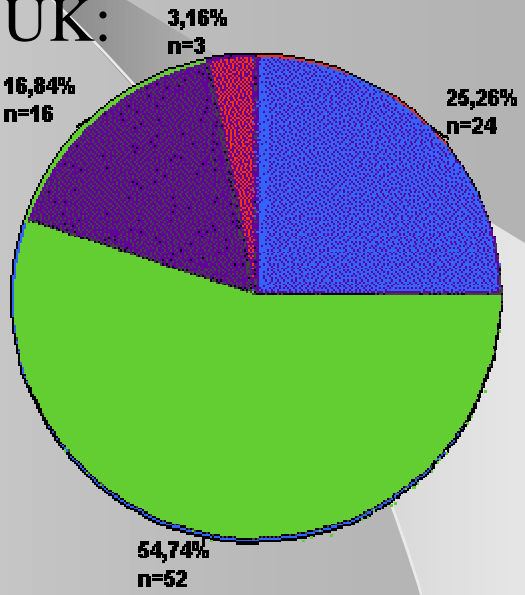
Organisation

- UK „Masterclasses“: Participation of complete science classes (A-level)
- D „Schnuppertage“: Participation of single students,
  chose physics from several science workshops

Age D:



UK:

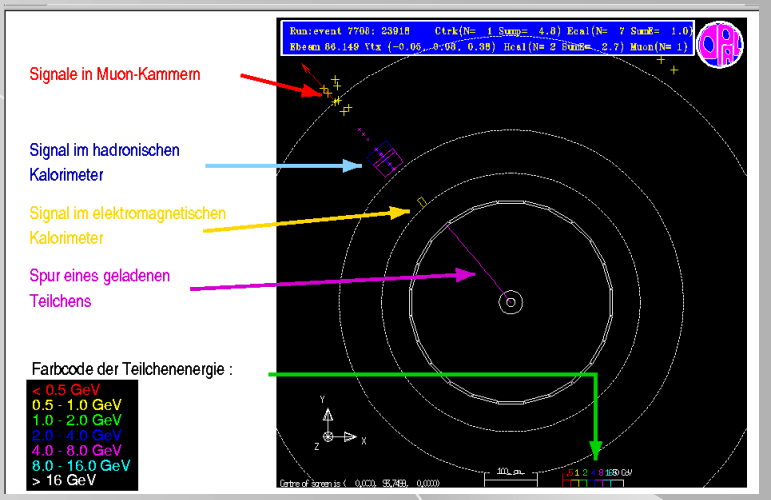


- Program: UK: 1 day, D: 2x 2 hours
  - 1-2 talks on particle physics
  - 1-2 workshop exercises at the PC

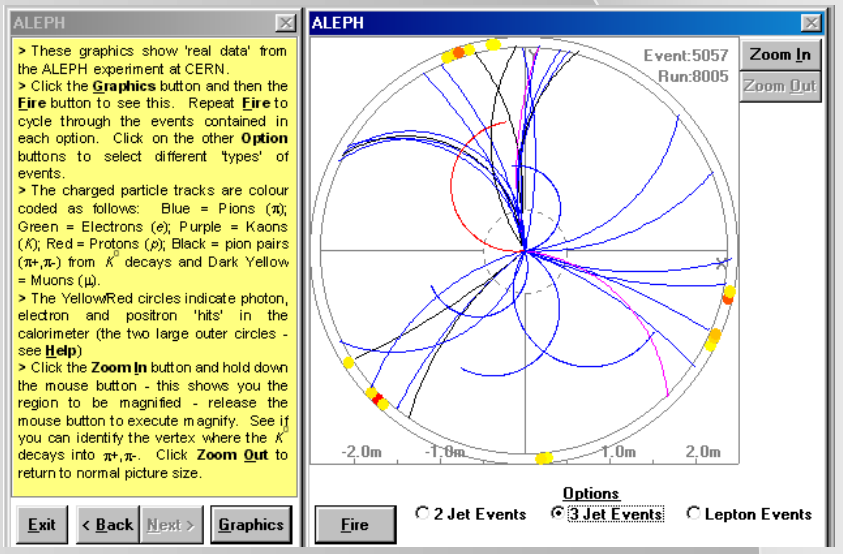
Workshop exercises

http://www.teilchenphysik.org → Hep Physiker → Schülerworkshops

- OPAL, Manchester
  - Identification of Particles and Events
  - Measurement of Z branching ratios
    - Identity of e, mu, tau
    - 5 quarks in 3 charge states, each
  - **Bonn:**
    - **partial translation,**
    - **excel analysis tool**



- Aleph, Lancaster
  - Laws of collision
  - e+e- annihilation
  - Particles in an magnetic field momentum messung
  - Event classes

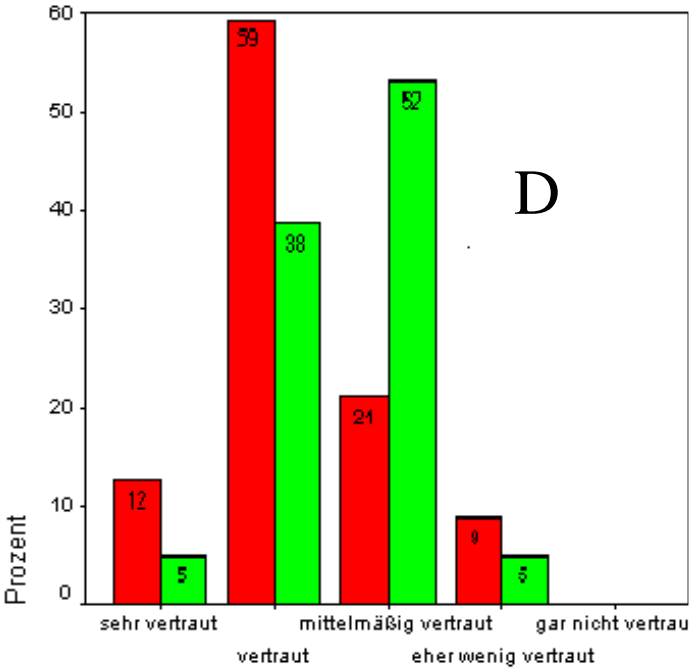


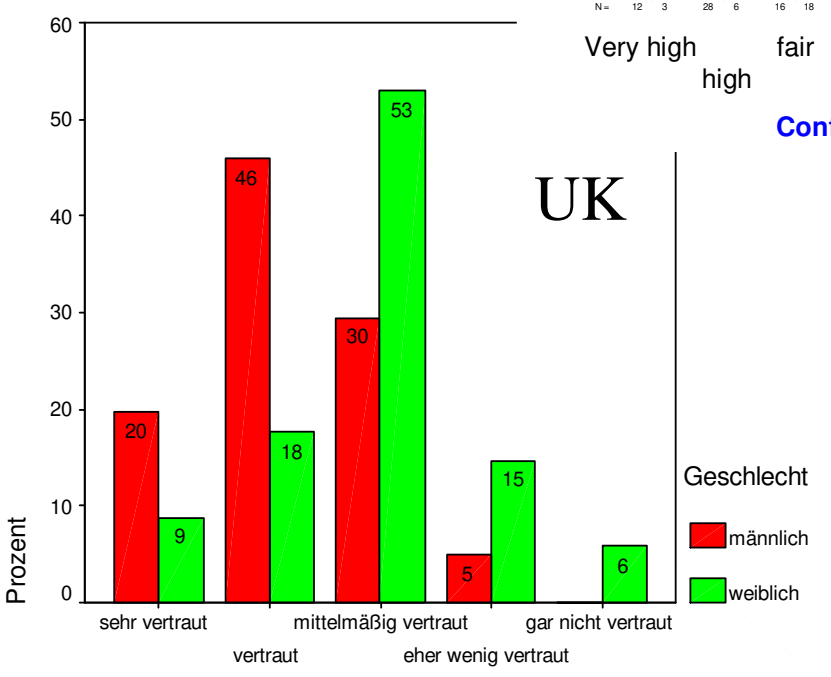
Questionnaire: 32 Questions

- Personal data: 14 Questions
  - age, gender,
  - school, preparation, computer use, science reading
  - self-concept, view of physics
- Working Experiences: 11 Questions
  - contact persons, teamwork
  - level, quantity, quality, lecture vs. workshops
  - supervision, chance for questions, own ideas
- Impact: 7 Questions
  - general judgement
  - change in physics interest, view of physics
  - increase in knowledge of physics

Self-concept: Confidence with Physics

- Clear Difference Boys ⟷ Girls
  - Boys: „highly confident“
  - Girls: „fairly confident“
- Very similar in D and UK





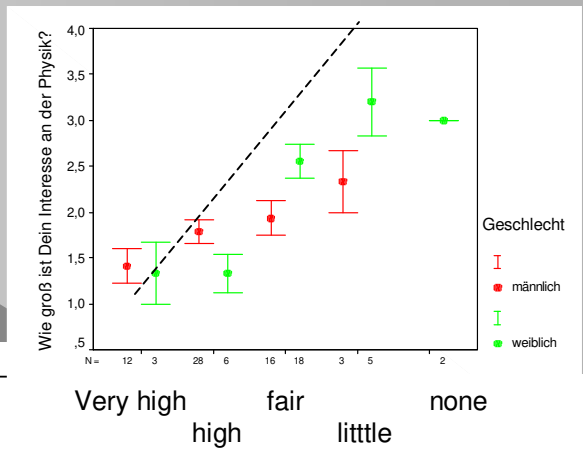
physics interest

little

medium

high

very high



Confidence with physics

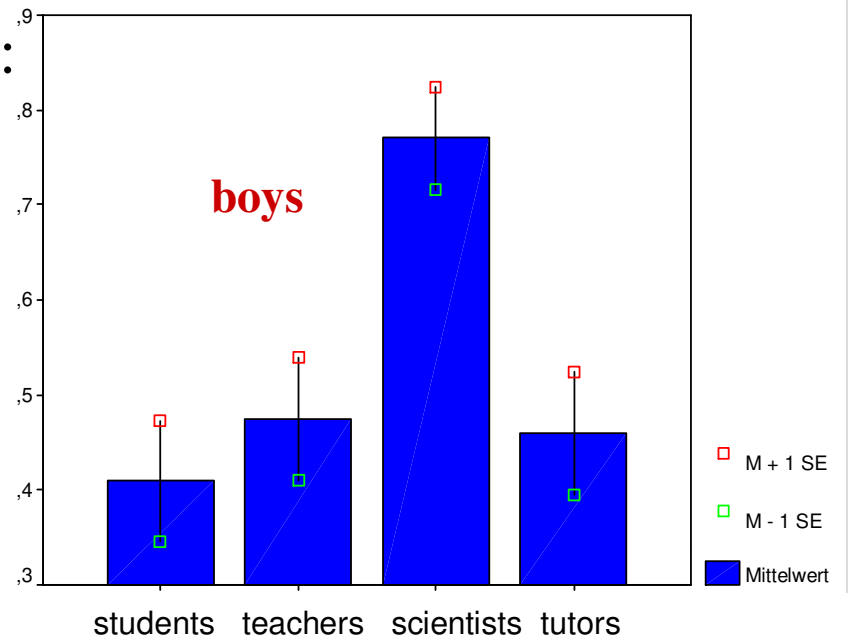
- Very strongly (ρ=41%) correlated with physics interest
- Physics interest on average „high“: ***more interested than confident***

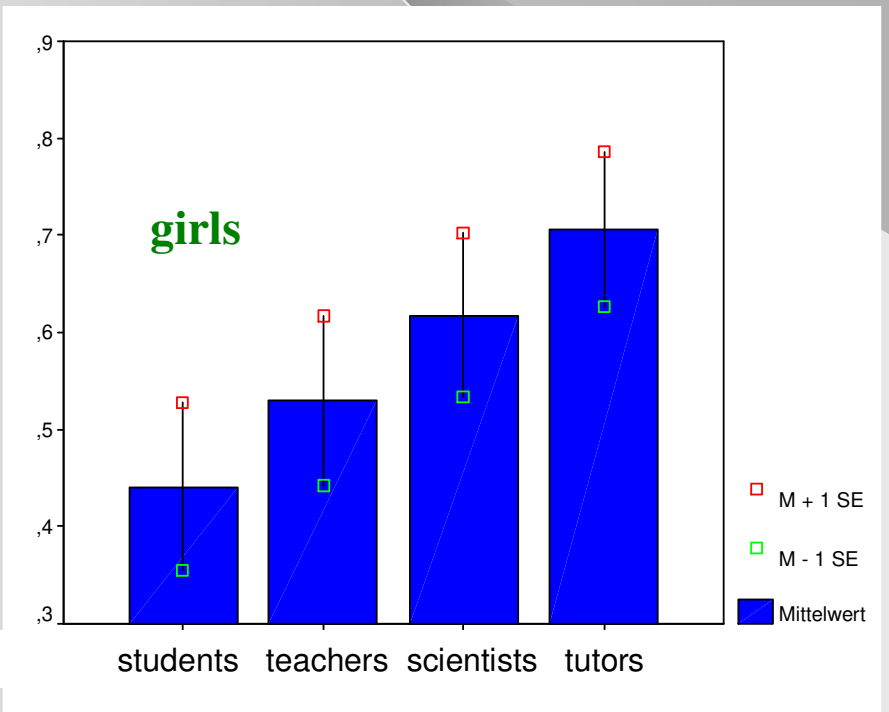
UK: contact to various Groups

(other students, teachers, scientists, tutors)

- Boys: mostly with scientists
- Girls: mostly with tutors
- Teacher in UK present, in D absent

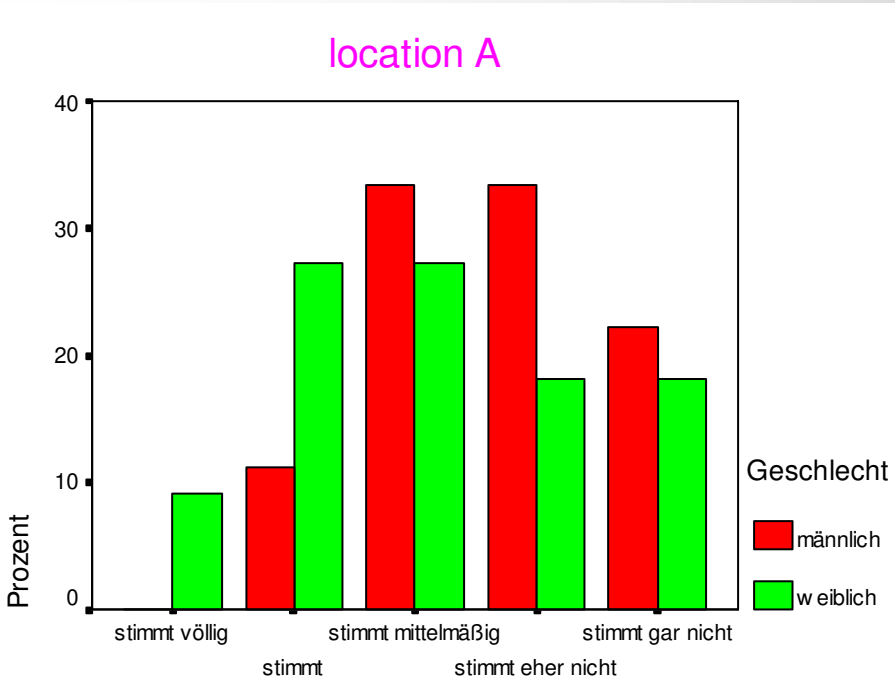
UK:



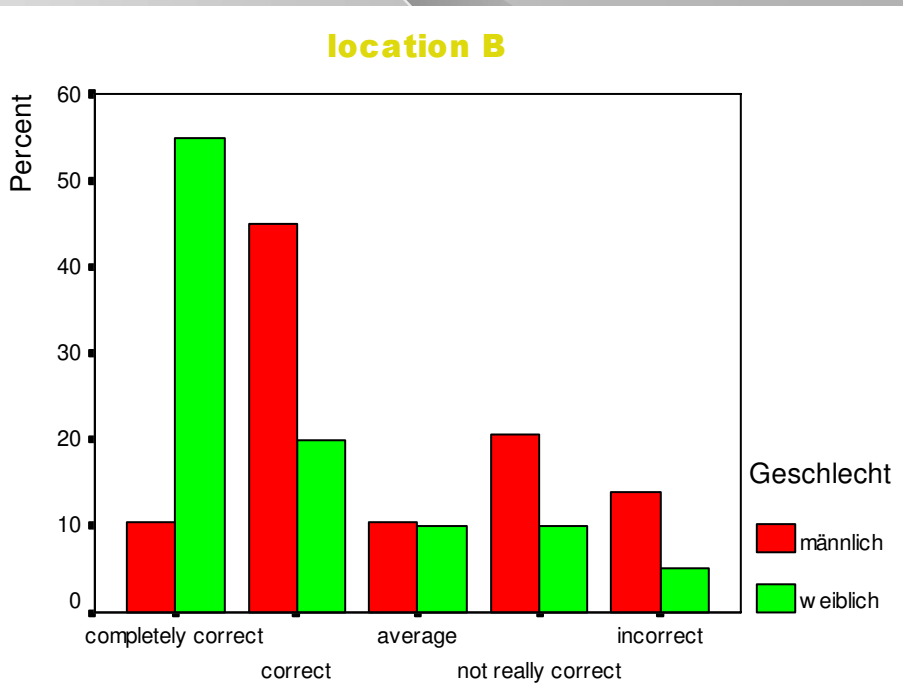


Importance of teamwork

- Teamwork with other students important to get results
  - especially for girls
  - especially at location B

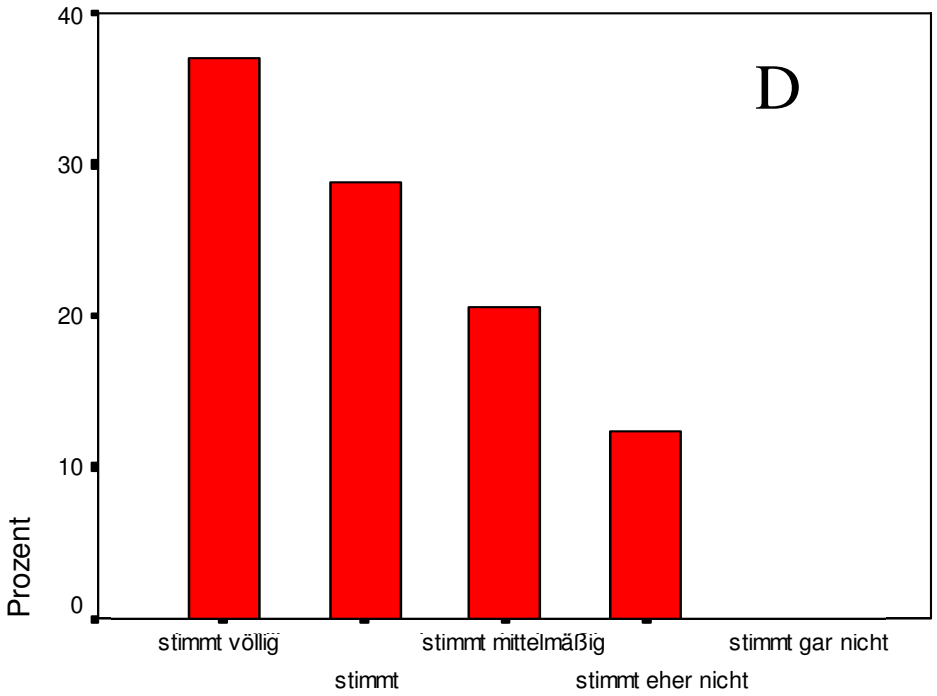


Teamwork with other students was important to get results

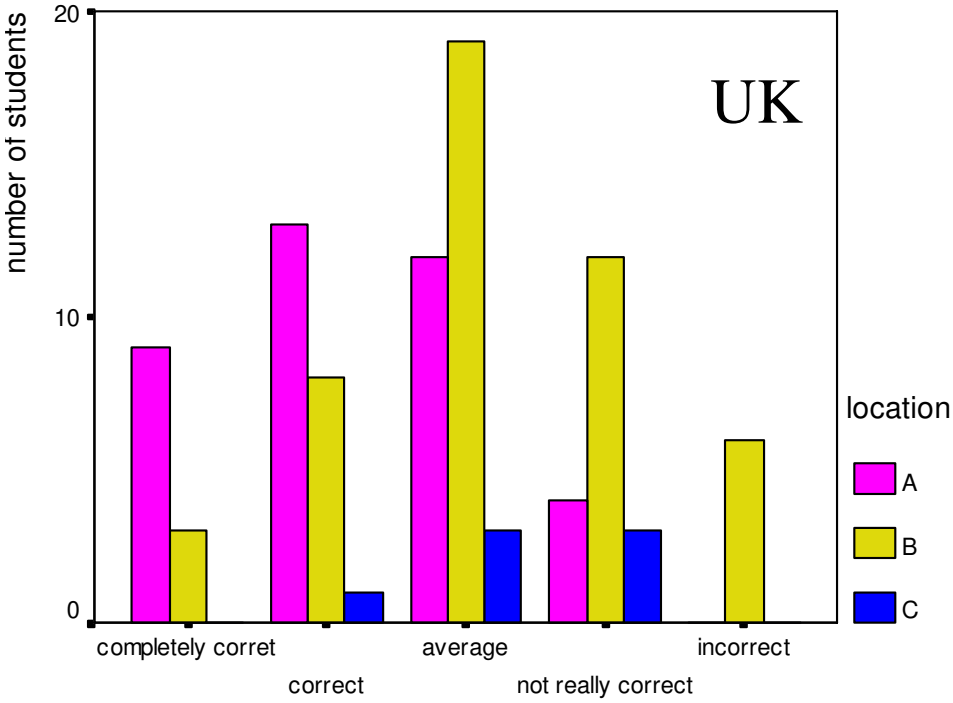


Teamwork with other students was important to get results

Judgement of lectures



Ich fand die Vorträge gut verständlich und interessant.



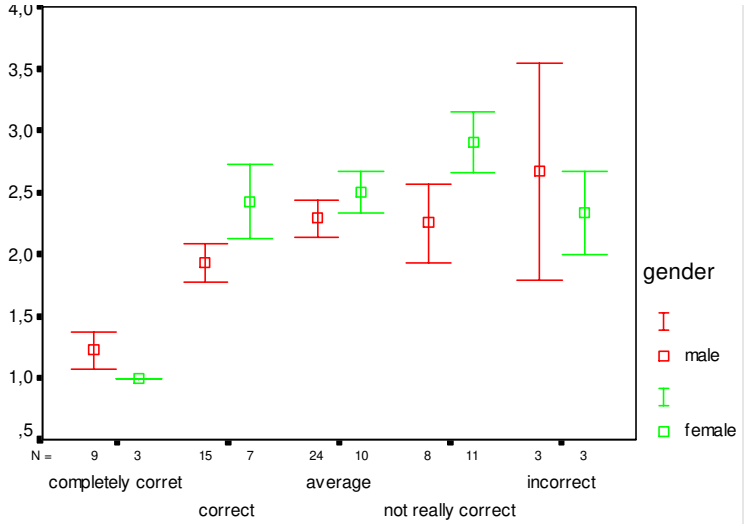
I found the lectures easy to understand and interesting.

I liked the masterclass little

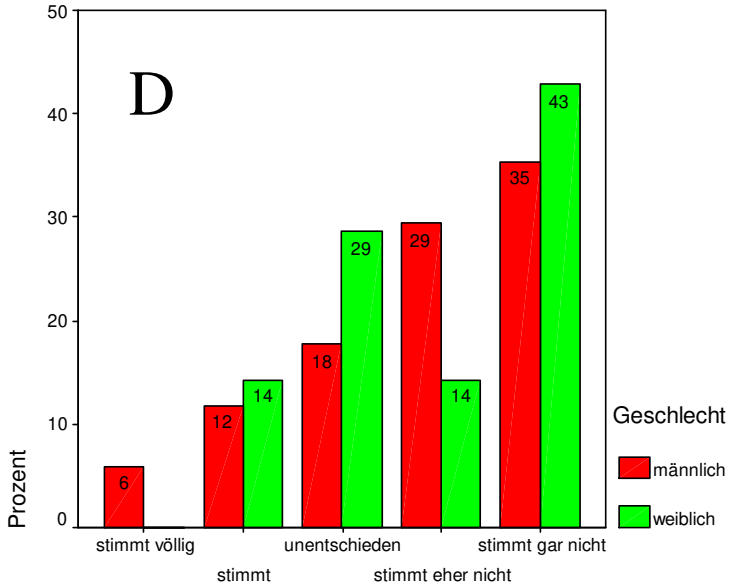
fairly

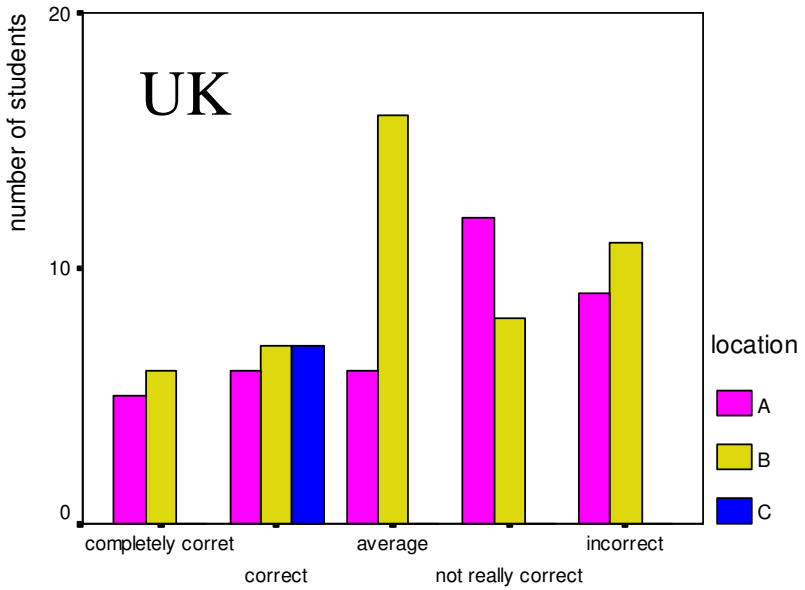
much

very much



Lectures .vs. PC experiments





preferred to skip some lectures and do more experiments

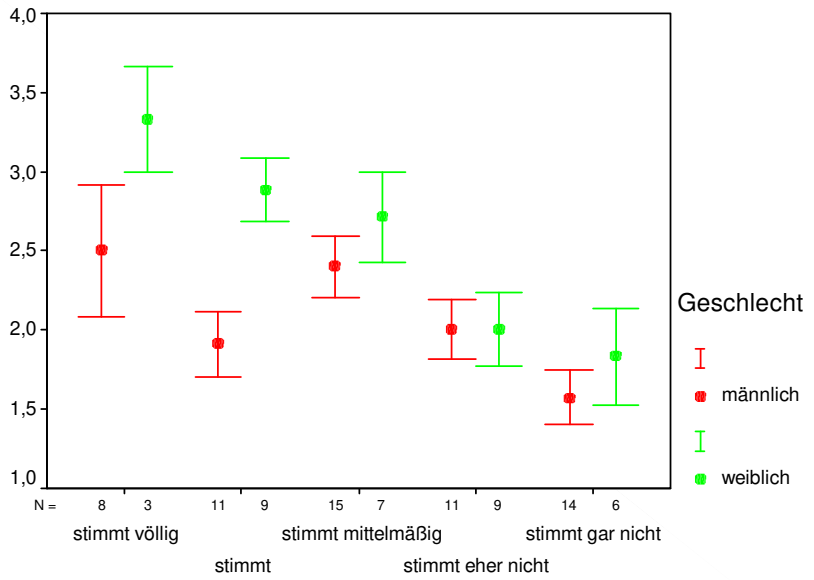
I liked the masterclass little

fairly

much

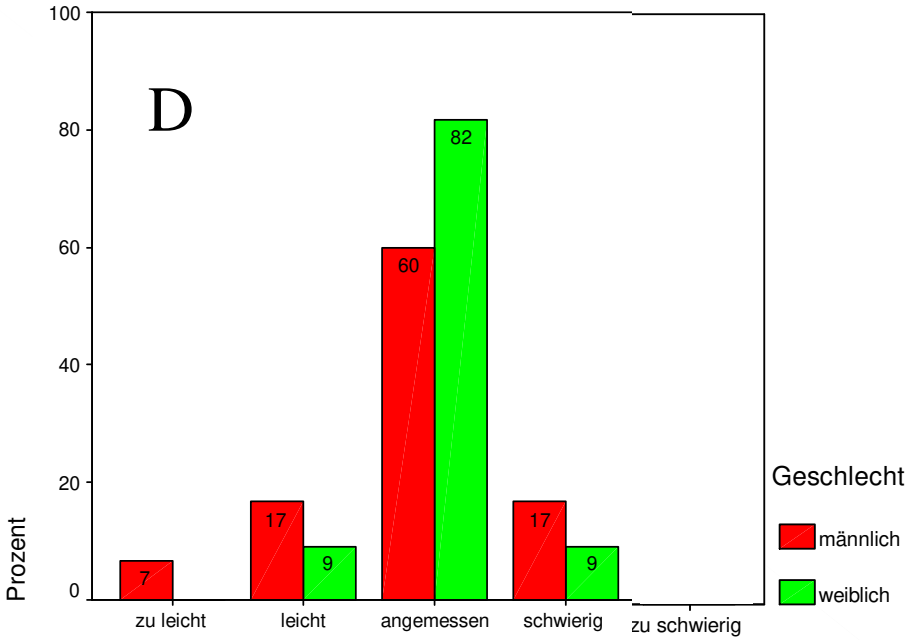
Very much

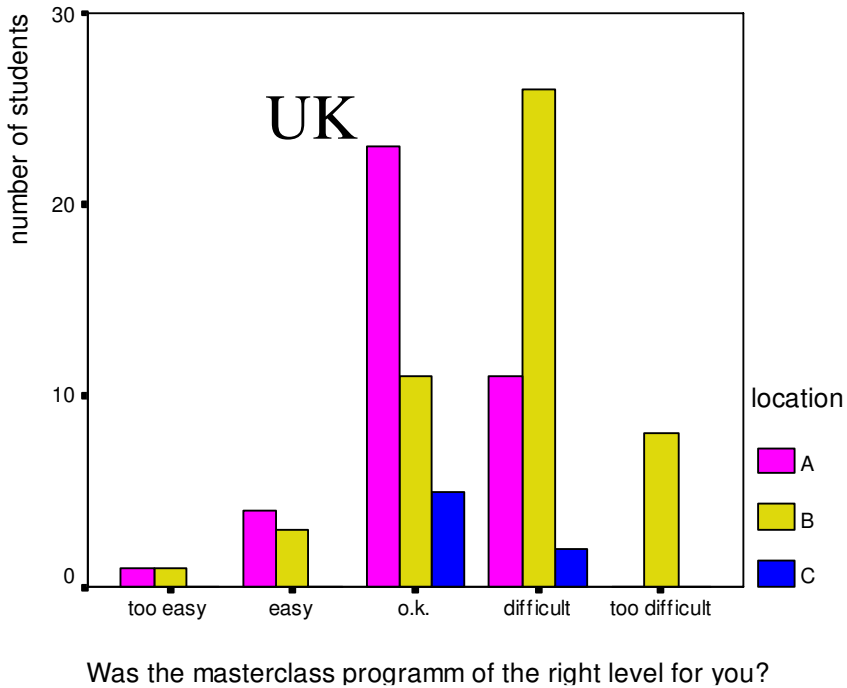
- Large correlations with
  - Lecture easy to understand and interesting
    ρ=-22% (partial) –36% (total)
  - **General judgement of masterclass**
    ρ=-28% (partial) –40% (total)



Ich hätte lieber auf manche Vorträge verzichtet.

Level



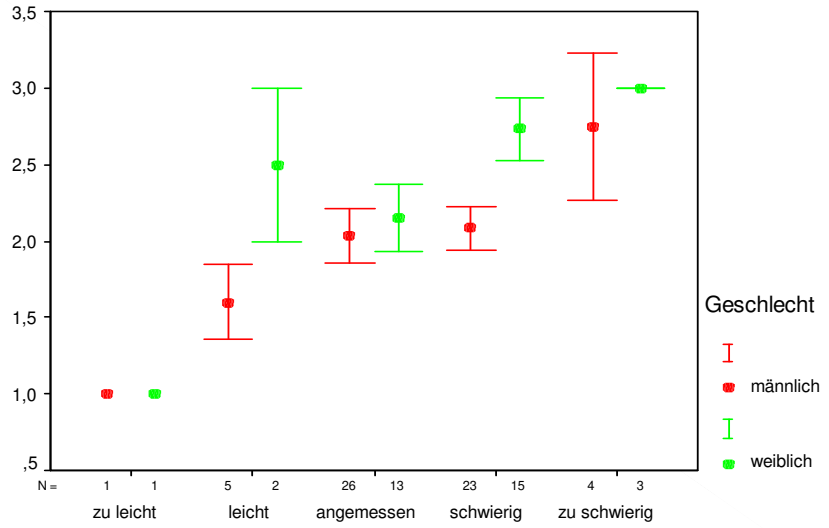


Was the masterclass programm of the right level for you?

I liked the masterclass fairly

much

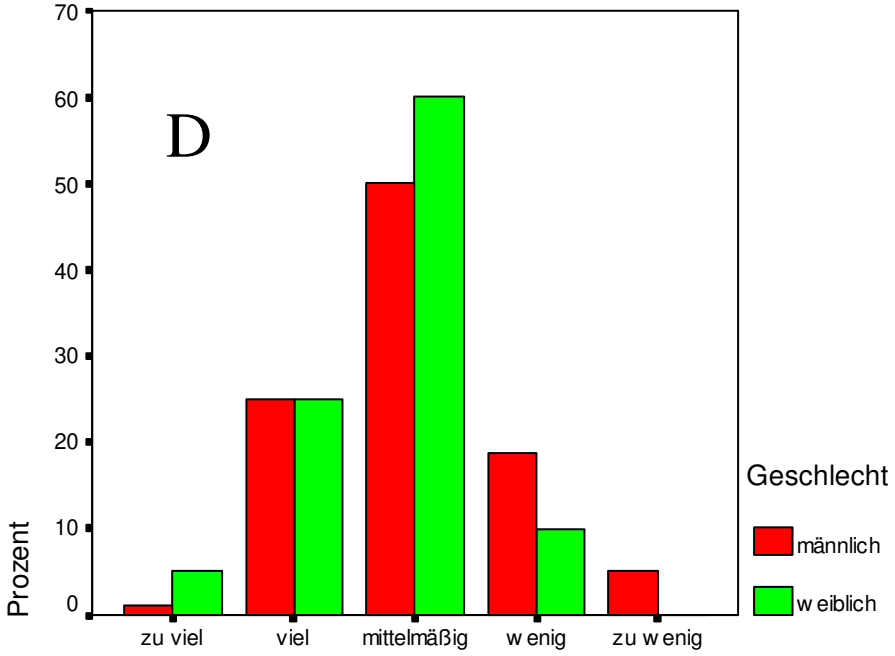
very much



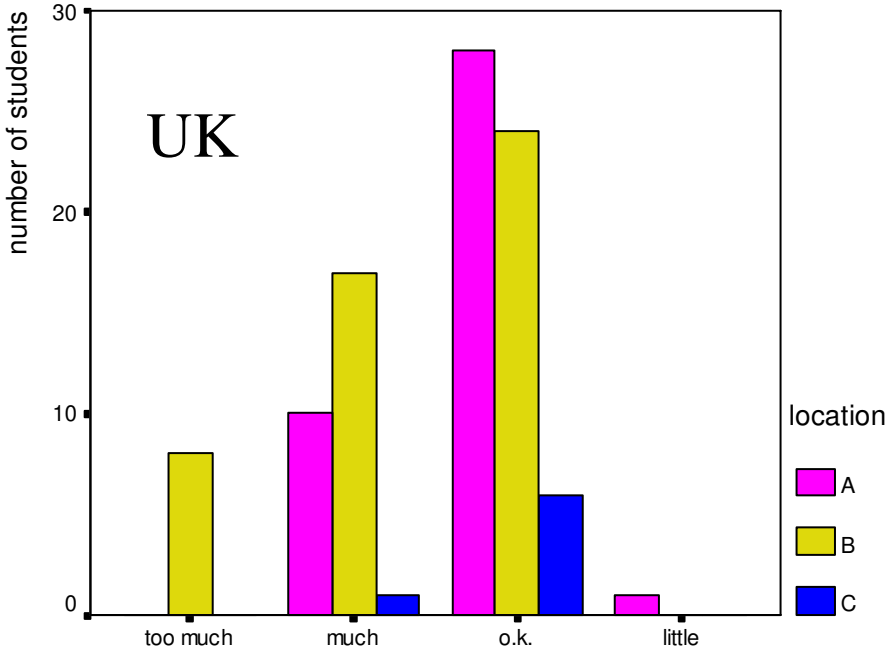
Wie fandest Du den Schwierigkeitsgrad der Veranstaltung?

- D: o.k.
  UK: o.k - difficult
- UK: *especially boys* prefer an easy program (ρ=20%)

Quantity

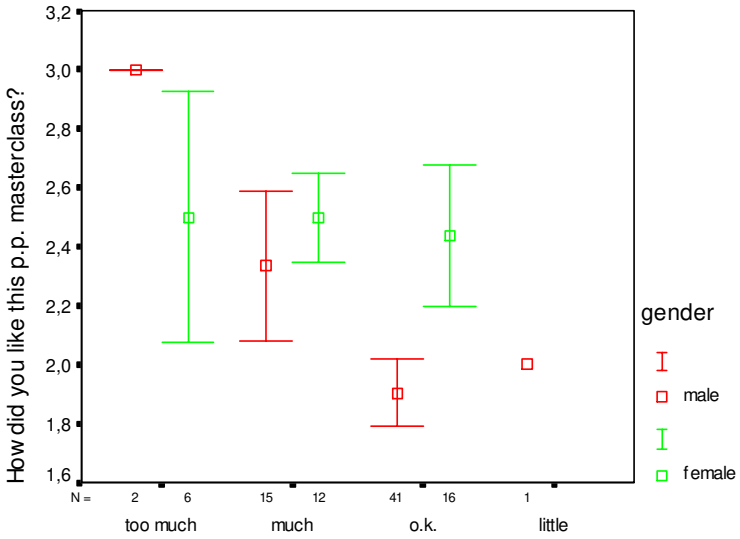


War der Stoffumfang des Schnupperkurses Physik angemessen

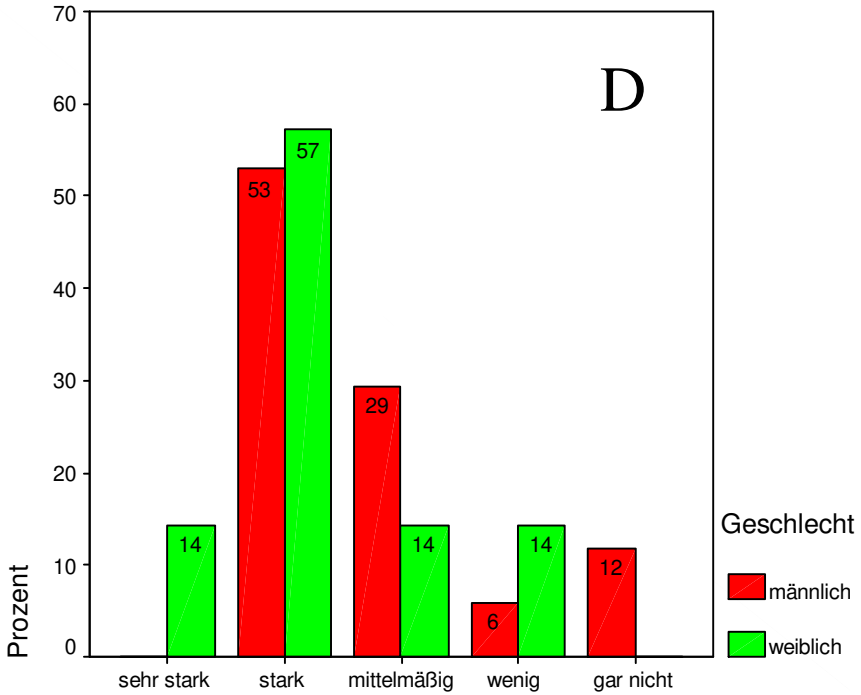


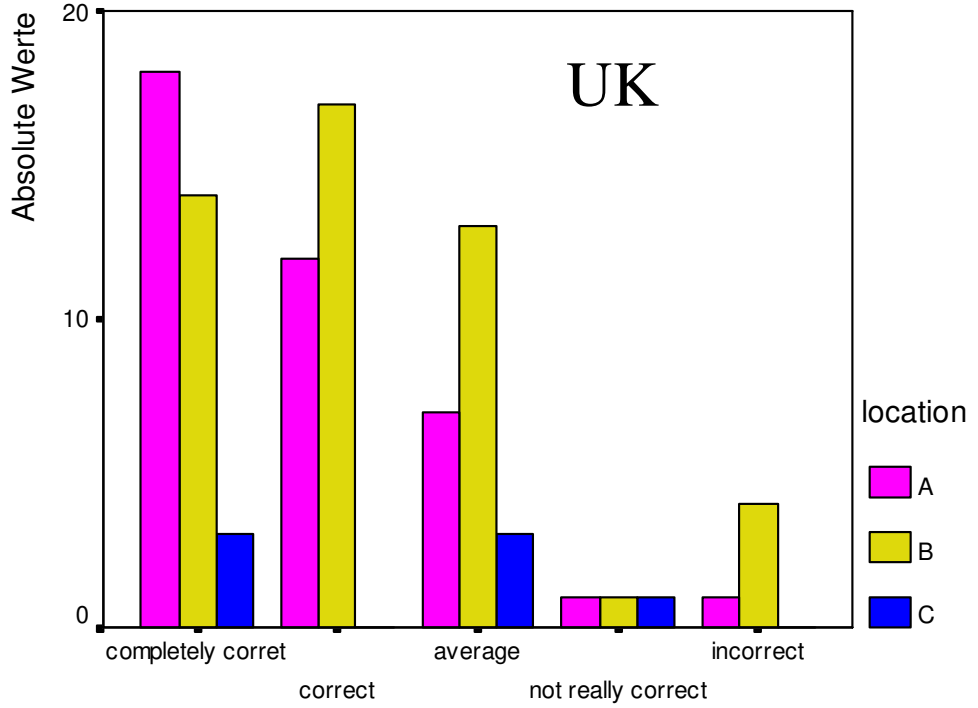
The quantity of the material was ...

- D and UK: o.k
- UK: *only boys* tend to dislike much material



Increase of knowledge

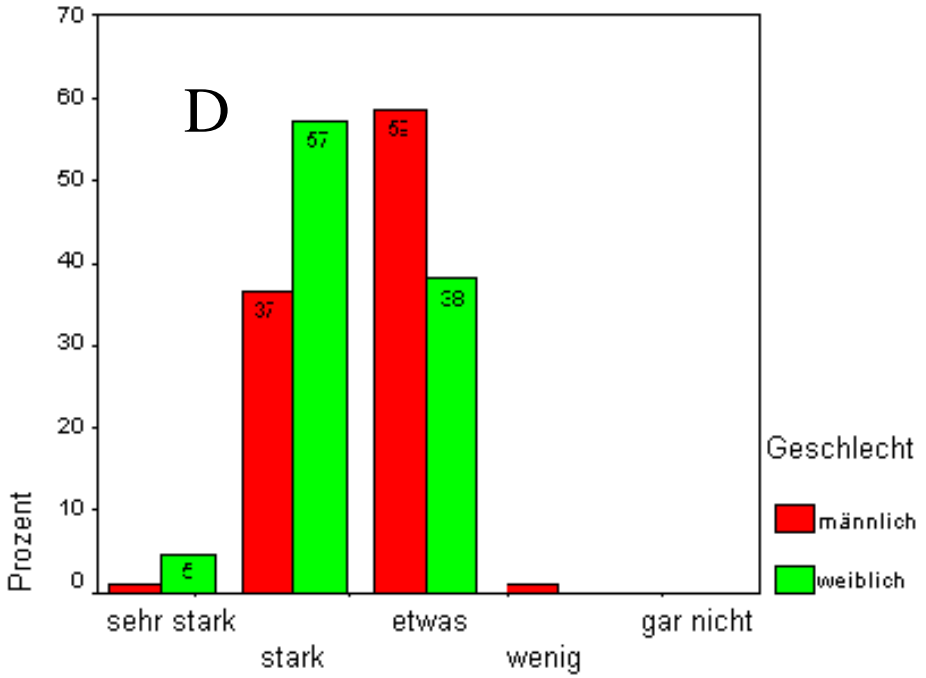




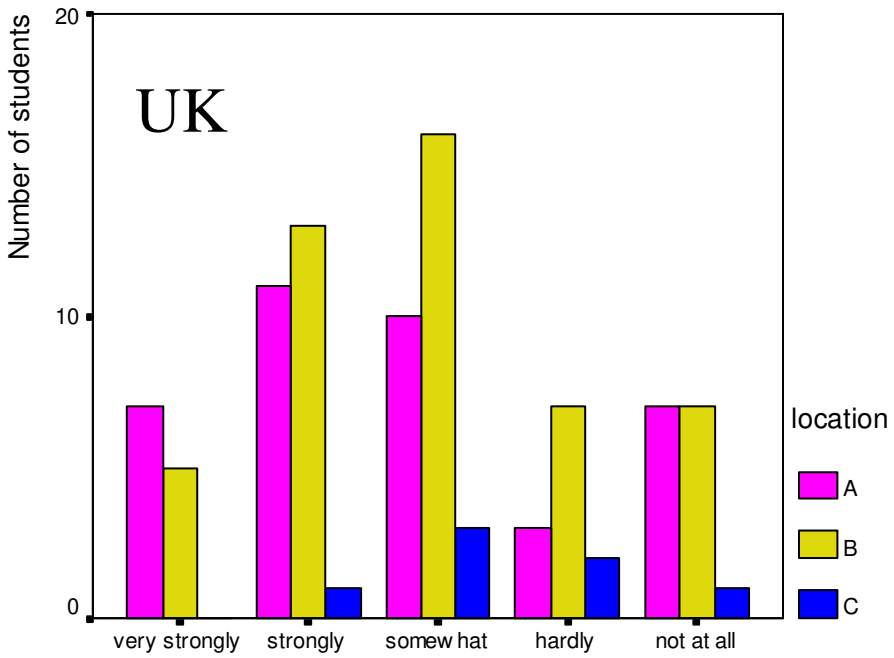
My knowledge in physics has increased today.

- Knowlegde clearly increased, especially in UK
- 26% correlation with „a priori interest in physics“
  20% correlation with „understandable and interesting lectures“
  no correlation with „level of difficulty“

Change of interest



Ist Dein Physikinteresse heute gestiegen?



Did your physics interest increase today?

- broader spectrum in UK
  - ρ=42% with increase of knowledge
  - ρ=29% with understandable and interesting lectures
- gender dependence different:
  - D: slighly more gain for girls
  - UK: slightly more gain for boys

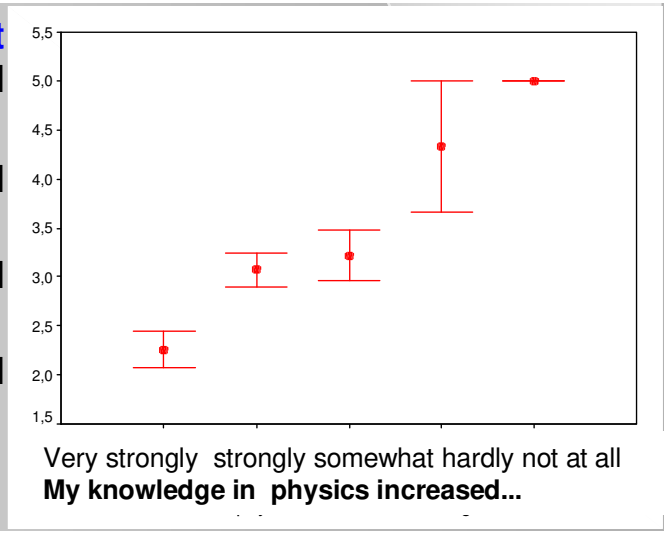
Interest

not at all increased

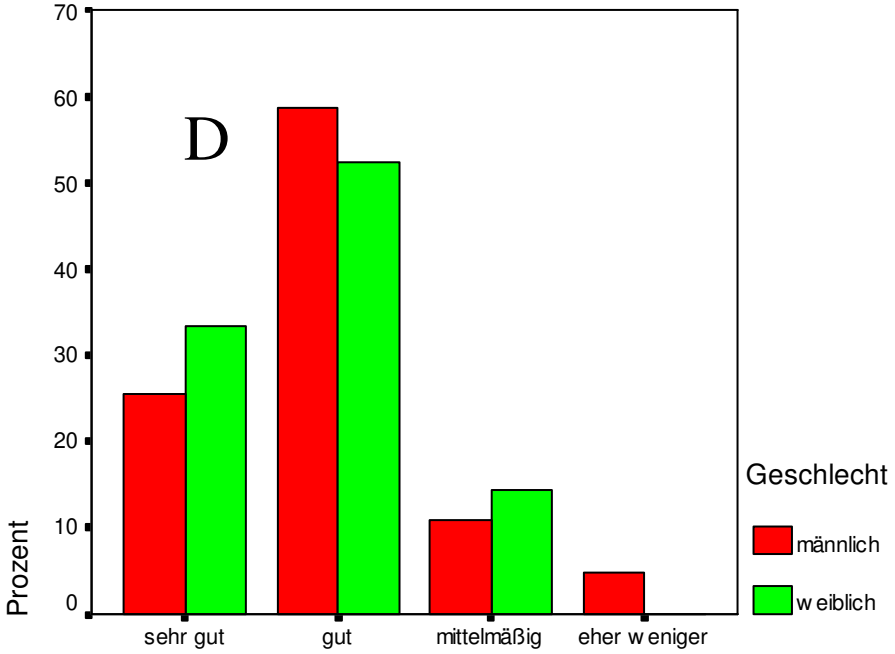
hardly increased

somewhat increased

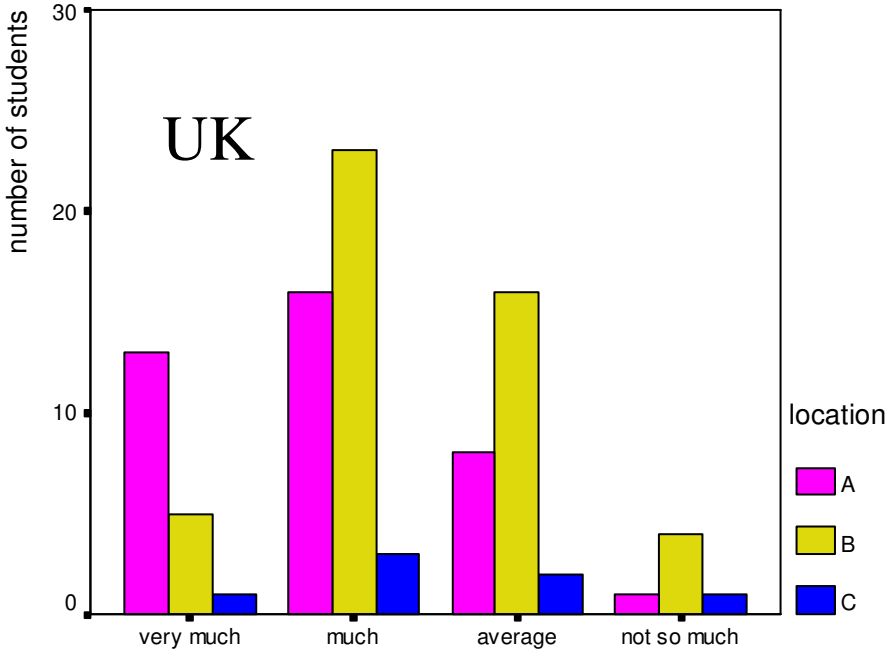
strongly increased



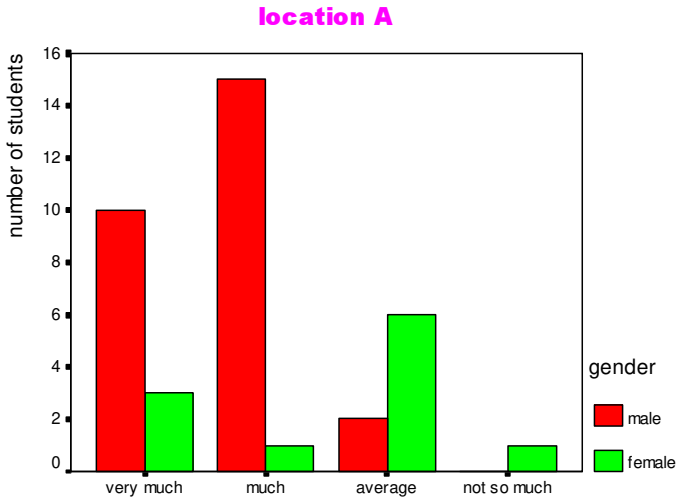
Overall Judgement



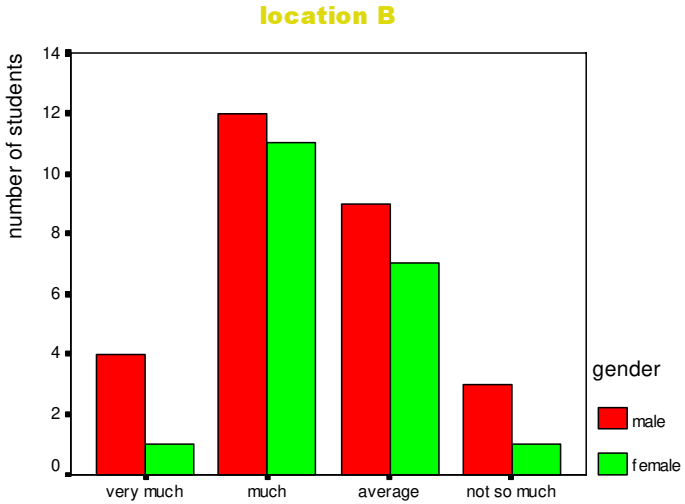
Wie hat Dir der Schupperkurs zur Teilchenphysik gefallen?



How did you like this p.p. masterclass?



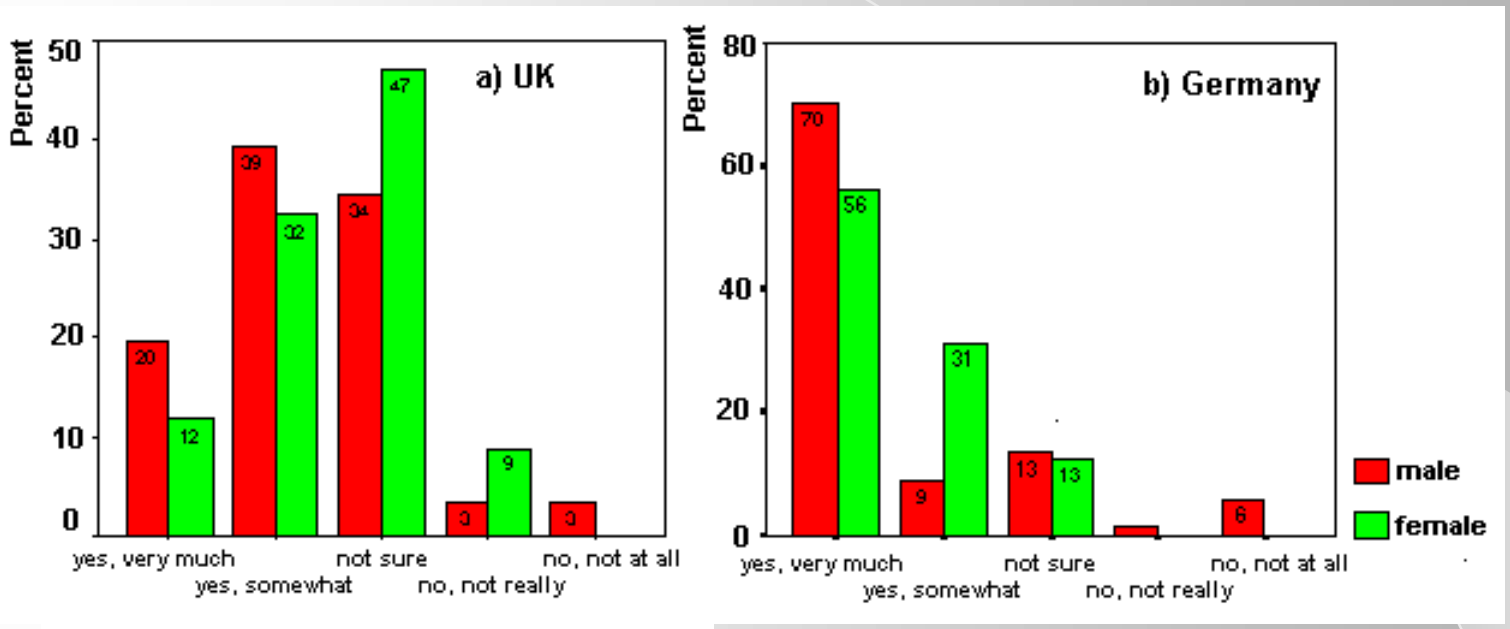
How did You like the particle physics master class

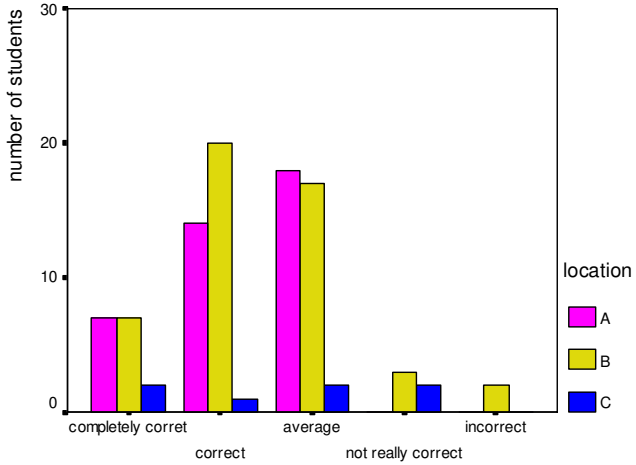


How did You like the particle physics masterclass

More modern physics at school?

- D: Yes, very much (no/few particle physics yet)
- UK: not sure, somewhat (particle physics in curriculum)





Would you like to deal more often with m. phy. in school?

Conclusions

- Self-concept of students similar in UK and D:
  - girls feel slightly less confident with physics
  - take more advantage of tutors and teamwork
- Effects of masterclasses different in UK and D
  - UK: many students prefer less lectures, more PC exercises
  - D: stronger wish for more modern physics at school
  - UK: students feel more increase of knowledge
  - D: especially girls feel more general increase of physics interest
- Within UK large differences
  - Largely caused by lack of successful lectures at location B
- Generally: Not too difficult, understandable masterclass programs cause
  - increase of knowledge
  - fascination by modern physics
  - increase of general interest in physics
- Evaluation at difference locations with same questionnaire
  - Wide range of information about realisation and impact
  - Very useful to compare different locations