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IMPLICATIONS OF SECONDARY LEVEL STEM EDUCATION ON ENGINEERING STUDENT RECRUITMENT IN NORTHERN IRELAND

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Background

Reduction in relative percentage of students entering STEM pathways.

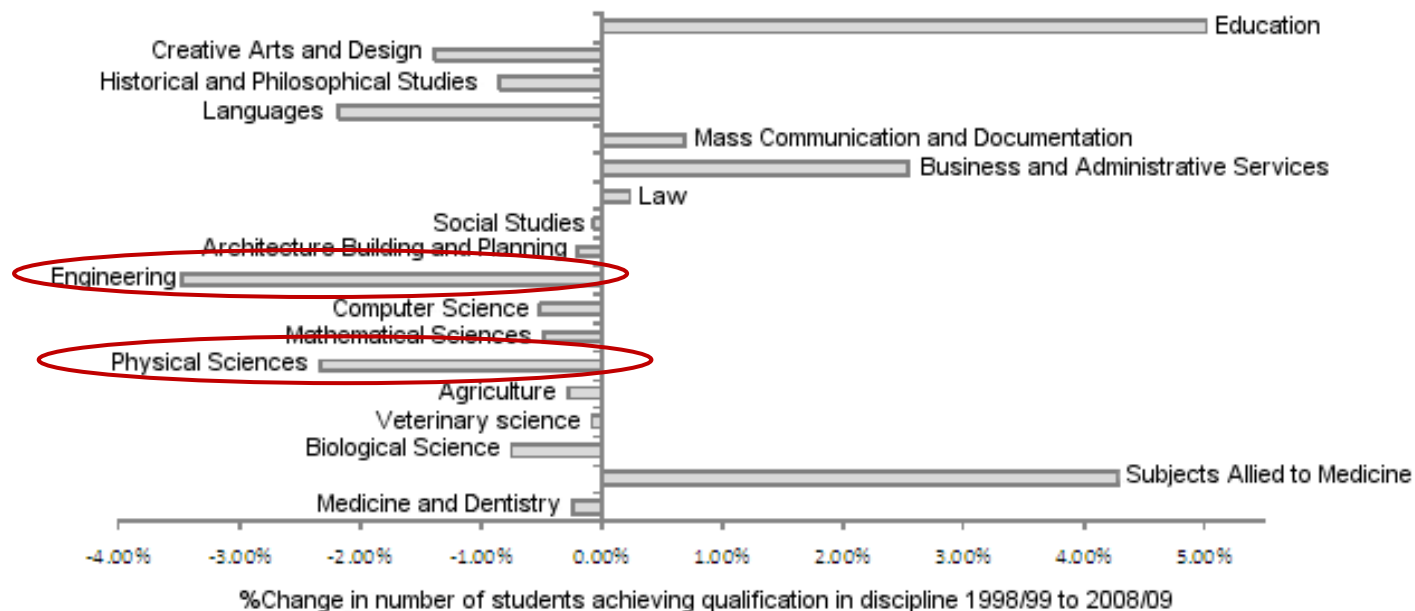
The NI sector (and the Irish and UK at large) have a continuing need for growth in these sectors.

Recent review of NI STEM education has revealed some interesting statistics.....



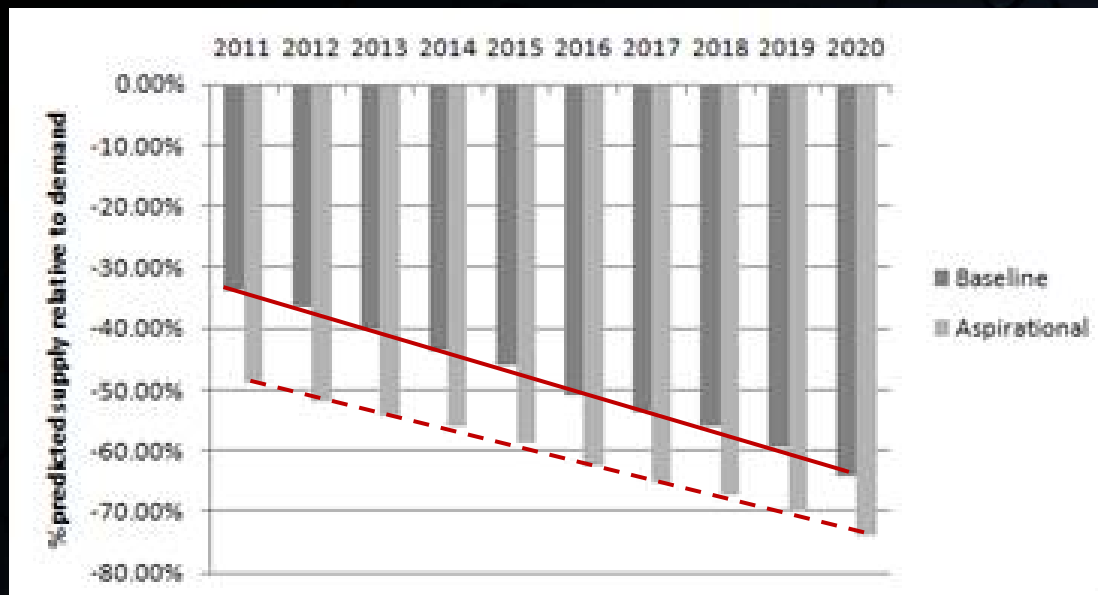
Recruitment and Retention

Over the last ten years, there has been a sustained decline in students graduating from tertiary level STEM subjects.



Recruitment and Retention

At the predicted contraction rate, this is predicting nearly a 65% shortfall in the EPS sector by 2020 relative to baseline demand.



Recruitment and Retention

Particularly concerning in light of new NI GCSE regulations (2007) which no longer require a balanced set of science subjects to be selected.

In the first year of introduction:

GCSE Physics \uparrow 33.3%

Double Award Science \downarrow 16%

Net loss of students qualified for

A-Level Physics = approx. 7%



Recruitment and Retention

Additionally, NI engineering student enrolments are only 80% of the UK average expected.

Subject combinations at A-Level are also changing dramatically:

Biology + Chemistry \uparrow 18%

Mathematics + Physics \downarrow 20%



Recruitment and Retention

STEM review noted a number of notable factors associated with losses from the STEM artery, namely:

- Large changes in the subject groupings being selected
- Perceived lack of engagement from the business community
- Continuing low percentage of females entering into tertiary STEM careers



Implications for HE Engineering

Sustained decline = less capable individuals entering into tertiary level engineering programmes, despite continuing need for these skills in the local economy.

Two questions to be addressed.....



Implications for HE Engineering

How clear are the STEM pathways in Northern Ireland made to secondary level students?

Is there a quantifiable gender bias in NI STEM education, and if so, where does it appear?



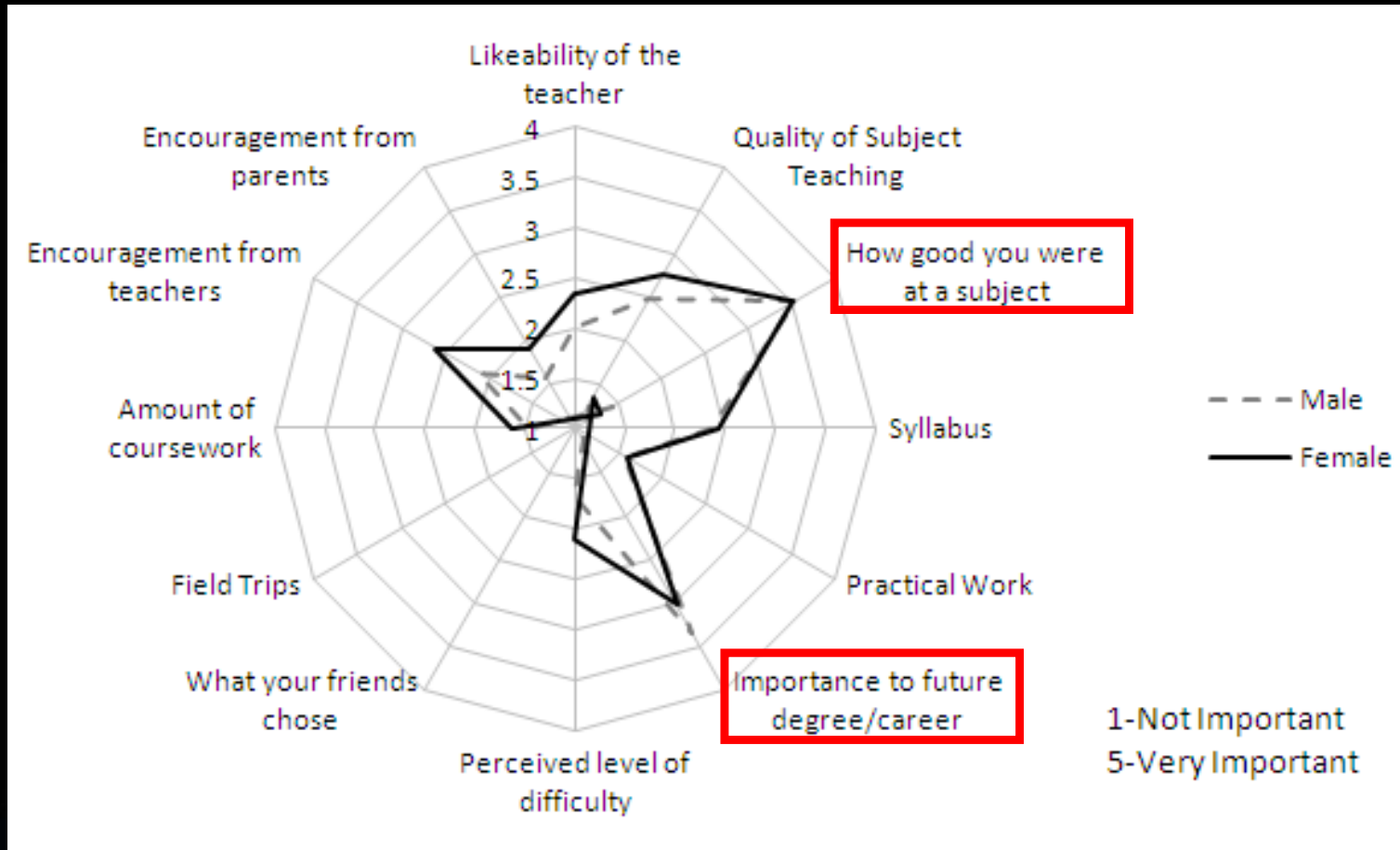
Methodology

Electronic survey of nearly 400 undergraduate students across three faculties.

Complimentary interviews with Initial Teacher Education students.

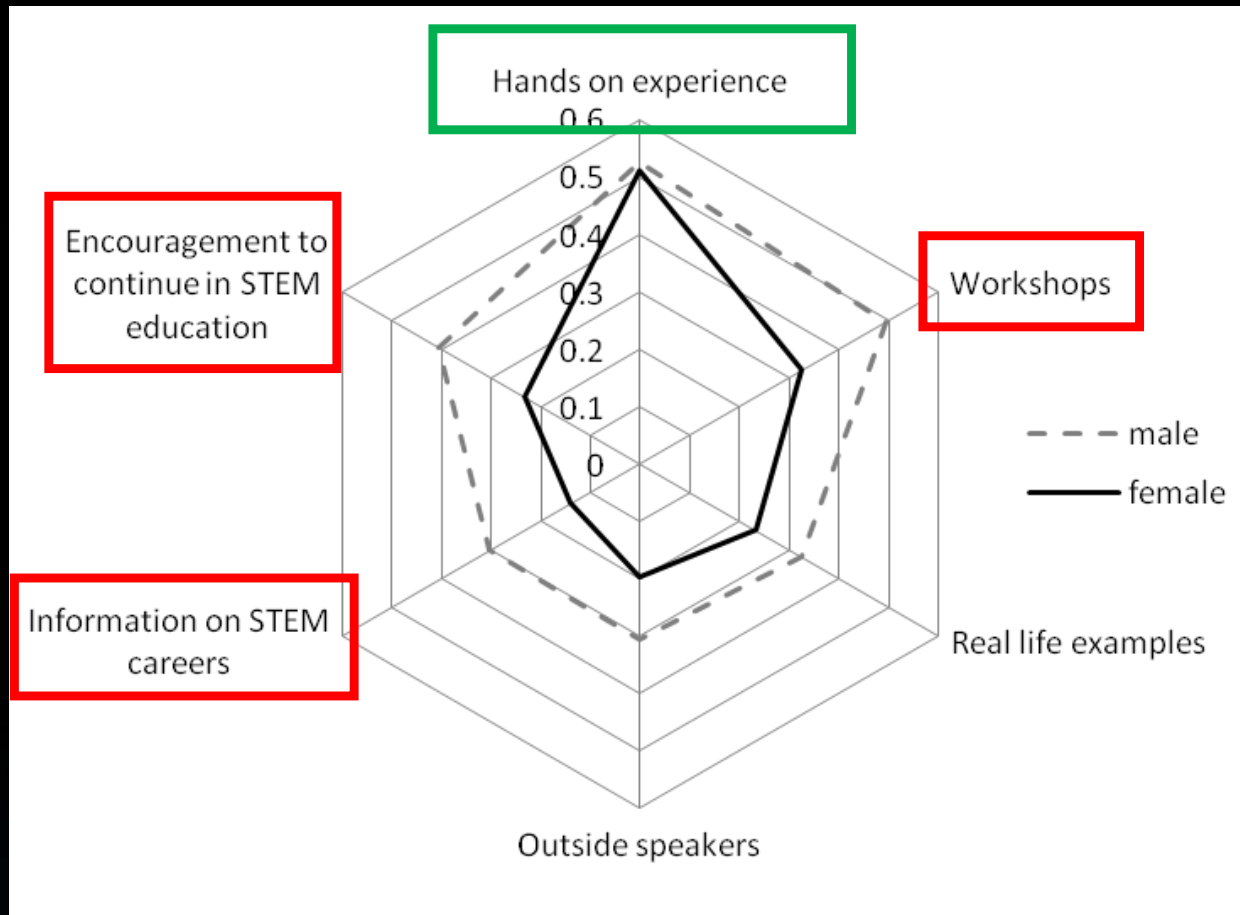


A-Level subject choice.....



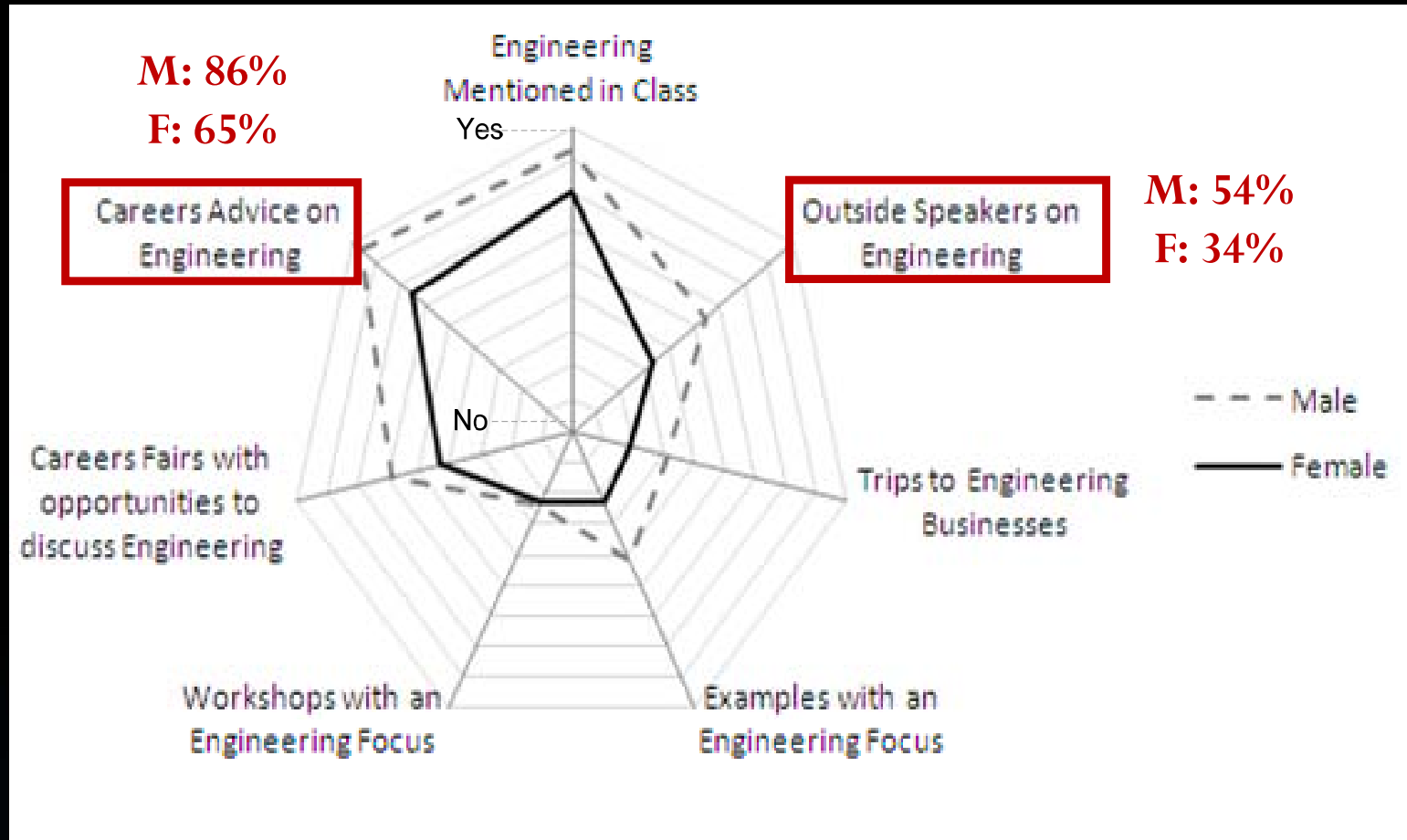
Look at careers advice in more detail.....

Good Careers Advice?

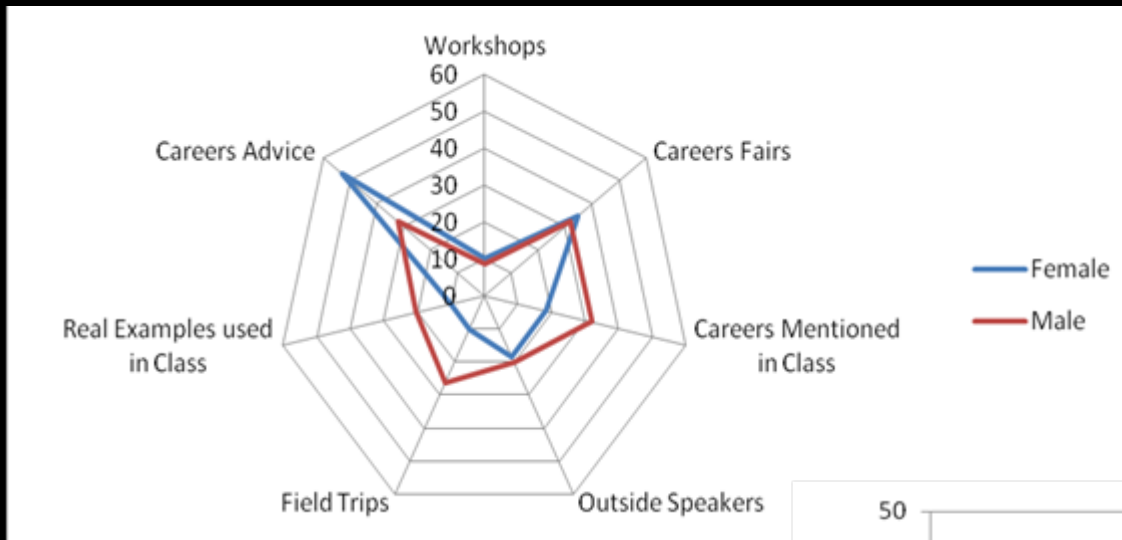


68% did not think they had received satisfactory careers advice

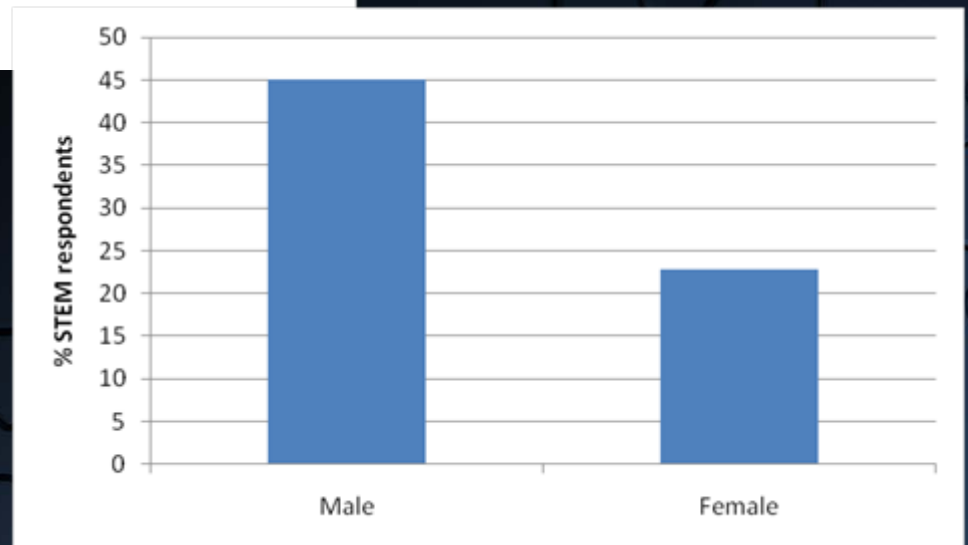
Engineering Careers Advice



Desirable Career Decision Aids



45% of male respondents felt they had received adequate careers advice, while only 22.8% of females could agree with this



Focus on Careers

Overall, the feedback on careers advice is not favourable.....

Becomes less so when split by gender, with female perception being much poorer, but placing increasing emphasis on individual advice.



Careers advice.....

1. Focussing on application procedures rather than actual career pathway advice:

"Careers classes in school were learning how to apply to university"

"my careers class always focused on applications to university and fees..... however it won't help you choose the career path which is right for you."

2. Lack of encouragement for females into engineering:

"I went to a girls school where it (engineering) was hardly mentioned. I resented this as I had a particular interest in the subject."

"Girls are seriously not made aware of engineering as a career choice..... I also found that I received not much encouragement with my choice."

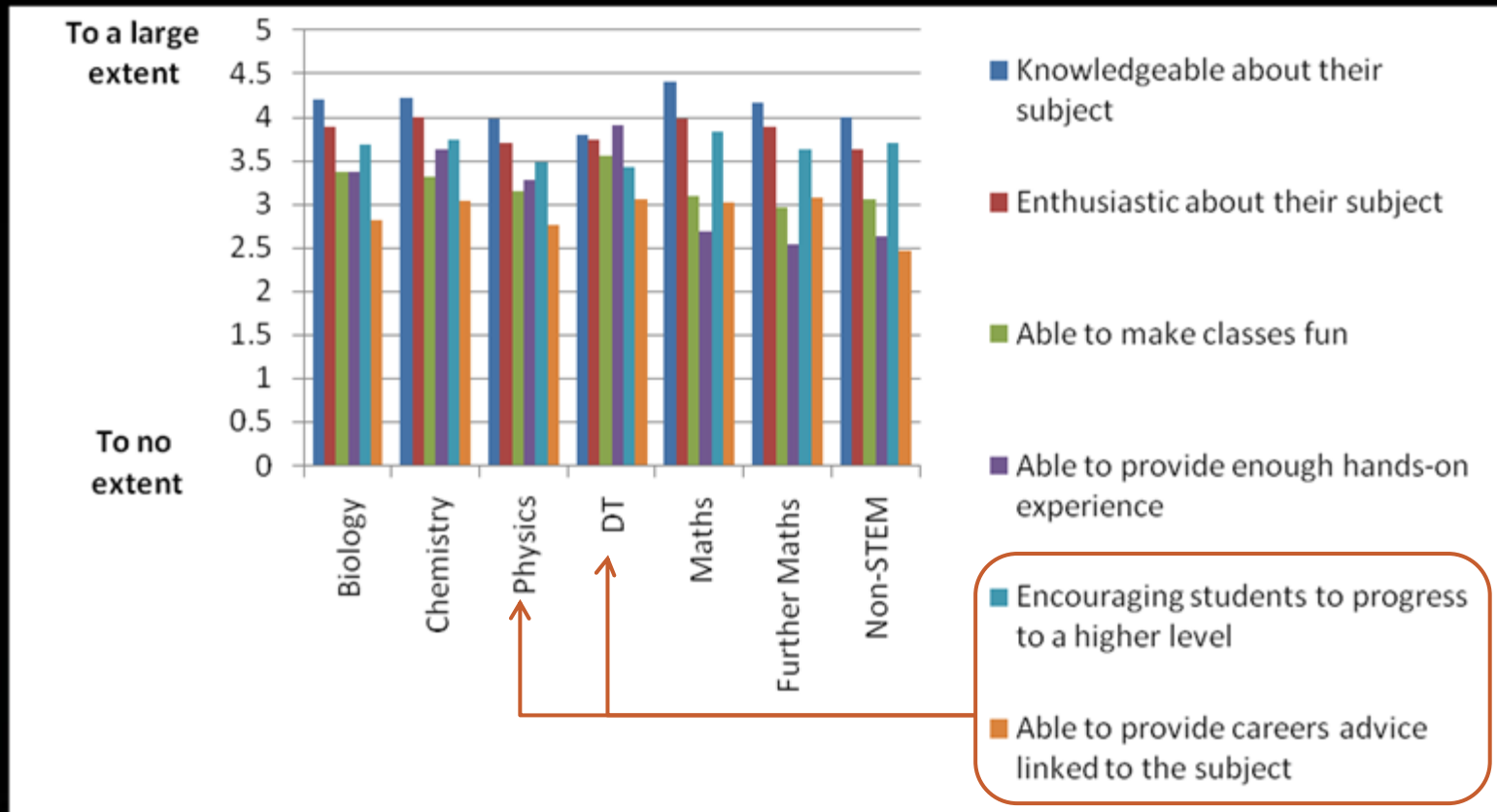
3. Careers teachers with pre-conceived notions of career pathways:

"I was encouraged to "know my limits"."

"Teacher input was more focused on telling me what they thought I should do rather than helping me make my own choice....."



STEM Classroom Experience



Lowest ratings for receiving encouragement to remain in Physics/Technology, and Physics lowest for provision of subject specific careers advice.

Observations.....

Increasingly abstract nature of A-Level STEM syllabus (in particular, physics)

Science subjects taught by non-specialists – physics particularly badly off due to low numbers.

Less than 200 registered physics teachers in NI – less than a third of biology registered.



Observations.....

Previous studies have shown direct link between subject qualification of teacher and achievement of students in exams (Smithers and Robinson, 2005).

Also comments on assessment dominating over the opportunity to enjoy the subjects.



Concluding Remarks

Engineering degree enrolments are already low, and new secondary educational models are likely to have a further impact downstream.

Arising from problems much earlier in the educational process.

Appears to be rooted in careers advice, which is also giving rise to the stark gender bias.



Concluding Remarks

Continuing issues with uptake of Physics at GCSE/A-Level, which is getting worse

Significant efforts need to be made to highlight relevancy of physics to careers pathways both inside and outside of the physics classroom.

