

[National Assembly for Wales](#)

[Enterprise and Business Committee](#)

[Follow-up inquiry into Science, Technology, Engineering and Mathematics \(STEM\)](#)

Evidence from the Cardiff Science Institute Initiative – STM 12

The Cardiff Science Institute Initiative

Contribution to the follow-up inquiry into Science, Technology, Engineering and Mathematics (STEM) Skills for the Welsh Government's strategy Science for Wales and Delivery Plan

1. Background to the Cardiff Science Institute (CSI)

The CSI is a proposal which has been worked upon since 2012 by Sam Chillcott and Professor Matt Griffin (Head of the School of Physics and Astronomy, Cardiff University). The objectives of the CSI are as follows:

- (i) to provide sustained and systematic support up to 1000 children aged 11-16 in their science education, in their local schools, to encourage and prepare them to take science subjects at A Level;
- (ii) to offer a nationally excellent sixth form education to around 200 students aged 16-18, and for mature students who wish to study A Level.

It will, to our knowledge, be the only institution in Wales to cater solely to pupils concentrating on science subjects in the age range 16-18 and will specifically aim to support Free School Meal (FSM) children.

Consultation with the Vice Chancellors of Cardiff University and the University of South Wales has taken place, with some encouragement. In particular Professor Karen Holford (Pro Vice-Chancellor, College of Physical Sciences and Engineering, Cardiff University), Professor Hywel Thomas (Pro Vice-Chancellor, International and Engagement, Cardiff University) and Professor Helen Langton (Deputy Vice Chancellor for the University of South Wales) are particularly supportive and interested in pursuing the project.

2. Areas of focus for this contribution

This contribution will focus upon section 2a of the terms of reference, namely;

- a) *The adequacy of provision of STEM skills in schools, further education colleges, higher education and work-based learning (including apprenticeships).*

3. Current problem

Both in Wales and in the rest of the UK, FSM children (a measure of children from the poorest and most disadvantaged households) significantly underperform relative to their better-off classmates. At each stage of the educational ladder, FSM children achievements fall short of those of their peers. In this short report there is not the space to include an in-depth analysis of this problem. However, in preparation for the CSI proposal, several statistics have been identified which illustrate starkly the magnitude of the problem.

UK wide

1. In the UK only 24% of FSM children attain five grades A*-C, compared to 48% nationally.
2. In the whole of the UK, less than 180 FSM students a year obtained three As at A-level. This is from over 75,000 children.
3. Given that three As is now the minimum requirement for many universities and for the most prestigious courses, there is clearly a structural failure in the system, with the poorest children having minimal opportunities to excel.

(Source: Sutton trust. Responding to the new landscape for university access; December 2010)

Wales

A Level Physics – all students

1. 255 students from the 15 further education colleges (groups) in Wales took A Level Physics in 2013. 954 students from sixth forms in Welsh schools took A Level Physics in 2013.

FSM pupils doing Physics A Level

2. 15% of Welsh children are FSM, amounting to 5,200 pupils per year (2013).
3. 3.9% of Welsh pupils took A Level Physics in 1996 but only 2.7% in 2007.
4. If 2.7% of Welsh FSM pupils took Physics it would equate to 140 pupils. In fact only 26 FSM pupils took A Level Physics in schools in 2013 – only 0.5%.
5. There are no FSM data for pupils at Welsh Colleges, so this number might go up slightly.
6. No Welsh FSM child got an A* at A Level Physics and less than five of them got an A in 2013 (schools only).
7. Unfortunately, the numbers of FSM pupils getting either an A or a B are so small that the statisticians can only say that between two and eight FSM pupils got either an A or B grade (for disclosure reasons). In the best case, 30% of FSM pupils obtained an A*-B grade; in the worst case it is 7.5%. For non-FSM pupils in schools it was 46%. In colleges it was 39% (all data from 2013).

Higher Education

8. On a positive note, for the 2000 year of entry there were 112 successful UCAS applicants accepted onto Physics degree courses in Wales. In the 2009 year of entry, this had risen to 180 students. It is not clear however, what proportion of these students were from Wales, or pupils from other countries studying for their degree in Wales.

(Source for points 1-7 from the Welsh Assembly Statistics Department for schools and colleges –

individual enquiry; source for point 8: Science, Technology, Engineering and Mathematics (STEM) Skills – IOP – Nov 2010.)

Key conclusions from these simple facts are the following:

- 1) Most students who take A Level Physics in Wales do so at schools – 79% at school, and only 21% at FE colleges.
- 2) FSM children are drastically under-represented in terms of Physics A Level uptake, thereby potentially excluding them from future success and career opportunities.
- 3) FSM children underperform significantly when they do A Level Physics compared to non-FSM pupils.
- 4) More needs to be done to support and encourage economically disadvantaged children to study A Level Physics. The **Cardiff Science Institute** initiative (full proposal available on request) seeks to address this need, offering the prospect of a major improvement in the performance and success of economically deprived children in the region.

4. Suggested further research

1. FSM data is needed for the further education colleges.
2. It would be interesting to see how the FSM numbers doing A Level Physics have changed over the past ten years.
3. Are further education colleges the most appropriate institutions for studying A Level Physics, given they underperform compared to schools and only a very small minority take A Level Physics at a further education college?