Supporting your most able students - Science

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“Why stretch our most able students?”

Answers on a post it note please

“I have come that you may have life and have it to the full” – John 10 v 10
The most able students
An update on progress since June 2013
(March 2015)

It is crucial that our most able students **fulfil their potential**. We need to **harness the talents** of these students so that they can become the **next generation of business, intellectual and political leaders**. If we succeed, it will **benefit** not only them as individuals but **our country as a whole**.

"I have come that you may have life and have it to the full" – John 10 v 10

Stretching the most able - what does it look like?

Stretching your most able students is not about creating extra or different activities for them. Stretch provision should be **inclusive**

It’s not about doing more, its about doing things a **bit differently** for your pupils

It’s about **challenging** students to **develop their skills** as Scientists. (or Historians, or Artists etc.)

“What a child do can in cooperation today, he can do alone tomorrow”

"I have come that you may have life and have it to the full" – John 10 v 10
A Case Study: Twyford Trust

The aim of the Science KS3 curriculum across the Twyford Trust is to
- Develop students who have a love of science
- Ensure KS4 Success,
- Student progression - A Level and beyond

We wanted them to learn the following key concepts and skills which underpin the study of Science and how science works in the real world:

1. Using scientific ideas and models to explain phenomena and developing them creatively to generate and test theories.
2. Critically analysing and evaluating evidence from observations and experiments.
3. Examining the ethical and moral implications of using and applying science. Enabling students to use science to act responsibly in the real world.

Key Features

- ALL students study the same topics – one Biology, one Chemistry, one Physics each term
- Students are taught an ‘introduction to science’ topic during the first half term. This topic includes embedding the key concepts (content) and skills.
- Topics differentiated to account for 3 different streams.
  - This will enable students to move between sets (or even streams) following each end of term test.
  - All students will have covered similar content but the time they reach GCSE, however to a different level.
Skills progression

The science skills needed for students to excel at GCSE need to be embedded throughout the curriculum:

- Long answer scientific writing
- Lab skills
- Study skills (independent learners!)
  - Each topic has a specific literacy/numeracy focus
  - Each topic has a specific science skill (these are linked to the NC Key processes)
  - All NC Key processes covered
  - All NC Key concepts covered

“Have come that you may have life and have it to the full” – John 10 v 10
Old vs New
Can you tweak the unit you have brought along to cater for your more able students?

What main ideas can apply to your unit of work?

"I have come that you may have life and have it to the full" – John 10 v 10
Differentiated Lesson Outcomes

All students will have covered similar content but the time they reach GCSE, however to a different level.

**Summary 1**

Stretch and challenge through planning:

1. What subject content do you want them to learn?
2. What are you asking pupils to do – skills wise?
3. How will you assess these skills and encourage them to assess themselves?
Classroom Practice

What is all this stretching lark about?

Vygotsky

“What a child do can in cooperation today, he can do alone tomorrow”

**The Zone of Proximal Development.**
The most learning occurs for a child when they are asked to do something *just* outside of what they can do.

“I have come that you may have life and have it to the full” – John 10 v 10
"I know I am being stretched by teachers that think, *what I think*, matters"

<table>
<thead>
<tr>
<th>The gadfly:</th>
<th>The stingray:</th>
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<tr>
<td>&quot;What do you mean by that?&quot;; &quot;But, what if...?&quot;; &quot;What evidence do you have?&quot;; &quot;Does that always apply?&quot;; &quot;How can you be certain that is true?&quot;.</td>
<td>&quot;Imagine if X was not the case, what then?&quot;; &quot;What if everything you’ve said was turned on its head?&quot;; &quot;What if a great change happened?&quot;.</td>
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<th>The midwife:</th>
<th>The ignoramus:</th>
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<td>&quot;That’s an interesting idea; could you explain it a bit more?&quot;; &quot;How might that affect things?&quot;; &quot;What made you think of that idea?&quot;.</td>
<td>&quot;What does that mean?&quot;; &quot;I don’t understand – can you start from the beginning?&quot;; &quot;So, do you mean that...?&quot;.</td>
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Have a go at being a Stingray...
Four Levels of learning

Dr Robert Fisher:
“We know that able children do best in classrooms where the work is intellectually challenging (‘Work that makes your brain hurt,’ as Jody aged six put it). Such work will involve the child exercising both cognitive and metacognitive skills.”

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<th>Rote</th>
<th>Literal</th>
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<tbody>
<tr>
<td>Repeats, copies</td>
<td>Reads, re tells, applies known procedures, communicates what is known</td>
</tr>
<tr>
<td>Analytical</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Classifies, solves problems, reasons, questions, transforms, summarises</td>
<td>Applies principles, understands key concepts, evaluates abstract ideas, forms new hypotheses</td>
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Summary 2
Stretching the most able in the classroom

Zone of Proximal development
- Asking student to do something just outside of what they can already do
Socratic Questioning
- draw out assumptions, misconceptions and errors in students own thinking
Four Levels of learning
- finding questions that shift the learner into the realms of analysis and concepts
Tweaks and Marginal Gains

Teaching Tweak:

Starting all science experiments off with a prediction discussion.

Marginal learning gain:

By allowing pupils to conceptualise their ideas before a practical they will eventually learn to apply their learning in new contexts more easily.

Reflections and Questions

Feedback