urban science
Session objectives

• To understand the key science and sustainability concepts behind the Urban Science project.
• To explore our range of teaching and learning resources devised for delivering GCSE science topics.
• To understand the rational behind these strategies for delivering Urban Science topics in the GCSE science classroom.
• To allow science teachers to have an input into the further development of the Urban Science learning modules.

A-Z chart - Make a start 😊
THE FIRST INK MADE FROM AIRPollUTION.
Urban Science asks what role can science play in creating healthy and sustainable cities...
Resulting in...

Learning modules for science and sustainability at KS3 and KS4 which:

- Deliver working scientifically & required practicals
- Develops practical science competences
- Provides a real-world context
- Integrates with Programmes of Study
- Raises standards and attainment
Grow Wild
Students investigate issues surrounding biodiversity and pollinators of food crops and relate how we can work scientifically.

A curriculum linked learning module for students aged 13-15 to develop competencies in working scientifically.

Learning challenge: Can we grow our own food?

Traditionally diet our food with the food we produce outside cities and towns. However, this is not always easy, and students will be required to find out more information on how to grow their own food. For example:

What seeds will produce flowers?
What pollinators will visit the flowers?

In the Shade

Students investigate the characteristics of UV Light, and explore how their knowledge can be used to create a safer environment for humans.

A curriculum linked learning module for students aged 13-15 to develop competencies in working scientifically.

Learning challenge: In the Shade

To tan or not to tan? When you expose your skin to sunlight, your skin will either burn or blister, and UV radiation carries enough energy to break chemical bonds in your skin tissue and with prolonged exposure, your skin may wrinkle or skin cancer may appear.

How can we recognise the harmful effects of solar radiation and take preventative measures to reduce the risks associated with exposure to sunlight?

The learning module can be used flexibly within the curriculum to support key knowledge about physics and develop working scientifically competencies. The learning links with the Sustainable Development Goals and provides a broader context for student learning. It is suitable for adapting as a STEM activity or Eco Club.

www.urbanscience.eu
Teacher Comments and Feedback

- Lots of ways to link to the curriculum
- Building of curriculum content
- Enquiring minds approach
- IBSE and sustainability competences
- Contextualised resources
- Really addresses misconceptions
- Seeing the link between this and KS2 topics
- Engaging activities which encourages independent questions
Our Inquiry Model – Rationale and impact

• This is based on the ‘Enquiring Minds’ 4 stage model’
  https://www.tes.com/teaching-resource/enquiring-minds-6034149

• In the Urban Science EU project such projects are referred to as ‘Inquiry’ or
  Inquiry Based science Education (IBSE) by our partners.

• It means moving from a transmission pedagogy to an inquiry pedagogy

• In a transmission pedagogy the teacher has most of the knowledge and
  transmits it to students

• In an inquiry pedagogy students are assumed to have some knowledge
  already, which can be built upon with the support of teachers
Our Inquiry Model – Rationale and impact

• Teachers can assess students’ current levels of understanding and suggest the next steps only when students have the opportunity to write and talk at length about their understanding of a scientific idea or concept. Activities that merely ask students to insert a word into a gap in a pre-prepared paragraph (where the words are usually listed on the worksheet) require hardly any thinking about science. **Maintaining Curiosity Ofsted 2013**

• .....aims for learners to be able to think critically, analyse alternatives, negotiate decisions and feel empowered to take responsibility. This requires openness to any idea learners will come up with, including consideration of the basis and evidence to build on ideas and action. **Energy Education feature SSR September 2014.**
Our Inquiry Model – Rationale and impact

• .....need to teach the RP with reference to working scientifically and the scientific content related to it GCSE Summer 2108 Examiner reports

• ‘The ability to read about science with healthy scepticism is a key element of scientific literacy. moreover it is a pre-requisite of citizenship and playing a part in democracy’ Wellington J, Osbourne J, 2001
Our Inquiry Model – Rationale and impact

Urban Science Learning modules (via an IBSE approach) could decrease ‘cognitive overload’

See Bob Pritchard’s blog posts
https://occasionalwitterings.com/

Types Of Cognitive Load

Extraneous + Intrinsic + Germaine

Tasks that do not contribute to learning + Due to the intrinsic nature/complexity of what is being learned + Learning load produced by the construction of schemes

= Total Cognitive Load
Our Inquiry Model – Rationale and impact

Science Capital

......itself is a measure of your engagement or relationship with science, how much you value it and whether you feel it is ‘for you’ and connected to your life. It highlights the significance of what you know about science, how you think about it, what (science related activities) you do and who you know in shaping attitudes and feelings about STEM.

Links

- [https://transformingpractice.sciencemuseum.org.uk/what-is-science-capital/](https://transformingpractice.sciencemuseum.org.uk/what-is-science-capital/)
The Urban Science Learning Modules

Stage 1

.....eliciting the knowledge, interests, ideas and motivation of pupils; discovering what they already know about the topic and why it matters (or not) to them. The teacher’s role is to help pupils draw on their own lives and experiences to discover things that interest them, make them excited, curious and want to ask questions.

Tools

A-Z
Mantle of the expert
5 whys
Messy wall

Beauchamp College CREST award project
The Urban Science Learning Modules

Stage 2

• shaping, defining and focusing an idea or question, and making plans to research it further; pupils dig deeper into the topic, identifying an area of interest and meaning for them. The teacher’s role is ensuring pupils can advance their inquiries meaningfully; providing frameworks and learning so that pupils can organise their research.

Tools

• Diamond 9
• Filter for focus
• SWOT analysis
• Thinking Hats
• Practical trials
The Urban Science Learning Modules

Stage 3

......pupil’s research, design and construct in order to make a contribution in their chosen enquiry, during which pupils engage in a variety of tasks depending on the nature of their enquiry; this is an opportunity to set their GCSE ‘required practical’ assessments into a real-life context. For example after investigating the variety of plant species found in their school grounds they can further research the effect of climatic changes on plant phenology. The teachers encourage pupils to manage their time, identify clear goals and monitor their progress.

Tools

• Survey
• Required practical
• Video
• Podcast
The Urban Science Learning Modules

Stage 4
• pupils communicate, share and present their new knowledge and understanding with others. It is a central theme of Urban Science that they share their work with their peers within their own and at other schools

Tools
• Forum Theatre
• School radio programme
• Science fair
Activity 2

In this activity we would like your feedback on our resources with the following key question in mind:

• How can these activities fit into your current mainstream GCSE lessons?
• Primary colleagues – how can you adapt them to fit into your Schemes of Work?

Think about

• How each theme connects to wider issues of urban sustainability.
PMI

Positive
In this step, simply enumerate all of the positive things you can think of. Don’t be critical, simply spill out all the positive points that you can think of.

Minus
In this step, enumerate all of the negative things you can think of. Again, don’t be critical simply spill out all the negative points you can think of.

Interesting
In this step, enumerate all the interesting points that you can think of. Rather than positive or negative, they are simply points of interest that you should direct your attention to.

Urban Science Resources
- Introductory module iChange
- US learning module - Grow wild
- US learning module – In the Shade
- Learning framework
Plenary

Using the ‘Plenary Pyramid’ list
• ‘A question I would like to ask’ (1)
• ‘What I am unsure about’(2)
• ‘What I have learnt’ (3)
Share with the rest of the group

Add to your ‘A-Z card’ knowledge about ‘Urban Science’ that you have learned during this session

Resources
A-Z card
Plenary Pyramid
www.urbanscience.eu

Engaging science, creating sustainable cities

Schemes of Work for science and sustainability at KS3 and KS4 which:

- Deliver working scientifically & required practicals
- Develops practical science competences
- Provides a real-world context
- Integrates with Programmes of Study
- Raises standards and attainment

We are currently developing Schemes of Work which are being trialled in schools now. You can join us!

Project News

- TEDEd lesson
- ASE Conference
- Third Partner Meeting
- New Enquiry Science Framework
- Second Partner Meeting
- Research Published
- Grants for STEM activities
- Kick-off Meeting
- Teacher Training 10th Dec 2019
- Urban Science modules launched

Modules freely available on the website