

Flat as a pancake: a pseudo-longitudinal study of attitudes and beliefs at the University of Edinburgh using CLASS

S.P. Bates, R.K. Galloway, C. Loptson and K.A. Slaughter

Overview

The Colorado Learning Attitudes About Science Survey (CLASS) has been used to carry out a pseudo-longitudinal study of student attitudes and beliefs at the University of Edinburgh, Scotland. Data has been collected during the 2009-10 academic year with 638 surveys being collected in total from high school students, all years of undergraduate study, and physics faculty. The results indicate a largely consistent level of expert-like thinking throughout undergraduate study, with students starting university with high levels which remain essentially static. Significant increases in levels of expert-like thinking are seen at transitions between high school and first year university and again between undergraduate and postgraduate study. Further analysis shows that while overall levels of expert-like thinking are constant, there are significant changes occurring in CLASS categories.

Physics Degrees in Scotland

The Scottish degree system usually requires four years of undergraduate study for a Bachelors degree with an optional fifth year available to some students, resulting in an Integrated Masters degree.

Neither of the first two years of the undergraduate degree count towards the final degree classification, with students typically studying two thirds physics and mathematics and the final third a free choice elective. This results in first year classes being made up of approximately 50% majors and 50% non majors (although all data reported here is for physics majors only).

Typical first year class sizes in Physics at Edinburgh are 300 students, while the average graduating class has around 70.

Methodology

The CLASS survey [1] was used to survey students in their final year of high school, all five years of undergraduate study and PhD students at the University of Edinburgh. In addition, physics faculty were surveyed at the Universities of Glasgow, Edinburgh and St. Andrews, as well as through the UK Higher Education Academy Physical Sciences Centre mailing list [2].

All data was collected during the 2009-2010 academic year. Data for first year undergraduates has been collected on two successive years, and statistical tests have been carried out to look for differences between the two years. No differences were found; this indicates our pseudo-longitudinal approach is likely to be valid.

References

[1] Adams, W.K., Perkins K.K. and Podolefsky N.S (2006) "A new instrument for measuring student beliefs about physics and learning physics the Colorado Learning Attitudes about Science Survey Physical Review Special Topics-Physics Education Research 2 010101

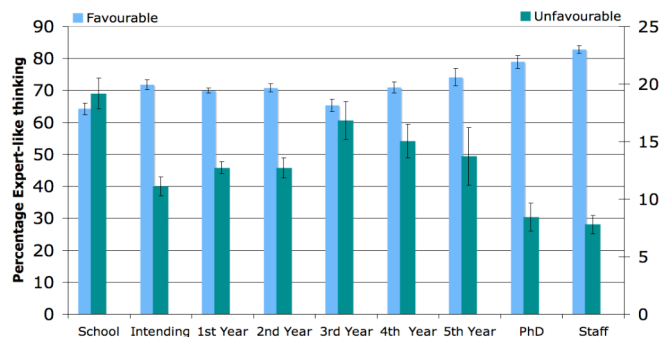


Figure 1: Favourable and unfavourable percentage scores for year groups at high school, the University of Edinburgh and faculty. Error bars represent the standard error.

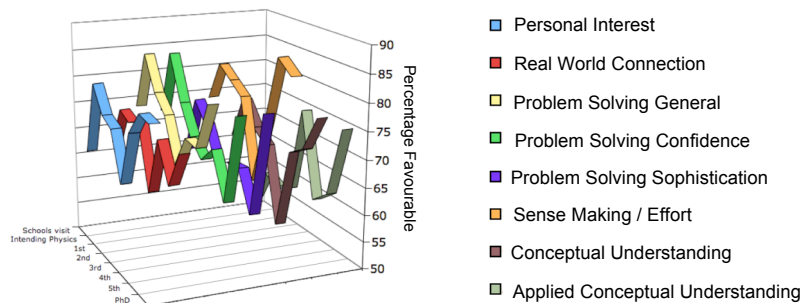


Figure 2: Favourable percentage scores for all survey cohorts across all CLASS categories.

Results

As shown in Figure 1, the percentages of expert-like thinking from first year of university through to final undergraduate year show no statistically significant differences, except third year, for which we have other evidence to suggest is significantly influenced by aspects of the curriculum structure.

However, analysis of the variation in responses broken down by cohort and by CLASS categories indicates notable changes, as illustrated in Figure 2.

Significant differences are seen in overall favourability percentages at the interfaces between general school population and physics degree, and at the degree exit point.

Conclusions

We have collected CLASS survey data across a very wide range of educational levels, from final year high school to faculty professor. Our pseudo-longitudinal approach has been validated by comparison with fully-matched longitudinal data collected over the last two academic years.

We find relatively unchanged levels of expert-like thinking throughout our undergraduate program, consistent with other work in this area [3].

In addition, we also find significant changes at the school-university and undergraduate-postgraduate transitions, strongly suggestive of selection effects.

References

[2] Physical Sciences Centre <http://www.hpacademy.ac.uk/physics/>
[3] Gire, E and Jone, B (2009) characterizing the epistemological development of physics majors Physical Review Special Topics-Physics Education Research 5 010103

