Your Scientific Health Investigation
Curriculum Links

Safety issues
Teachers and students should carry out their own risk assessments for the planned investigations, in line with their department policy

KS3 Science Programme of Study (DfE National Curriculum PoS)	KS4 GCSE Science Programme of Study (DfE National Curriculum PoS)
Scientific attitudes • pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility • understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review • evaluate risks **Experimental skills and investigations** • ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience • make predictions using scientific knowledge and understanding • select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent and control variables • use appropriate techniques, apparatus and materials during fieldwork and laboratory work, paying attention to health and safety • make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements • apply sampling techniques **Analysis and evaluation** • apply mathematical concepts and calculate results • present observations and data using appropriate methods, including tables and graphs • interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions • present reasoned explanations, including explaining data in relation to predictions and hypotheses • evaluate data, showing awareness of potential sources of random and systematic error • identify further questions arrising from their results **Measurement** • understand and use SI units • use and derive simple equations and carry out appropriate calculations • undertake basic data analysis including simple statistical techniques	**Development of Scientific thinking** • the ways in which methods and theories develop over time • using a variety of concepts and models to develop scientific explanations and understanding • appreciating the power and limitations of science and considering ethical issues which may arise • explaining every day and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments • evaluating risks both in practical science and the wider societal context, including perception of risk • recognising the importance of peer review of results and of communication of results to a wide range of audiences **Experimental skills and strategies** • use scientific theories and explanations to develop hypotheses • plan experiments to make observations, test hypotheses or explore phenomena • apply knowledge of a range of techniques, apparatus and materials to select those appropriate to the experiment • carry out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations • recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative of the whole population • make and record observations and measurements using a range of apparatus and methods • evaluate methods and suggest possible improvements and further **Analysis and evaluation** • apply the cycle of collecting, presenting and analysing data including; • present observations and data using appropriate methods • translating data from one form to another • carrying out and representing mathematical and statistical analysis

Curriculum Links

KS4 GCSE Science Programme of Study (DfE National Curriculum PoS) continued.....

- representing distributions of results and estimations of uncertainty
- interpret observations and data including identifying patterns and trends, make inferences and draw conclusions
- present reasoned explanations including relating data to hypotheses
- being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error
- communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations

Vocabulary, units, symbols and nomenclature

- developing their use of scientific vocabulary and nomenclature
- recognising the importance of scientific quantities and understanding how they are determined
- use SI units
- use prefixes and powers of ten for orders of magnitude (e.g. kilo, centi, milli, micro, nano)
- interconverting units
- using appropriate number of significant figures in calculations

KS3 Biology subject content (DfE National Curriculum PoS)	KS4 Biology subject content (DfE National Curriculum PoS)
Nutrition and digestion • the consequences of imbalance in the diet, including obesity, stravation and deficiency diseases **Gas exchange systems** • the impact of exercise, asthma and smoking on the human gas exchange system	**Health, disease and the development of medicines** • the relationship between health and disease • non-communicable diseases • the impact of lifestyle on the incidence of non-communicable diseases

PSHE
DfE National Curriculum PoS)

Physical health and fitness

- the risks associated with an inactive lifestyle (including obesity)
- the positive associations between physical activity and promotion of mental wellbeing, including as an approach to combat stress
- the characteristics and evidence of what constitutes a healthy lifestyle, maintaining a healthy weight, including the links between an inactive lifestyle and ill-health, including cancer and cardio-vascular ill-health

Behaviour Change Theory links

BCT 1.1 Goal setting (behaviour)
BCT 1.2 Problem solving
BCT 1.3 Goal setting (outcome)
BCT 1.4 Action planning
BCT 1.5 Review behaviour golas
BCT 1.6 Discrepancy between current behaviour and goals
BCT 1.7 Review outcome goals
BCT 1.8 Behavioural contract
BCT 1.9 Commitment
BCT 2.3 Self-monitoring of behaviour
BCT 2.4 Self-monitoring of outcomes of behaviour
BCT 2.7 Feedback on outcomes of behaviour
BCT 3.1 Social support (unspecified)
BCT 3.2 Social support (practical)
BCT 3.3 Social support (emotional)
BCT 11.2 Reduce negative emotions
BCT 13.1 Identification of self as role model

Planning Your Scientific Health Investigation

Objectives

At the end of this activity students should be able to:

- Formulate their own question to investigate health
- Design and construct a plan for their own scientific health investigation
- Safely carry out their scientific health investigation
- Record reliable, precise and accurate data
- Make a conclusion based on the evidence collected

Hook

Examples of questions previously investigated on lesson PowerPoint.

Activities:

Introduce the activity and share the objectives with the students. Individuals record how confident they are for each of the objectives at the start of the activity.

Starter

Activity 1: What question on health are you going to investigate?

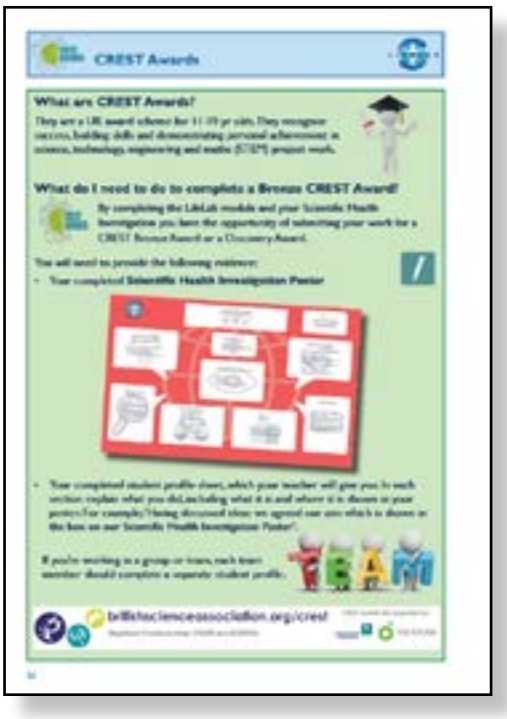
Discuss with students and remind them how the scientists approached their studies in the Southampton Women's Survey and the TeC-19 Study . Then pose the question ***'How could you investigate your health?'***

Be as open as possible and try to encourage them to be imaginative.

- In small groups revisit the question they have decided to investigate on health, checking they have decided how they will make their measurements and what resources they will need. LifeLab is happy to support with resources if possible and given enough planning time.
- Feedback to the whole class from each group, sharing ideas for their investigation. Students should be free to decide their own question. Ideally, each group will answer a different question.
- Class discussion sharing any problems/questions they may have come across and how they have solved them.
- Students discuss how scientists carry out investigations; aim/hypothesis, collecting reliable / accurate / precise data, controlling variables etc. Another chance to re-enforce these keywords in a context in which they have some personal investment. Encourage students to use different types of data for their investigations (i.e. they could data on opinions, habits from peers) not just 'quantitative' data.

Introduce the CREST Bronze Award. Stress that this isn't extra work, it is included in the work they do as part of their investigation.

Planning Your Scientific Health Investigation



Main

Activity 2: Planning our own scientific health investigation

Time: variable, teacher's discretion

Students plan their own investigation and carry out their investigation, collecting and recording data.
Analyse and draw conclusions based on the evidence collected from their investigations.

N.B. if students wanted to do a sport/exercise related investigation this could be done in conjunction with, or as part of, a PE lesson.

Plenary

Students evaluate their findings.
'Do they trust their data? What would they go on to do now? Would they repeat their investigation? Would they change anything?'
Students need to complete the CREST Award checklist included in the teacher's resource pack if they wish to submit their poster for a Bronze award.
Students refer back to the lesson objectives and complete the assessment for learning activity in the orange boxes, feedback and share an interesting fact they have found out from the lesson.

Remind students about using the LifeLab app

Homework

Students decide in their groups which person is responsible for writing each section of their scientific health investigation poster (introduction/method/results/discussion/images etc). They then prepare their section for homework.

Resources

- Your Scientific Health Investigation PowerPoint slides
- Student booklet pages 52-54
- Bronze CREST Award checklist (on teachers memory stick)
- Electronic or hardcopy of poster template

Keywords

- hypothesis
- evidence
- precision
- accuracy
- repeatability

Presenting Health Data

Objectives

At the end of this lesson students should be able to:

- Present their results from their investigation as a scientific health investigation poster
- Evaluate their scientific health investigation posters

Hook

Show examples/photos of some science posters.
Look around your Science Lab.
Can you see any more examples?

Activities:

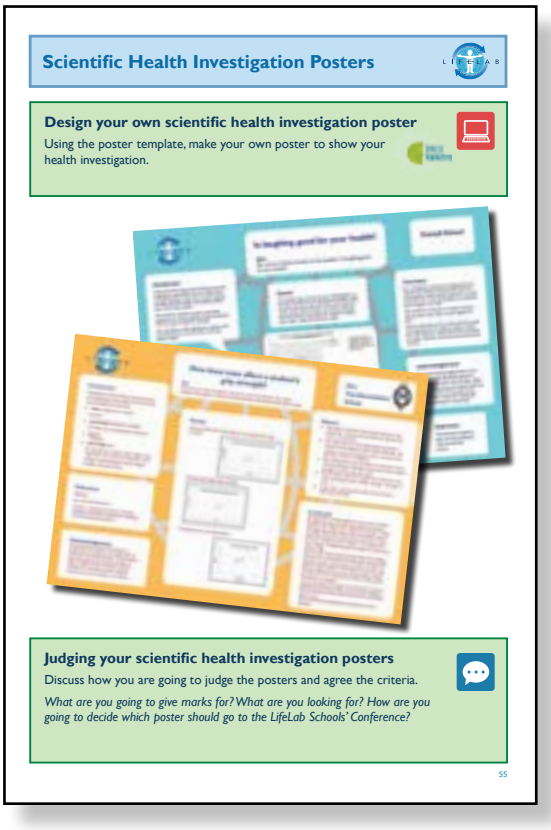
Introduce the lesson and share the objectives with the students. Individuals record how confident they are for each of the objectives at the start of the lesson.

Starter

Science posters vs Scientific investigation posters **Time: 5 minutes**

Discuss what is the difference between a science poster and a science investigation poster.
Brainstorm: ***'What is a science poster? What does it look like? What is its purpose? What is the audience? Why would scientists choose to present their findings like this?'***
Show students some examples of 'scientific investigation posters' - some from scientists and some from LifeLab students who have produced scientific investigation posters.
The idea isn't that the students will be able to understand the scientific investigation posters, but more that they can discuss how the data, graphs, method and findings are presented along with references.

Presenting Health Data



Main

Activity 1: Design your own Scientific Health Investigation Poster

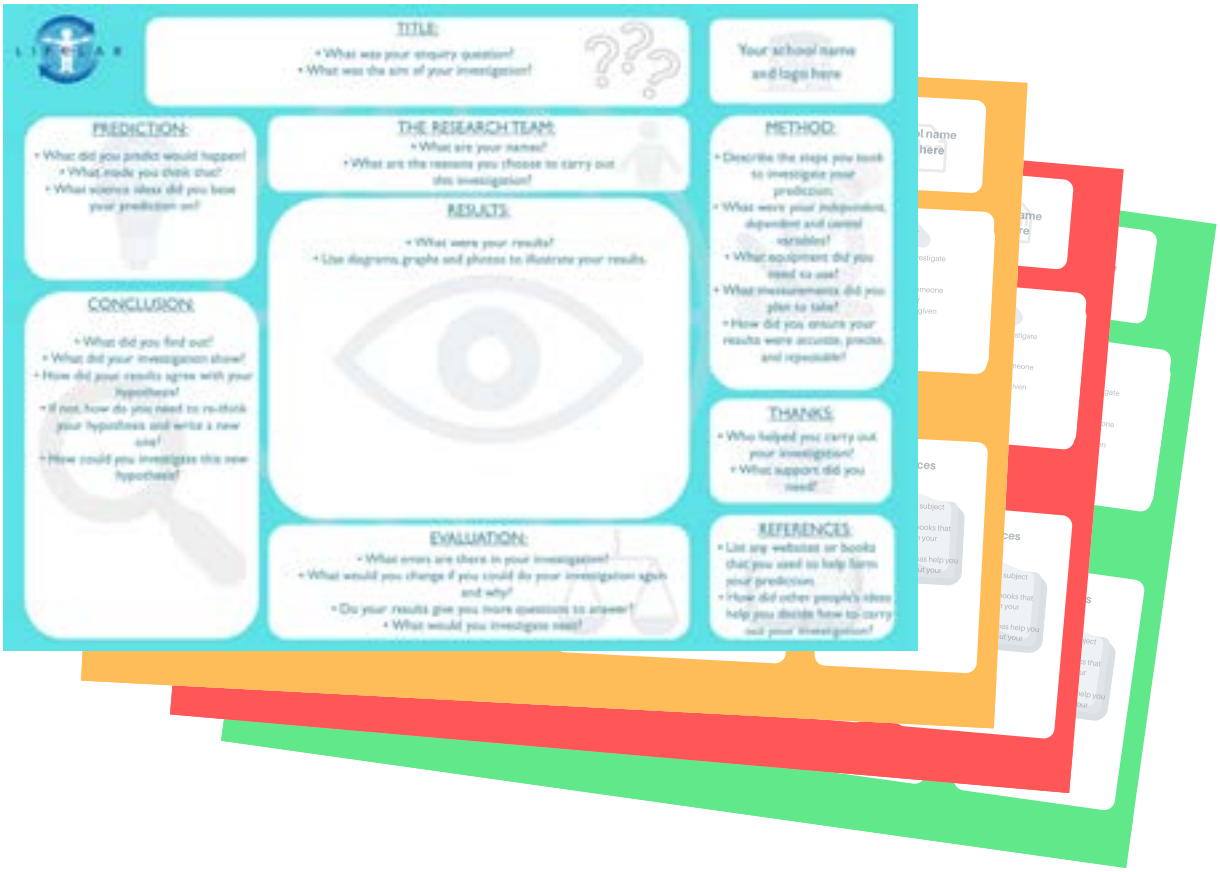
Time: variable, teacher's discretion

Using the poster templates given in PowerPoint or the printed versions, the students, in groups, produce their own scientific investigation poster.
The key points the students need to think about are: audience, presentation of actual data, how to make a poster look interesting (not too much text, more images, but relevant images), authors, addresses, logos, acknowledgements, references, the structure of the poster with aim/hypothesis/method/results/conclusion etc.

Each member of the group could write a different section (possible homework from previous lesson). Perhaps include any images/results of the LifeLab activities if appropriate.

The PowerPoint templates given can be modified in any way the students want eg. Colour/background/layout etc.

NB there is a good opportunity here to link to English and Maths with numeracy and literacy skills being used for data analysis and write up/presentation.



Presenting Health Data

Plenary

Activity 2: Judging your Scientific Health Investigation Posters

Time: variable

Students need to think about a list of points/criteria to consider using when judging the posters. Discuss how the students are going to judge the posters, agree the criteria.
'What are they going to give marks for? What are they looking for? How are they going to decide which poster should go to the LifeLab Schools' Conference/Showcase?'
This could lead into an extension lesson, where the students can have a mini conference and then decide which posters are the "best" and should be presented at the LifeLab schools' conference/showcase.
Students refer back to the lesson objectives and complete the assessment for learning activity in the orange boxes, feedback and share an interesting fact they have found out from the lesson.

N.B. Teachers need to arrange printing of the posters; they are best printed out on A3.
For those selected to submit for a Bronze CREST award you will need to send the teacher's checklist per poster and an electronic copy of the student poster as evidence to LifeLab. LifeLab will invoice you for the CREST certificates that are awarded per student. The three posters sent for the showcase will be paid for by LifeLab.

Remind students about using the LifeLab app


What is a Scientific Health Conference?

Many scientists from the University of Southampton and throughout the United Kingdom are working to understand more about how we can make sure people have a Healthy Start to Life. They work with scientists in universities all around the world who belong to the International Society for **Developmental Origins of Health and Disease, (DOHaD)**.

Every year the DOHaD scientists from across the world meet to talk about what they have been doing. They talk about their work and share ideas, and learn from each other. **Collaboration and team work are important for scientists.**

The University of Southampton Institute of Developmental Sciences, University Hospital Southampton

At a conference, scientists will either give a talk or present a poster. After a talk or a poster presentation there is time for questions from the audience.

The scientists also have a journal where they can send reports about their work. The reports have to be reviewed by other scientists and then approved by the editor before they can be published. Scientists from all around the world read journals to find out about what other scientists are doing.

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Extension

Holding your scientific health conference

Time: variable, teacher's discretion

Watch the video clip from a scientific conference and discuss what goes on at a science conference.
http://m.youtube.com/watch?feature=related&v=Jm1qTR22XPo

Discuss with students what scientists do at scientific health conferences, ***'What is the purpose of holding scientific health conferences? What are the benefits for the scientists?'***
Recap on how the students are going to judge the posters and confirm the criteria.
'What are they going to give marks for? What are they looking for? How are they going to decide which posters should go to the LifeLab Schools' Conference?'

Students organise and hold their own Scientific Health Conference, looking at all the posters and award their marks for each one.

Resources

- Your Scientific Health Investigation PowerPoint slides
- Student booklet pages 55-56
- Examples of scientific health investigation posters
- Computer/IT access for electronic poster template **or** A1 paper copies of poster template (available from LifeLab on request)

Keywords

- conclusion
- evaluation
- audience
- acknowledgements
- reference
- conference