upd8 WIKID

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Our 11-14 course has been designed from first principles to:

- Make **all** science relevant and contemporary.
- Produce students confident with **How Science Works** skills.
- Raise students' achievement and understanding.
- Fit the National Strategy Framework (we waited until it was fixed).
- Adapt to national assessment arrangements when published.

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Contents

*I can't imagine teaching without **upd8** now, and I am a veteran of 26 years at the chalk face!*

Kay Gray, Hayward School

Planning pack *A curriculum with clear goals*

What do you really want students to understand and do? Our learning goals are the '**Big Scientific Ideas**'. These are the concepts **and** skills from the National Curriculum and Strategy Framework, and consistent with the Standards of many other countries.

> And here's the result of our 'backwards design' – an 11-14 science programme for understanding and motivation. Years 7 and 8 introduce all the Big Ideas. Some are in constant use across the units, while others are further developed in Year 9.

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wikid was designed by teachers and educators working 'backwards' from the curriculum **goals**.
First we grouped the Big Ideas into coherent theme-based topics that last approximately 6 weeks. By having fewer units we give students more time to master skills and concepts.
The topics are arranged for progression.
We decided what the outcomes would look like (assessment) and produced a learning programme (activities) to deliver those goals.

Wikid year 7 (11-12 year olds)

Year 7	Forensics	Cook!	Extinction	Electromancer	A & E	Alien
Student role and mission	A trainee forensic scientist, learning techniques for solving cases	Become trainees to famous chefs Gordo and Jimella searching for perfect recipes	A trainee reporter for Planet TV, alerting audiences to the plight of endangered species	A Muggle magician mastering invisible forces	A nurse treating emergency patients and babies	A planet hunter looking for evidence of extra-terrestrials
Big Ideas	Particle model Patterns in reactions Risk Working with evidence	Chemical reactions Energy transfer Scientific models	Changing atmosphere Behaviour Variation Adaptation Communication/ collaboration	Electricity Magnetism Energy Planning an investigation	Cells Reproduction Implications of science Multicultural science	Solar system Universe Forces Collecting/ presenting evidence
Framework (HSW)	1.2ei and 1.2eii 1.2fi and 1.2fii	1.1a1i, 1.1a1ii	1.1ci, 1.1cii,1.1a2i	1.2a,	1.1bi,1.1bii	1.2d1,1.2dii, 1.1a2ii
QCA APP (draft)	AF 4,5	AF 1	AF 3	AF 4	AF 2	AF 5
Framework (Content)	3.1, 3.3,	3.1, 3,2, 4.1	2.2 , 2,3 5.1	4.1	2.1	4.2, 5.3
1999 KS3 SoW	7e, 7g, 7h	7f, 7g, 7h	7c,7d, 8d	7i, 7j, 8j	7a, 7b, 8c	7i,7k,9j
Personal, learning, thinking skills	Self managers	Creative thinkers	Team workers/ Reflective learners	Independent enquirers	Effective participators	Independent enquirers/Reflective learners

Wikid year 8 (12-13 year olds)

Year 8	Design a home	Species at war	Studio magic	Pyrotechnics	Catastrophe	Live & kicking
Student role and mission	An energy entrepreneur designing carbon zero houses	An ecologist in a national park, modelling and managing the ecosystem	An fx expert, making sound recordings and light shows	A chemist designing a fireworks display	A geologist, trying to save people from volcanic eruptions	Making better lifestyle choices for yourself
Big Ideas	Energy (I, II) Decision making	Food webs Biodiversity Scientific argument	Waves (energy) Scientific explanations Multicultural science	Elements Patterns in reactions Risk Planning an investigation	Changing Earth (I, II) Collaboration	Cells Causes of behaviour Working with evidence Variables
Framework (HSW)	1.1bi,1.1b11	1.1a3i	1.1a3ii, 1.1bii	!.2c, 1.2a	1.a2i,1.1c1, 1.1cii	1.2ei,1.2eii,1.2fi, 1.2fii, 1.2b
Framework (Content)	4.1	2.2, 5.1	4.1 (waves)	3.1, 3.2, 3.3	5.2	2.1
QCA APP (draft)	AF 2	AF 4	AF 1	AF 4	AF 3	AF 5
1999 KS3 SoW	7i, 8i	8d	8k, 8l	8e, 8f	8g, 8h	8a, 8b, 8c, 9b
Personal, learning, thinking skills	Independent enquirers/Team workers	Independent enquirers	Independent enquirers	Effective participators/ Self managers	Effective participators	Creative thinkers

Wikid year 9 (13-14 year olds)

Year 9	Adolescence	Car 2.0	Adventure sport	Ultimate challenge
Students' role and mission	An experimental psychologist trying to learn what makes us tick	Engineer designing the ecocar you'll drive in 2013	A sports scientist and a game designer applying physics	(bringing it all together) Face extreme situations with science
Big Ideas Main	Causes of behaviour Limitations of science	Patterns in reactions Using models Decision making	Forces Planning an investigation Variables	
Big Ideas to recap in this Unit	Cells Variation Scientific argument Working with evidence	Chemical reactions Changing atmosphere	Energy Electric current Science explanations Collecting/presenting evidence	All
Framework (HSW) Main big ideas only	1.1bii	1.1a1i ,1.1a1ii1.1bii	1.2a,!.2b	1.1a2i,1.1a2ii
Framework (Content) Main big ideas only	2.1, 2.3	3.2, 3.3, 5.1	4.1, 4.2	2.2, 5.3
APP (draft) Main big ideas only	AF 3	AF 1, AF 2	AF 4, AF 5	AF 2, AF 3
1999 KS3 SoW	9a, 9b, 7b	9e, 9f, 9g	9i, 9j, 9k, 9l	9c, 9d, 9h
Personal, learning, thinking skills	Effective Participators	Creative thinkers	Independent enquirers	Self managers

How Science Works *at the heart*

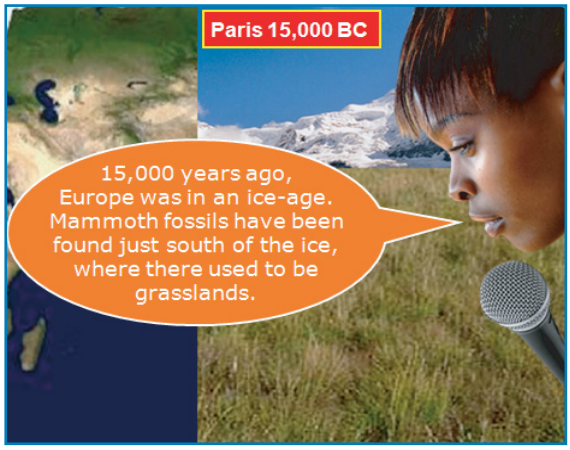
Upd8 wikid *is a solution for HSW. Our approach is: teach, apply and progress.*

Teach: The **Forensics** unit focusses on '**Working with evidence**'. One week of lessons explicitly teaches about reliability through a plot about 'Cold Cases'.

Apply: The rest of Forensics gives lots of opportunity for students to practice 'Working with evidence'.

Progress: It's such an important idea in science that the year 8 unit 'Live and Kicking' takes students further forward, and then it's revisited again in year 9 'Adolescence'.

How Science Works infuses the whole approach to **wikid** units: even the characters in the story model it! 'Working with evidence' is consolidated in Extinction, where students use evidence from real scientists to deduce what made mammoths go extinct.



Themes and missions make science meaningful

- What's the point of learning this science? That's the question we asked ourselves while designing each unit. Which is why the science ideas are all embedded in human contexts that show who uses them or who discovered them. So in **Forensics** students master particles while learning practical techniques to solve cases. In **Cook!**, they learn about 'energy transfer' as an apprentice chef, making tastier food. Science gets it licked!
- What message are we communicating about science? **That it's a great subject to continue with**.

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We constructed our units around themes so students see purpose in their learning and experience it more as an adventure story than 'difficult' or 'dull' science. A **narrative** makes ideas easier to remember, more accessible and more interesting. It motivates students to tackle more complex ideas.

Ask the **questions** *before answering*

Science is often back-to-front '*answering questions before students have ever asked them*'.

Research suggests that students who experience 'inquiry' based approaches are more motivated in science.

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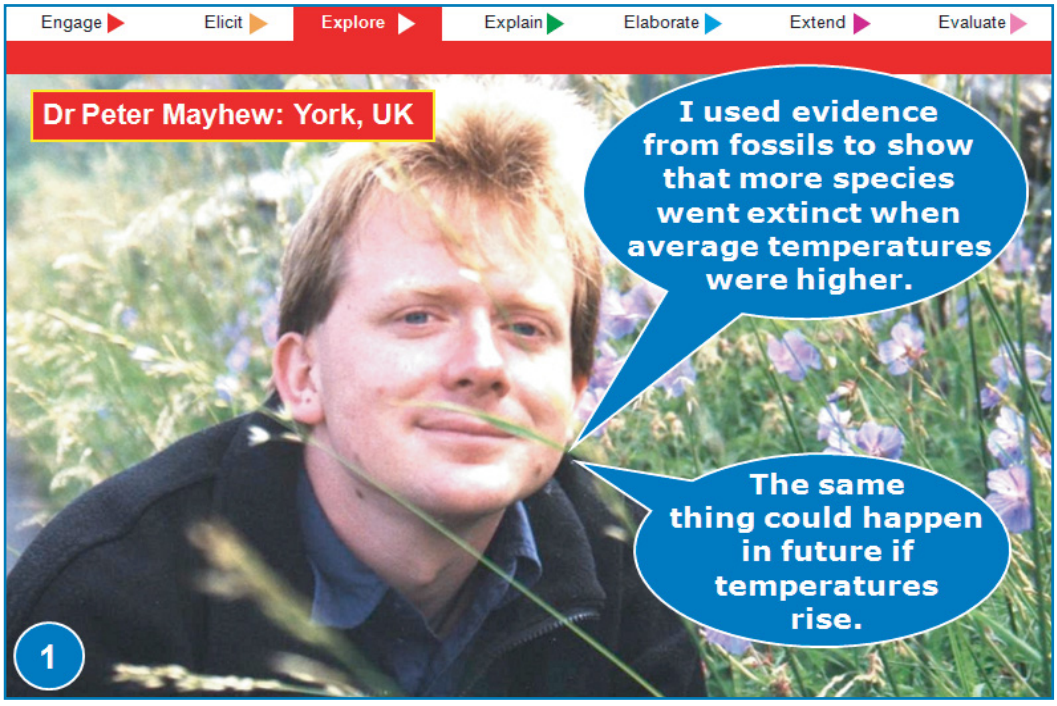
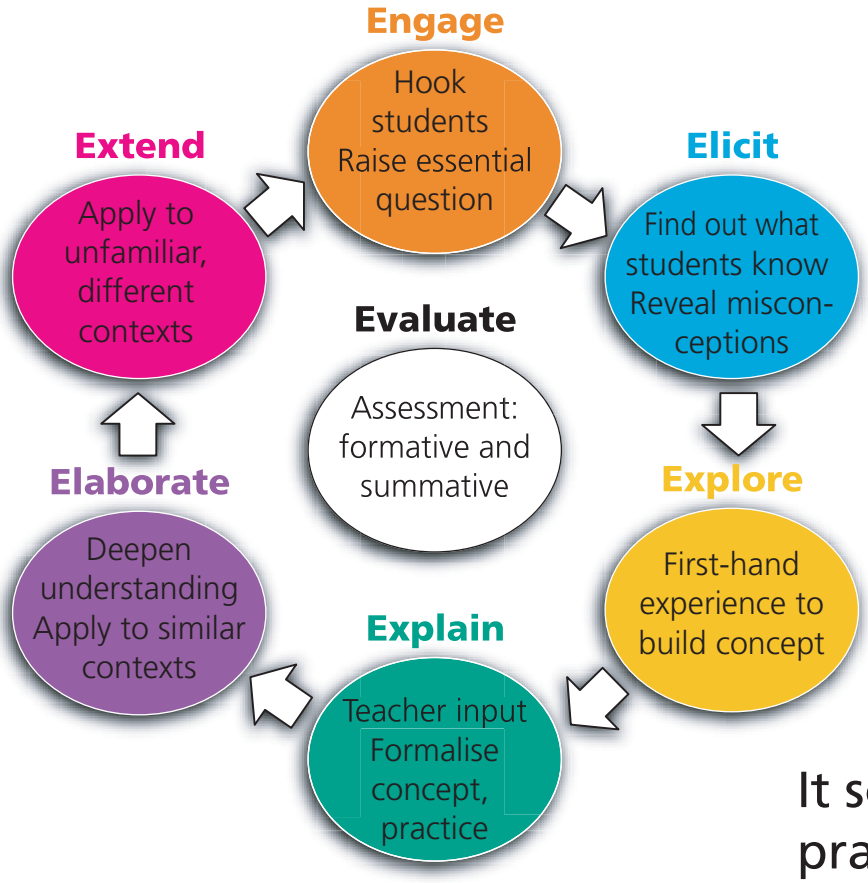
In **upd8 wikid**, the teaching sequences promote a spirit of **inquiry** by using 'essential questions'. These are short, provocative questions that automatically lead students to uncover the Big Ideas. Sharing learning objectives using essential questions can be more powerful than displaying lists of outcomes. It helps students to take ownership of their learning.

In the **Forensics unit**, the question that frames the sequence on Evaluating evidence is 'What do you need to prove guilt?'. And while students investigate extinction, to learn about the changing atmosphere, the science question they are really answering is: 'Climate change: too much too quickly?'



Teaching *and* **learning** *pack*

Activities organised into easy-to-use learning cycles



New assessment arrangements and 14-16 courses demand understanding and skills not 'shopping lists' of facts.
Like **upd8**, we obviously have a wide variety of active learning activities. What makes **wikid** different is that it gives you the resources to teach a topic from start to finish. You get coherent learning plans that maximise skill development and understanding. They are based around '7E's learning cycles to make them easy to use.

It sounds new, but in practice what it means is:

- Hands-on experience (Explore) comes before teacher instruction (Explain)
- More opportunities to apply ideas/skills, in similar contexts (Elaborate) and across different contexts (Extend).

Otherwise, it's just a series of stages which model the best teaching. Of course, it comes complete with high quality PowerPoint and pdf teaching materials, student sheets and technicians' notes.

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Much science teaching is done by what's called 'direct instruction'. It works for some purposes, but it doesn't give students a lasting understanding they can apply in the future. Here, a **constructivist** approach works better. Students actively build ideas through experience and reflection. The 7E's learning framework makes this teaching style easy to implement.

Assessment *pack*

upd8 wikid has been designed to match the Strategy Framework, and fit QCA's draft 'Assessing Pupil Progress' scheme. It's online and it evolves, so it will adapt as national assessment changes between now and 2011.

Formative assessment

How do you uncover what students know, and build a bridge to what you want them to know? The 7E learning cycle offers built-in formative assessment throughout:

- **'Elicit'** tasks probe what students already know. For instance, in 'Mammoths Extinct', students – as TV reporters – are challenged to communicate 'what's in the air', so any misconceptions they may hold can be revealed and addressed.
- **'Evaluate'** tasks check students' understanding of new ideas. Many give performance descriptors related to National Curriculum levels. The PowerPoint and pdf presentations are also full of 'assessment for learning' type questions.

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We make tasks arise naturally from the context, so that students perceive them as **challenges** to overcome. That makes them think more deeply, gives them a greater sense of achievement, and engages them in higher order thinking.

Summative assessment

How do you know if students really understand the Big Ideas? You need evidence from a variety of assessment tasks.

We all use topic tests, but they only provide part of the evidence you need. **upd8 wikid** provides teachers with end of unit 'performance tasks' that are set in authentic contexts and often involve producing a product, like a presentation.

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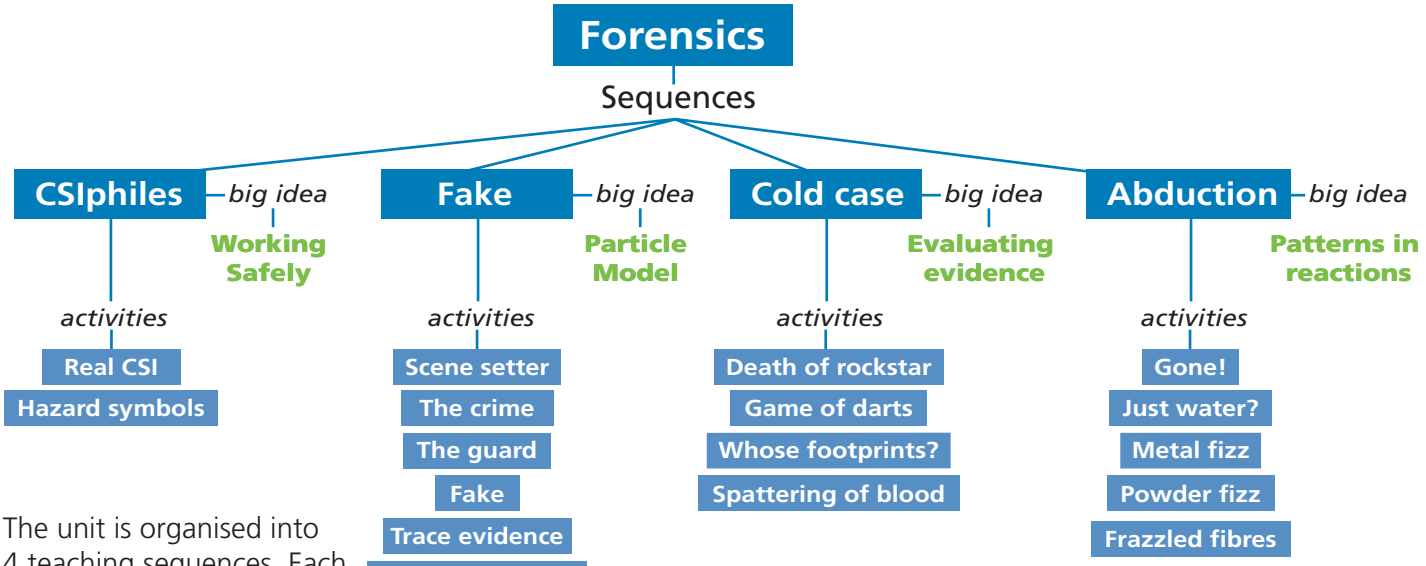
The best test of understanding is what students can do with it in a real situation or **know-how**. We use performance tasks set in authentic contexts – what students or scientists might do outside the classroom. These performances bring together concepts, facts and a whole range of scientific, personal and learning skills.

In '**Mammoths extinct**' students learn about the effect of changing climate on species. Their performance task is to decide where to build a 'Pleistocene park' for cloned mammoths. The idea is it can only be accomplished if students understand the idea. The task comes complete with performance descriptors, for effective assessment.



The unit is organised into 4 teaching sequences. Each teaches one Big Idea, in the context of a different plot.

Here's an extract from the teacher's guide for '**Fake**', which clearly sets out the learning objectives.

Big Scientific Idea

The particle model provides explanations for the different physical properties and behaviour of matter (Strategy Framework 3.1)

Concepts

What we want students to understand

- If we imagine substances are made up of tiny particles, then we can explain what happens in physical changes, including dissolving and changes of state.
- Pure substances can be identified by their physical properties, including melting and boiling points and solubility.
- Particles in liquids and gases can move because their particles are not joined together.
- We can separate a mixture of different substances because their particles are not joined together.
- (Building on previous understanding) solids and liquids can be separated, and can be changed physically.

Questions

What students will inquire into

- Why do particles matter to forensic scientists?
- What tests help forensic scientists solve crimes?
- Is forensic evidence enough to prove guilt? (whole unit)
- Do all substances have different physical properties?

Facts

What students need to remember

- Pure substances change state at known temperatures.
- The amount of a pure substance that dissolves in a certain amount of water is its solubility.
- Impurities affect the physical properties of a substance, including the temperature at which it changes state.
- Solids, liquids and gases are made up of tiny particles.
- When a substance changes state, the arrangement and movement of its particles change.
- The particles of the substances in a mixture are not joined together.

Skills

What students need to know how to do

- Use boiling point and melting point data to identify pure substances.
- Compare solubility using a semi-quantitative scale.
- Plan a suitable method to compare solubility.
- Knowledge of the criteria for doing a fair test.
- Make and record observations of physical properties.
- Use the separation techniques of chromatography and distillation and filtration.

Teaching 'the Crime' activity

Each individual activity in the '**Fake**' sequence comes with its own Teachers guide which is the basis of a **lesson plan**. Using the framework of the 7E learning cycle, it takes you through the running order, linking to the supplied resources. Here is an extract:

Stage/summary	Time	Running notes	Opportunities
Explore Let students try one technique. We need something coloured moving through the air.	25	Present using **Forensics Fake 1.ppt** **Practical activity:** See risk assessment notes in **technician's guide.doc** Students work in pairs. They are given a small piece of laminated white card which they must make a fingerprint onto. They then use brushes and charcoal powder to gently brush on the powder to show up the prints. *Discuss with students how good this technique is. Show them slide 5* ... (continues)	Practical
Explain What's special about iodine? Particle model	10	Students should find that only iodine works. Show slide 6 on how the iodine can be used to show up the fingerprints on the frame. Slide 7 poses the question: Why does iodine work? Slide 8 – Introduces the idea of particles ... (continues)	
Elaborate Apply to a related context: sublimation	10	Demonstrate the technique. Use a piece of filter paper and ask members of the class to put fingerprints all over it. Put this in a large beaker which contains iodine ... (continues)	Demo

Assessing students' understanding

'The crime' activity comes with a homework task, which gives performance outcomes, related to National Curriculum levels. Below is an extract:

The forensic scientist Dr Sherl challenges students to explain why they needed the idea of particles to find the fingerprints.

Level 4:

Describe what the arrangement and movement of particles in solid iodine looks like. Describe the arrangement and movement of particles in iodine gas (you can do this with diagrams).

Level 5:

As Level 4 plus:
Explain why a lump of solid iodine did not show up the fingerprints, but why iodine moved to, and then stuck onto, the fingerprints when it was heated.
Science words to use: Solid, gas, particles, sublimation.

Level 6:

As Level 5 plus: Use the ideas of particles and energy to explain why the solid iodine changed when it was heated.

They absolutely love the idea of the topic and the practicals. Science is the best subject ever since we did the fingerprints! They're desperate for the next lesson.

Sarah Woods, trialling Forensics

Publication *details*

The first **upd8 wikid** units are about to be published. Why only now? Because we began development once the Strategy Framework was clear, in late 2007. **Wikid** is now being rolled out gradually so we can incorporate assessment changes. We have a top notch development team, including the **upd8** editors and writers, and (for the first units) 11 partner schools. We use the technology of a 'wiki' website to build better plans and activities through wide collaboration. Trialling is a vital part of our process to ensure the materials are of the highest quality, and 150+ schools have trialled already.

What you'll get when you subscribe

The publishing timetable for the units is shown below. To enable you to start teaching **upd8 wikid** in September 2008, the first 6 week unit – Forensics – will be published at the beginning of July. The next two units (currently in trialling and revision), will be published in August. The final three year 7 units will be published in December.

Units	Publication date
First Y7 unit: Forensics	**Early July**
Extinction, Cook (after trialling)	Late August, 2008
Remaining Y7 units Final version after trials	19th December, 2008
First 3 units Y8 (after trialling)	May – June, 2009

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A teacher on the TES staffroom forum

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