Briefing on the changes to pre-19 qualifications and curricula in the four nations of the UK

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The Royal Academy of Engineering
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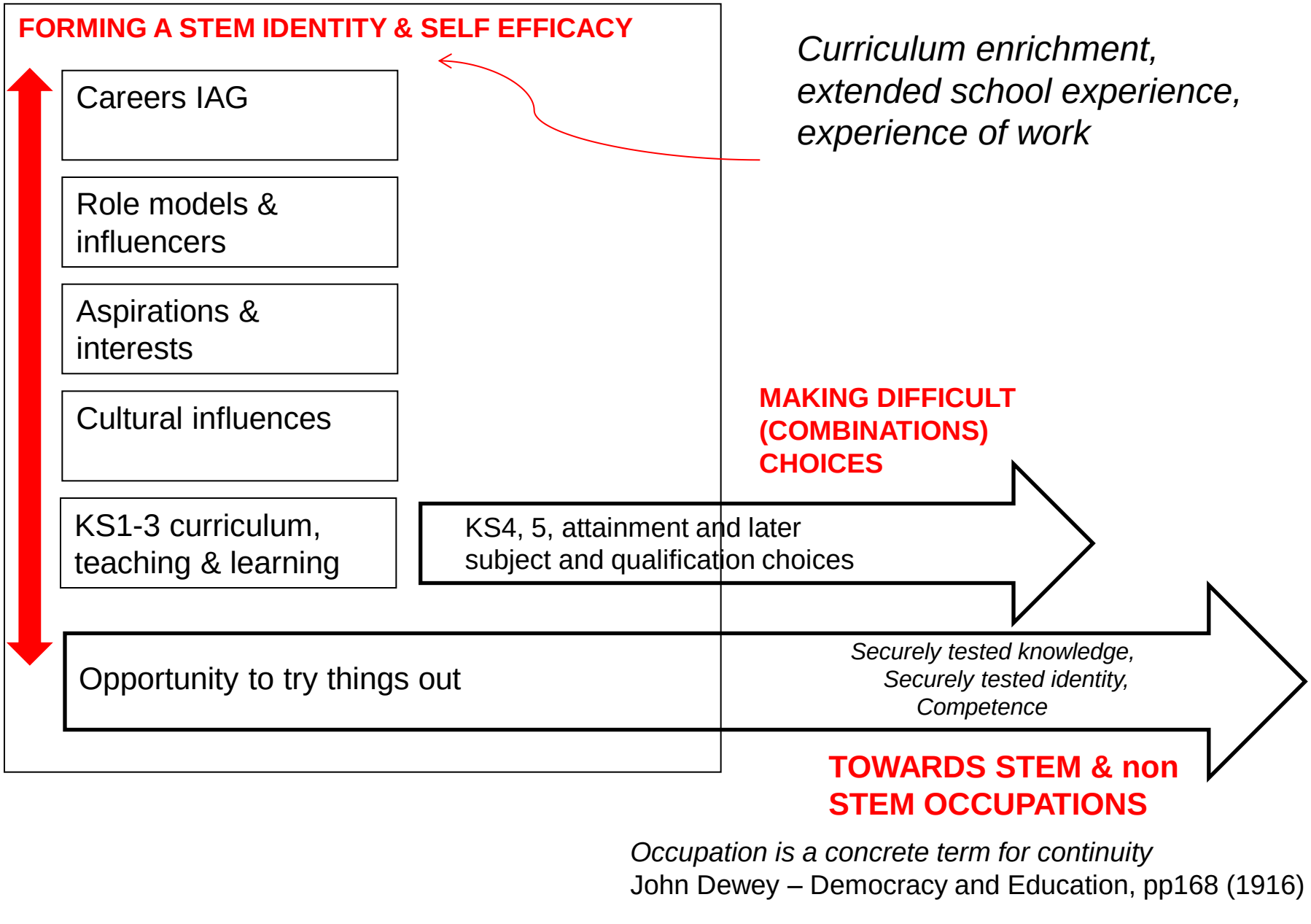
Focus of this presentation

- Progression to engineering undergraduate study for UK domiciled young people (progression for adults not considered here)
- Science, technology, engineering and mathematics (STEM) progression to and through the 14-19 phase – emphasising STEM qualifications taken post 16.
- The rapid changes in 3-19 education and how this varies around the UK



Occupation is a concrete term for continuity
John Dewey – Democracy and Education, pp168 (1916)

Possible components of a STEM progression & retention map

Recent changes to 5-19 STEM in England

- Rise in youth unemployment & **participation age rising**
- National Curriculum review: **Computing and D&T 'successes'**
- **Linear GCSEs and new grading**
- **Careers IAG 'not working'** (Ofsted)
- The English Baccalaureate (and many proposed 'Tech Baccs')
- Free schools, studio schools , UTCs, more academies, new post-16 provision
- Big rise in Apprenticeships (smaller rise in STEM Apprenticeships) with **implementation of Richards Review reforms**
- Wolf review of 14-19 vocational education (**KS4 accountability tables**, post 16 programmes of study, role of 'instructors' in schools, **KS5 accountability**)
- 'Respected' technical qualifications for use in FE and UTCs
- Engineering qualifications in schools after the Diploma in Engineering

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STEM A levels

Summer 2013 in ENGLAND

Maths up 4.0% for males (49k), up 1.0% for females (32k)

Physics up 3.4% for males (26k), up 2.0% change for females (7k)

Chemistry up 3.8% for males (25k), up 7.4% for females (23k)

Biology down 1.5% for males (24k), up 4.3% for females (33k)

D&T down 9.9% for males (8k), down 9.0% for females (7k)

Source: JCQ

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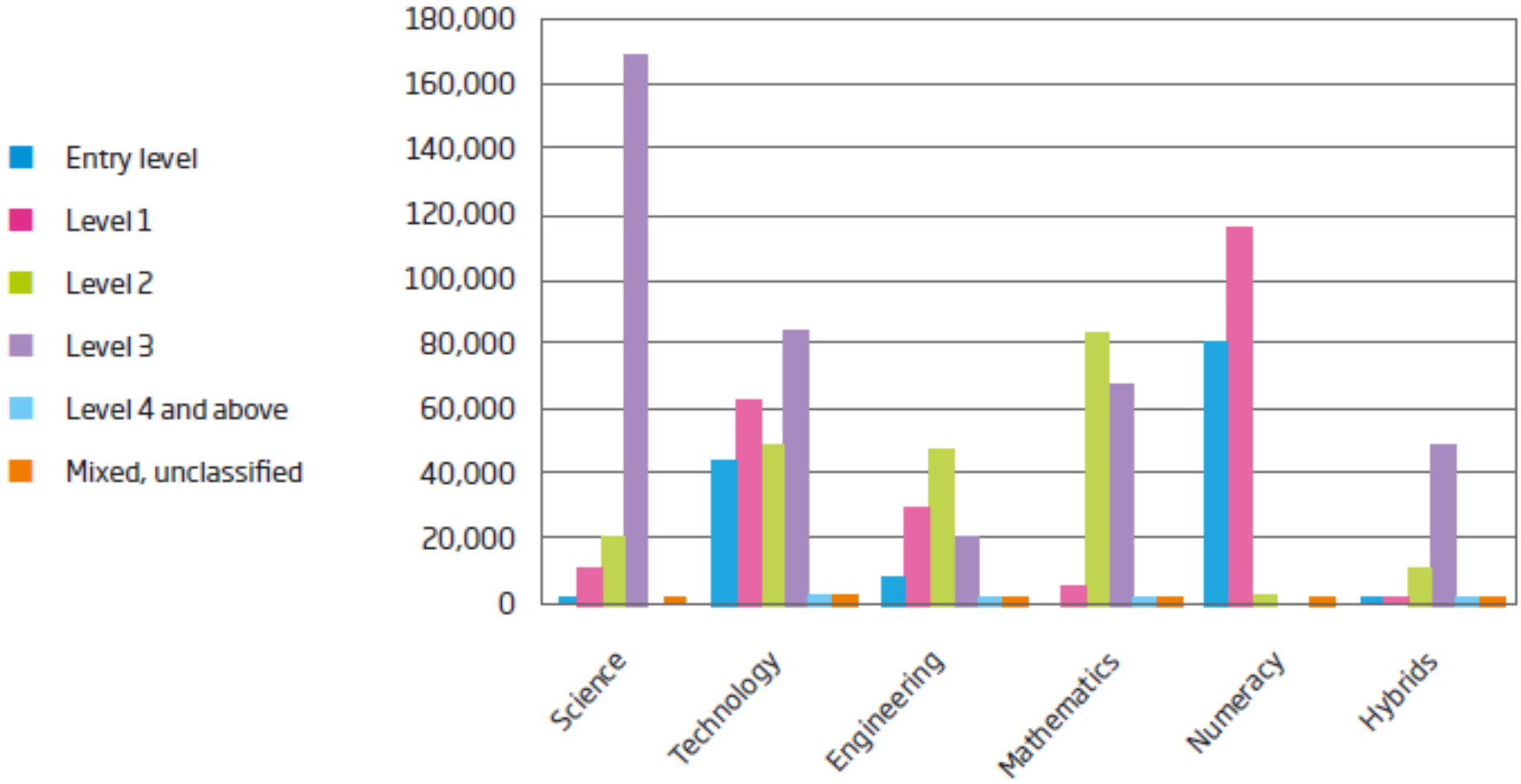
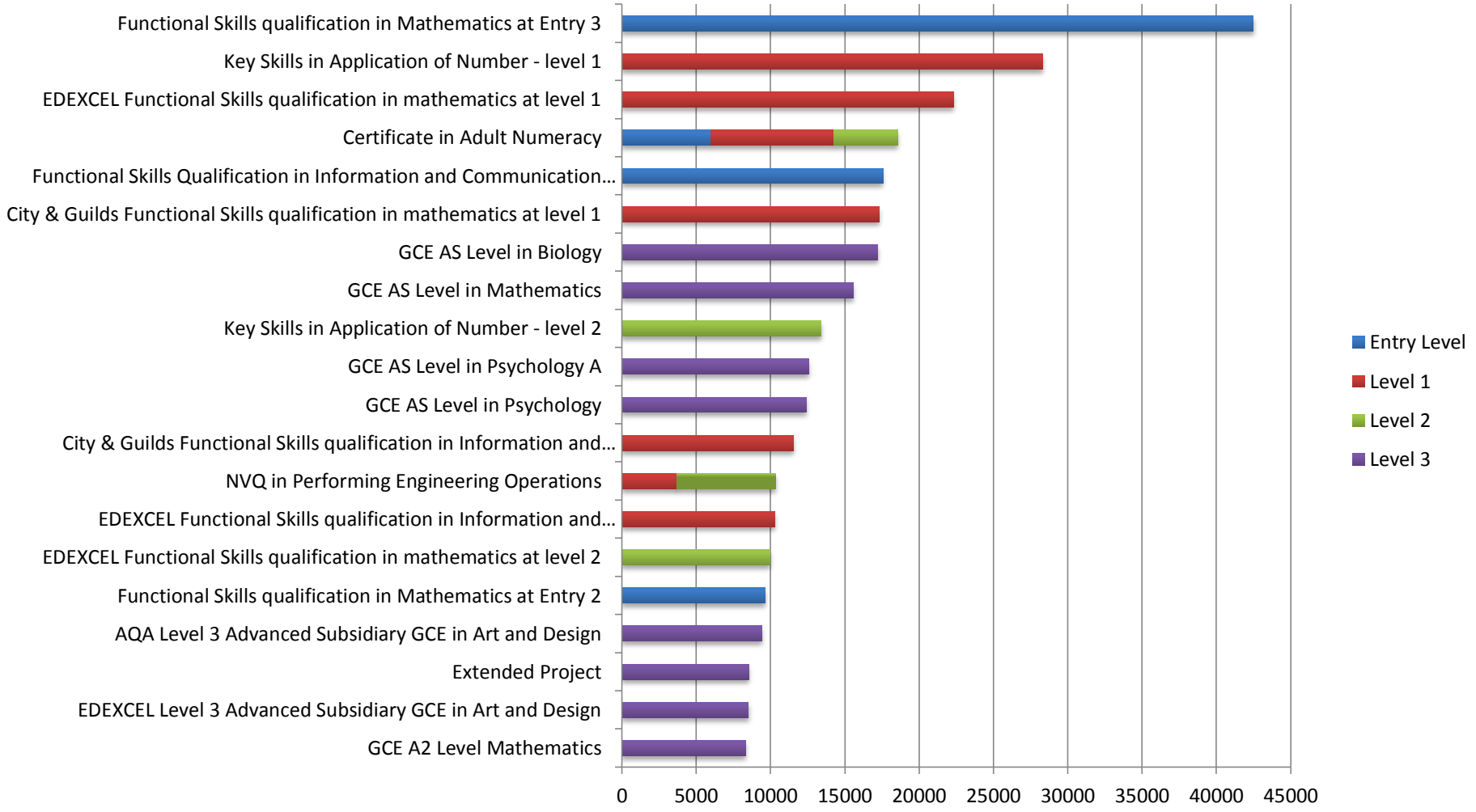
Young people



Funded qualifications completed by 16-18 year olds **in the FE and Skills sector** in England

All-England (FE & Skills Sector) Top 20 Under 19s STEM achievements by level 2010-2011 (funded & not funded)



Recent changes to 3-18 STEM in Scotland

- Rise in youth unemployment. Different participation ages than in England (younger completers)
- Different national qualifications retained (Standard Grade, Intermediates, Highers, Advanced Highers) – plus a strong tradition of HNC and HND
- 'Curriculum for Excellence' is a big vision for education (and society) in Scotland. Linked to the Goodison Group and report (*by 2025 Scotland will be regarded as a world-leading learning nation*). Developed in 2004, took effect 2010.
- Engineering is more obvious as a component of the 'technologies curriculum' than in other UK nations.

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STEM Highers

Summer 2013 in SCOTLAND

Maths 11k males, 10k females – annual trend: flat

Physics 6k males, 2.5k females - annual trend: up

Chemistry 5k males, 5k females - annual trend: flat

Biology 4k males, 6k females - annual trend: down

Technology 0.7k males, 0.04k females - annual trend: down

Source: SQA

Recent changes to 5-19 STEM in Wales

- Rise in youth unemployment but falling numbers of 14-19 year olds
- Progression to 2A levels or equivalent improving annually (circa 96%)
- Wales NOT following the GCSE reforms of England
- New national curriculum established in Wales in 2008. It emphasises skills more than the curricula in England or Northern Ireland.
- The Welsh Baccalaureate Qualification is offered to 14-19 years olds at Foundation, Intermediate and Advanced levels.
- 14-19 qualifications were reviewed in 2012. GCSEs and A levels to be retained, the Welsh Baccalaureate to be made more rigorous with grading introduced at Advanced level in 2013

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STEM A levels

Summer 2013 in WALES

Maths up 3.0% for males (2k), no change for females (1.5k)

Physics up 6.1% for males (1.2k), down 10% for females (0.3k)

Chemistry up 1.9% for males (1.2k), up 1.3% for females (1k)

Biology down 5.0% for males (1.2k), no change for females (1.6k)

D&T down 3.0% for males (0.5k), down 12.0% for females (0.3k)

Source: JCQ

Recent changes to 5-19 STEM in Northern Ireland

- Rise in youth unemployment and falling numbers of 14-19 year olds.
- 215 ‘post primary’ schools – 68 of which are grammar schools. 42% of 14 year olds are in grammar schools. 33% ‘attainment gap’ between grammar and non-grammar (5 A*-C at GCSE) – gap closing fairly quickly. Grammar schools account for 60% of the A level entries from schools

Post primary schools are required to provide pupils with a broad and balanced education and therefore must **provide** at least one course related to each of 9 areas of learning (mathematics is one area, science & technology another). From September 2013 schools will be required to provide all pupils with access to a minimum number of courses at KS4 (current target 24). In both cases at least one-third of the courses must be general courses and at least one-third applied courses.

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STEM A levels

Summer 2013 in NORTHERN IRELAND

Maths up 7.0% for males (1.8k), down 5.3% for females (1.2k)

Physics up 11.1% for males (1.2k), down 17% for females (0.4k)

Chemistry up 9.1% for males (1k), no change for females (1k)

Biology no change for males (1.3k), down 6.0% for females (2k)

D&T up 2.0% for males (0.7k), down 5.0% for females (0.2k)

Source: JCQ

What we know about progression: (England) in summary

Some things learned from longitudinal tracking of the National Pupil Database and population survey datasets (additional to that of Fischer Family Trust) :

- Post 16 destinations mostly include education – most frequently 'sustained' education. Few go directly to work. There is a similar picture post 18 but with a third out of education.
- Progression in science and maths is narrow - focused on those with the highest prior-attainment. Progression in other subjects is more inclusive.
- Combinations of work and study potentially offer additional value post 16 and post 18.

There is a rare political, social, economic and educational opportunity to position **technical STEM** (exemplified as 'engineering') and both intrinsically worthwhile and inclusive for a wider spectrum of prior attainment (not under estimating the issues around gender in-balance)

What we know about progression: (England) in detail

Some things learned from longitudinal tracking of the National Pupil Database (additional to that of Fischer Family Trust) :

DfE destinations research: (OSR13/2012)

1 year after taking Key Stage 4 in 2009/10

- 85% are in sustained education (of which 4% points in Apprenticeship) but +-10% variability between Local Authority areas
- 9% not in sustained education
- 6% not captured in the data (includes those at work)

1 year after taking Key Stage 5 in 2009/10

- 64% are in sustained education (of which 52% points in Higher Education and 2% points in Apprenticeship) but +-15% variability between Local Authority areas
- 8% not in sustained education
- 28% not captured in the data (includes those at work)

More detail on progression

CAYT destinations research: (DfE RR182)

For those entering the labour market aged 16, the is a high degree of persistence in activity over time. Those in work or study / work at 16 are likely to be in that state at 19.

Transitions to the labour market at 16 and 18 are strongly associated with parental aspirations and pathways taken by parents.

There is some evidence that combining work and study post 16 produces better labour market outcomes. However, the long term wage outcomes of those who enter jobs without training are similar to those with training.

For those in full time education, there are labour market benefits to also having work.

Training that leads to qualifications that have known economic value is most valuable.

More detail on progression

Effect of SATS result on progression to A level (DfE RR079, 2012)

- Those who achieved L3 in numeracy at KS1 are 9 times more likely to progress to A level maths than those who achieved L2 or below.
- For science it was between 3.3 times and 4.3 times

- Those who achieved L5 in numeracy at KS2 are 28 times more likely to progress to A level maths than those who achieved L4 or below.
- For science it was between 7 times (biology) and 19 times (physics)

More detail on progression

Subject progression to AS and A Level (DfE RR195, 2012)

- 59% of pupils achieve A*-C in GCSE maths. 20% of those progress to AS maths. Progression rate for A* GCSE is 79%. For a C it is 1%.
- 72% of those taking AS maths progress to A Level

- 62% pupils achieve A*-C in double science GCSE. 24% of those progress to at least one AS science. Progression rate for A* GCSE is 65%. For a C it is 7%.
- 67-70% of those taking AS in science progress to A Level

As calibration – looking outside of STEM
Geography: Progression rate for A* GCSE is 40%. For a C it is 11%.
History: Progression rate for A* GCSE is 53%. For a C it is 16%.
English: Progression rate for A* GCSE is 49%. For a C it is 8%.

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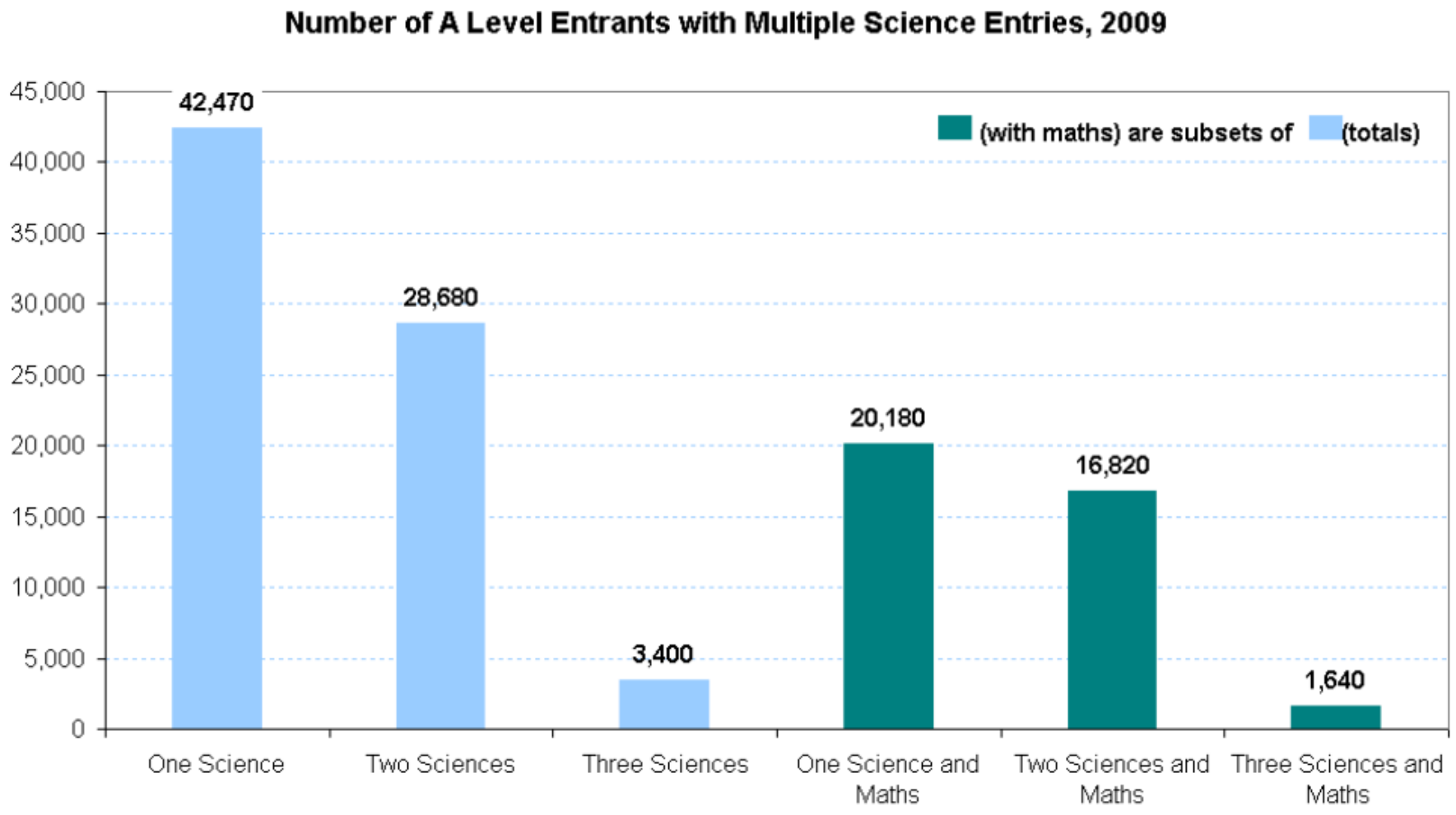

Subject progression to AS and A Level (DfE RR195, 2012)

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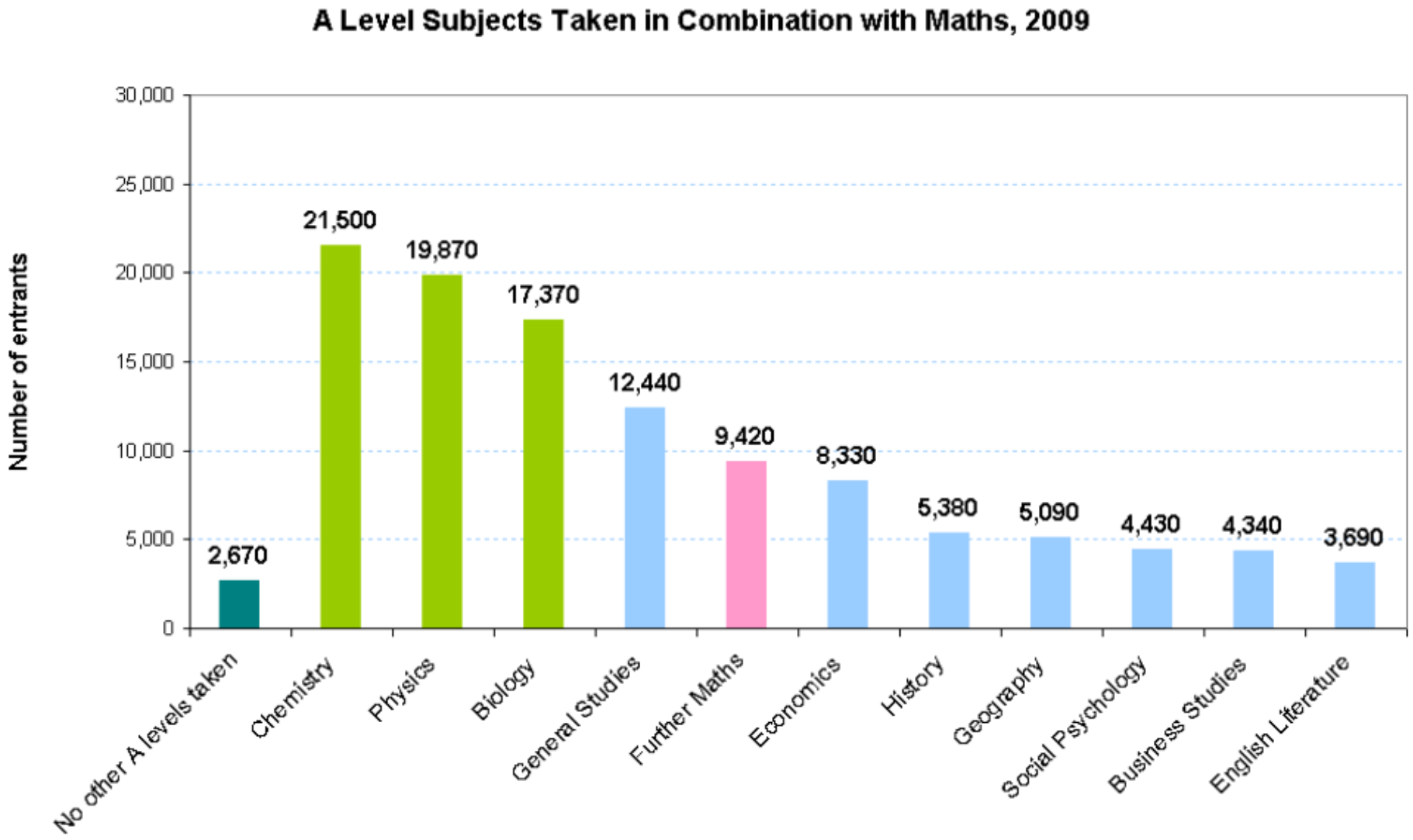

Subject progression to AS and A Level (DfE RR195, 2012)

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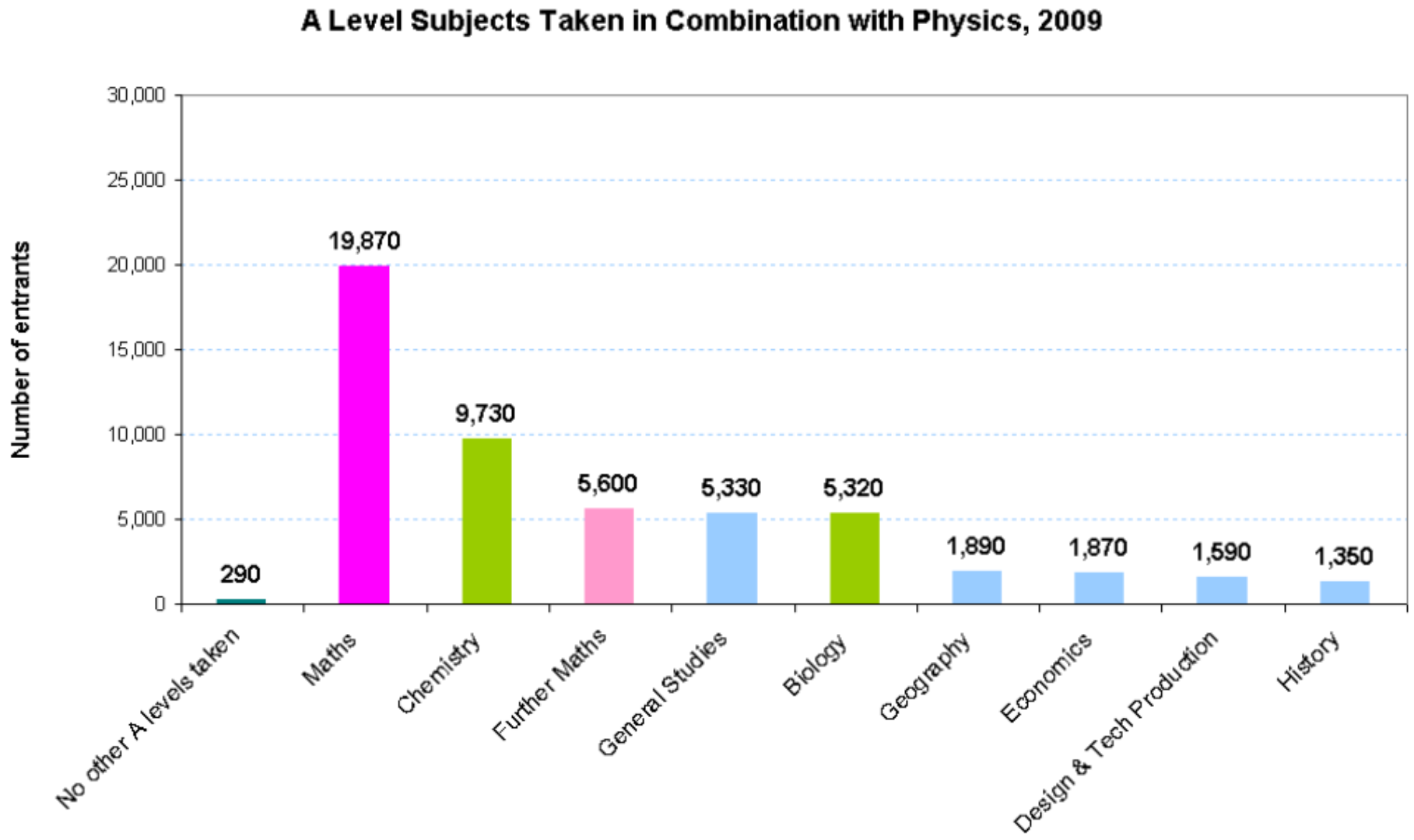

Subject progression to AS and A Level (DfE RR195, 2012)

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STEM progression routes

Some well known examples of STEM progression routes exist:

- Rising rates of science A level are associated with rising rates of triple science at GCSE (DFE / BIS HLSG KPIs)
- 84% of people with 3 science A levels progress to STEM HE
  (Demand for STEM Skills DIUS, 2009
- 40% of people with BTEC Level 2 progress to BTEC level 3
  (Returns to BTEC vocational qualifications, London Economics, 2010)
- 16% of people who are accepted onto engineering degree courses hold a Level 3 vocationally related qualification in engineering
  (RAEng analysis of UCAS data for 2010/11)

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STEM progression routes

Reasons to exercise caution:

- Some students are presented with fewer progression options than others
  (*Subject and course choices at ages 14 and 16*…. DFE Report RR160, 2011)
- Progression is sensitive to local context
  (*Respected…*, Edge / Baker Dearing Trust, RAEng, 2011)
- There are more factors in play than just subject choice combinations – gender, ethnicity, socio-economics included
  (RR160, *Why choose physics and chemistry….*, IoP/RSc, 2008)
- There are multiple routes into most STEM destinations – too much emphasis on specific progression routes might imply otherwise
- Transition rates to STEM employment destinations can be surprisingly low (<50%) (HESA, *Labour market value of STEM qualifications…*

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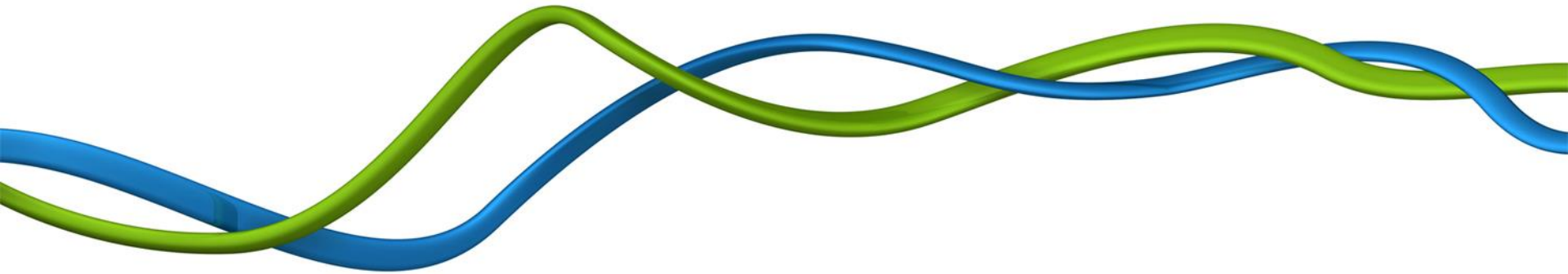

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STEM A levels

Summer 2013 across the UK

Maths up 4.0% for males (53k), up 1.0% for females (34k)

Physics up 3.8% for males (28k), 0% change for females (7k)

Chemistry up 4.0% for males (27k), up 6.8% for females (25k)

Biology down 1.5% for males (27k), up 3.6% for females (37k)

D&T down 8.0% for males (9k), down 9.5% for females (7k)

Source: JCQ