



# STIMULATING **PHYSICS**

Improving access, creating demand

## **Student Attitudes to Physics at School and University**

Jim Knowles, Physics Teacher Fellow  
Elizabethan High School  
Nottingham Trent University

## Educational Research

**To investigate why students are attracted to and also drop Physics.**

Questionnaires used range of question types including Lickert and Osgood Scales (Reid 2006)

Data collected about subjects studied, factors influencing subject choice, opinions about physics, attitudes to careers

These were issued to:

- 1<sup>st</sup> year UG Physics students,
- 1<sup>st</sup> year UG Chemistry students &
- Year 12 &13 Physics students at the school.

## Sample

- Small sample of students surveyed
- Year 12 Physics (5 male; 3 female)
- Year 13 Physics (3 male; 1 female)
- Physics first year degree (14 male; 4 female)
- Chemistry first year degree students (15 male; 12 female)

Views of the whole cohort were obtained

“Rich data”

## Data analysis

Responses were categorised on

- subject studied,
- year of study
- gender.

Quantitative data was entered into spreadsheets to produce tables, also producing bar and pie charts to identify patterns of responses.

## Hypothesis 1: A-level Physics students these days often don't study A-level Maths, which limits success in Physics.

- What proportion of A-level Physics students were also studying A-level Maths?
- 10/11
- Therefore A2 Physics students do tend to study Physics with Maths.

## Hypothesis 2: The combination of subjects chosen don't necessarily compliment each other

- What other subjects do A-level Physics students study?
- Beyond Maths - other choices spread across 10 other subjects
- More breadth less depth - wider choice of subjects studied at A-level, and doing 4 subjects at AS level instead 3 (pre-2000) risks students allocating less study time to A-level Physics than they once did.

## More encouragement, praise and career guidance.

Students passing AS Physics yet choosing not to continue with A2 probably represent the main target group to encourage.

These people should be encouraged to follow physics based degrees, perhaps requiring universities to develop courses attracting students with more moderate grades.

The future is a technical based society!

# Factors influencing choice of study at A-level.

A-level students (both genders) stated strongest influences on choice were:

- *Good grades at school*
- *Enjoyment of subject*
- *Career opportunities.*

Of moderate influence were

- *Parents*
- *Your teacher at school*

*Parents > more influential than teachers*

*Teachers > more influence over females than males*

In contrast,

*Information from mass media, Friends, Demonstrations, Exhibitions,  
Festivals, Open evenings, Educational visits*

were of little influence!!

## Factors influencing choice of study of Physics at Undergraduate Level.

- Factors influencing choice of study Physics at UG Level are mostly comparable with those studying at A Level.
- One difference was the less frequent selection of *good grades* as a factor.
- What is a good grade?
- Again teachers and parents are of moderate influence, with teachers > more influential than parents in the uptake of the subject at degree level.

## Factors influencing choice of study of chemistry Undergraduate Level.

- Factors influencing the study of Chemistry at is mostly comparable with Physics:
- *Enjoyment of subject* and *Career opportunities* were most influential.

One difference however was that chemists selected factors such as

- *Information from mass media* and
- *Demonstrations, exhibitions, festivals, open evenings* being of moderate rather than negligible influence with female chemists being influenced by most factors to some extent.

## Implications

- *Information from mass media and*
  - *Demonstrations, exhibitions, festivals, open evenings*
- may be persuading students to pursue degrees in Chemistry more than Physics.

Consequently although these factors are only of moderate to low influence, Undergraduate physics recruitment teams, need to up their marketing of the subject, by focussing on the career opportunities Physics provides and redefining *good* grades in physics (the most difficult A Level) as *pass* grades.

## Where do you think physics lies in a league table of the most highly paid graduates?

Would anyone like to say, which category the IoP would place Physics graduates?

1<sup>st</sup> to 5<sup>th</sup> place

1<sup>st</sup> Medicine

2<sup>nd</sup> Law

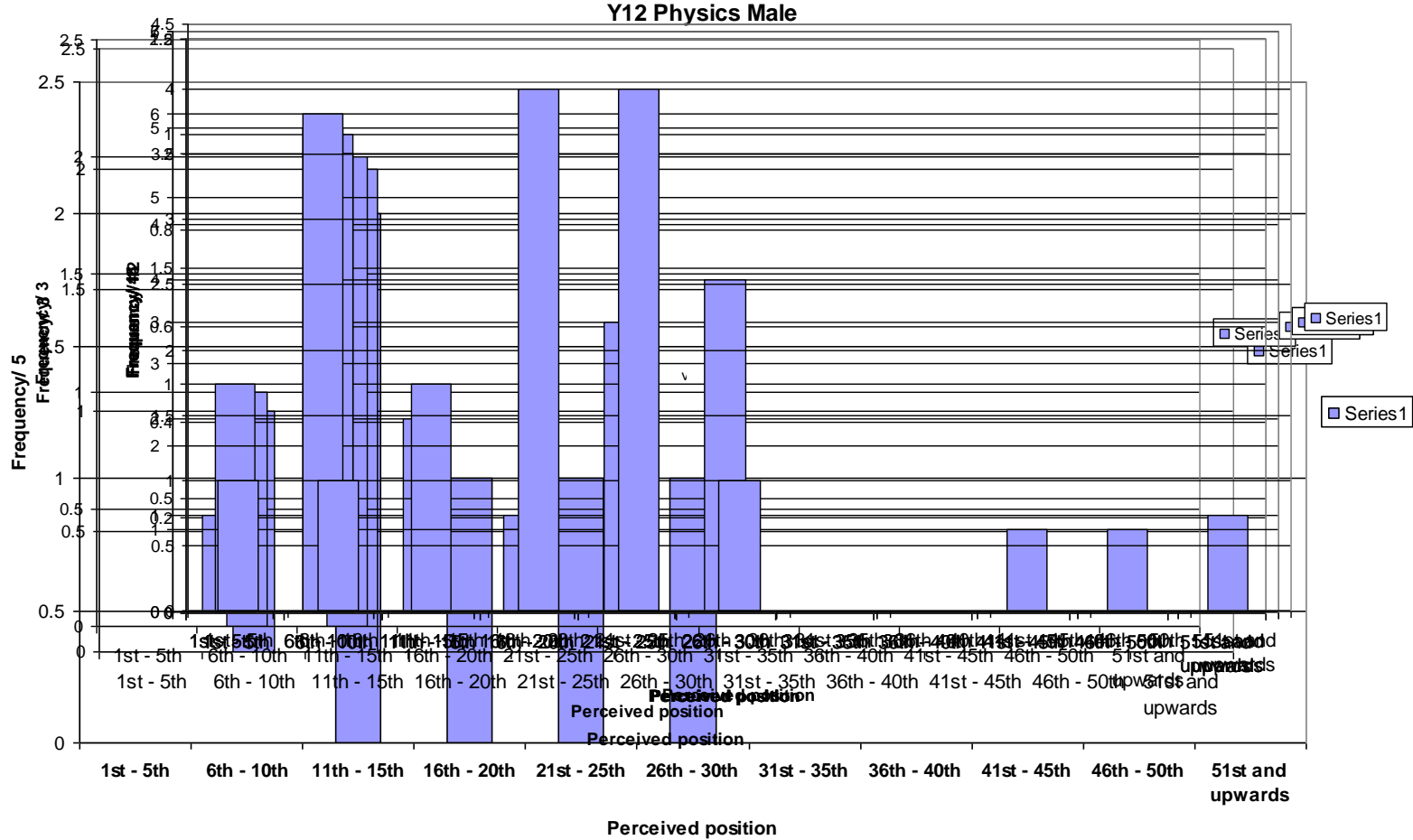
3<sup>rd</sup> Engineering (requiring physics)

4<sup>th</sup> Physics

5<sup>th</sup> Chemistry

# How students perceive potential salary for physics graduates

Q17) Where do you think physics graduates earn the most? (The most highly paid graduates?)



## This suggests:

- AS students undervalue earning potential
- Students studying physics particularly in HE realise the potential salary of Physics; chemists less so.
- Females have a more precise view of salaries, though non-physicists are less accurate

## Other findings

Students find conceptualising Physics more challenging than the mathematics

- Students are attracted to AS courses by experiments, yet practical work pleases them less as they progress up
- The combination of understanding of physical concepts and mathematics, sometimes from different courses and applying them through experimentation is the challenge, as perhaps practical skills are under developed

## Finding the blindingly obvious and simply enlightening

- Having issued the questionnaire to year 13, one student asked, “What do you mean by Physics being perceived to be hard? It is hard!”
- Subsequent discussion with the class confirmed that they unanimously considered Physics to be the hardest subject, despite all studying Maths!

## Purely and simply in the words of an A-level student,

- “Physics is more difficult than Maths, because to succeed at Physics you’re expected to know some Maths which isn’t taught in the physics syllabus [e.g. logarithms], whereas in Maths you’re not expected to know anything from other subjects.”

## And furthermore...

- “In Physics there are many difficult and abstract concepts we have to understand but in some subjects you just have to be able to do some set processes without understanding where it comes from.
- Physics has a very large syllabus, so there’s lots to remember especially the formulas.

## I find Physics the most difficult subject

- I study, because in the exam we are expected to work out Maths problems using formulas, derive formulas, explain things and unlike a Maths exam, in Physics we have to write long explanations for things, which I find difficult because I think Physics is a quantitative subject!”

## Thanks

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