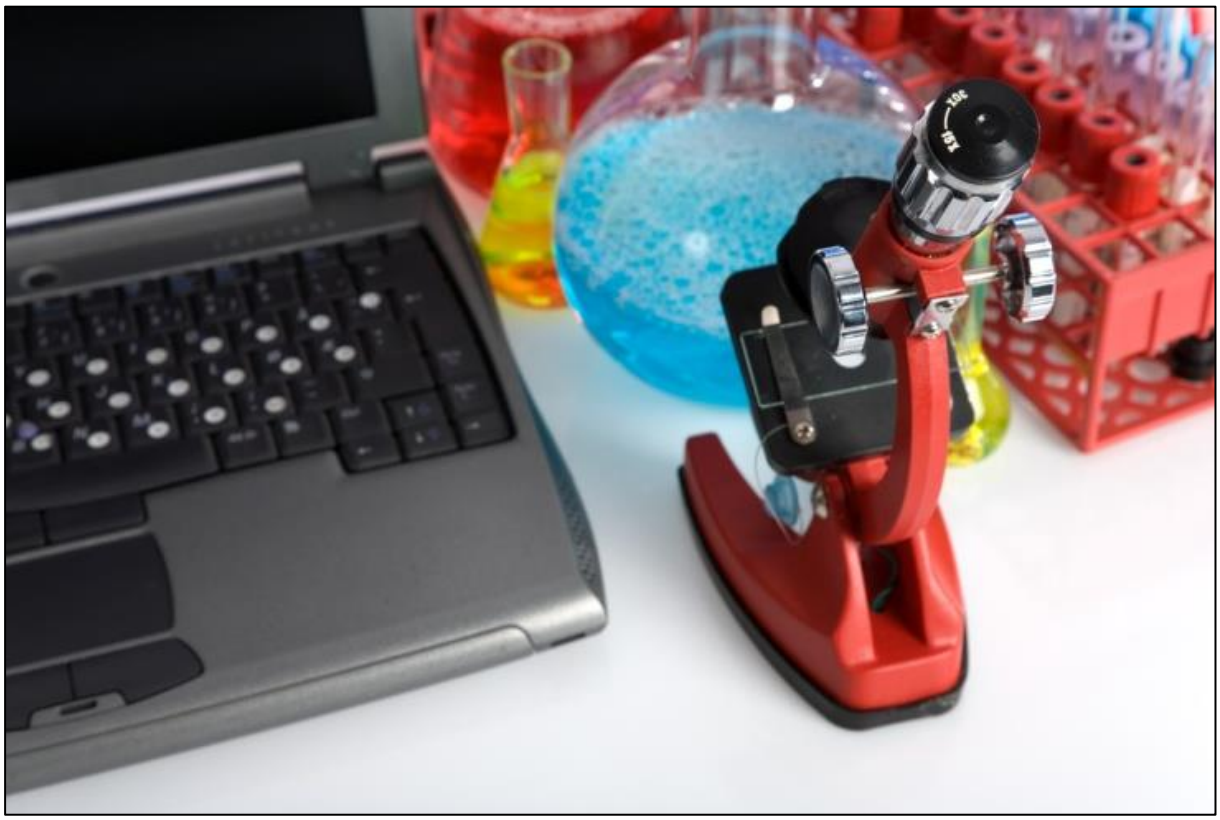
Course Support Notes

National 3 Science Course Support Notes



Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Contents

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the National 3 Science Course. They are intended for teachers and lecturers who are delivering the Course and its Units. They should be read in conjunction with the *Course Specification* and the *Unit Specifications* for the Units in the Course.

General guidance on the Course

Aims

As stated in the *Course Specification*, the aims of the Course are to enable learners to:

- develop basic knowledge and understanding of science
- develop an understanding of science's role in scientific issues and relevant applications of Science in society and the environment
- develop scientific inquiry and investigative skills
- develop scientific analytical thinking skills in a Science context
- develop the use of technology, equipment and materials, safely, in practical scientific activities
- develop problem-solving skills in a scientific context
- use scientific literacy in everyday contexts
- establish the foundation for more advanced learning in Science

Progression into this Course

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- National 2 Science in the Environment Course or relevant component Units

Experiences and outcomes

National Courses have been designed to draw on and build on the curriculum experiences and outcomes as appropriate. Qualifications developed for the Senior Phase of secondary education are benchmarked against SCQF levels. SCQF level 4 and the curriculum level 4 are broadly equivalent in terms of level of demand although qualifications at SCQF level 4 will be more specific to allow for more specialist study of subjects.

Learners who have completed Curriculum for Excellence experiences and outcomes will find these an appropriate basis for doing the Course.

In this Course, learners would benefit from having experience of the following:

Organisers	**Lines of development**	
Planet Earth	Energy sources and sustainability	SCN 04
	Processes of the planet	SCN 05
Health and wellbeing	Substance misuse	SCN 39, SCN 43
Electricity, waves and materials	Electricity	SCN 09,SCN10,
	Vibrations and waves	SCN 11,
Materials	Properties and uses of substances	SCN 16,
	Earth's materials	SCN17

More detail is contained in the Science Progression Framework, which shows the development of the key areas throughout the suite of Courses.

Progression from this Course

This Course or its components may provide progression to:

- National 4 Science Course
- National 3 or National 4 in another science subject
- Skills for Work Courses (SCQF levels 3 or 4)
- National Certificate Group Awards
- National Progression Awards (SCQF levels 3 or 4)
- employment and/or training

Hierarchies

Hierarchy is the term used to describe Courses and Units which form a structured sequence involving two or more SCQF levels.

It is important that any content in a Course and/or Unit at one particular SCQF level is not repeated if a learner progresses to the next level of the hierarchy. The skills and knowledge should be able to be applied to new content and contexts to enrich the learning experience. This is for centres to manage.

- Science Courses from National 3 to National 4 are hierarchical
- Courses from National 3 to National 4 have Units with the same structure and titles

Approaches to learning and teaching

The purpose of this section is to provide you with advice and guidance on learning and teaching for National 3 Science.

Teaching should involve an appropriate range of approaches to develop knowledge, understanding and skills for learning, skills for life and skills for work. This can be integrated into a related sequence of activities, centred on an idea, theme or application of science, based on appropriate contexts. It need not be restricted to the Unit structure. Learning should be experiential, active, challenging and enjoyable, should include appropriate practical experiments/activities, and could be learner-led. The use of a variety of active learning approaches is encouraged, including peer teaching and assessment, individual and group presentations, role-playing and game-based learning with learner-generated questions.

When developing your Science Course there should be opportunities for learners to take responsibility for their learning. Learning and teaching should build on learners' prior knowledge, skills and experiences. The Units and the key areas identified within them may be approached in any appropriate sequence, at the centre's discretion. The distribution of time between the various Units is a matter for professional judgement and is entirely at the discretion of the centre. Each Unit is likely to require an approximately equal time allocation, although this may depend on the learners' prior learning in the different key areas.

Learning and teaching, within a class, can be organised, in a flexible way, to allow a range of learners' needs to be met, at different levels of achievement. The hierarchical nature of the Science Course provides improved continuity between the levels. Centres can therefore organise learning and teaching strategies in ways appropriate for their learners.

Within a class, there may be learners capable of achieving at a higher level in some aspects of the Course. Where possible, they should be given the opportunity to do so. There may also be learners who struggle to achieve in all aspects of the Course, and who may only achieve at the lower level in some areas.

Teachers/lecturers need to consider the *Course Specification* and *Unit Specifications* to identify the differences between Course levels. It may also be useful to refer to the Science Progression Framework.

When delivering this Course to a group of learners working towards different levels, it may be useful for teachers to identify activities which cover common key areas and skills for all learners, as well as additional activities required for some learners. In some aspects of the Course, the difference between levels is defined in terms of a higher level of skill.

An investigatory approach is encouraged in Science with learners actively involved in developing their skills, knowledge and understanding by investigating a range of relevant Science applications and issues. A holistic approach should be adopted to encourage simultaneous development of learners' conceptual understanding and skills.

Where appropriate, investigative work or experiments should allow learners the opportunity to select activities and/or carry out extended study. Investigative and experimental work is part of the scientific method of working and can fulfil a number of educational purposes.

All learning and teaching should offer opportunities for learners to work collaboratively. Practical activities and investigative work can offer opportunities for group work, which should be encouraged.

Group work approaches can be used within Units and across Courses where it is helpful to simulate real life situations, share tasks and promote team working skills. However there must be clear evidence for each learner to show that they have met the required Assessment Standards for the Unit or Course.

Laboratory work should include the use of technology and equipment that reflects current scientific use. Appropriate risk assessment must be undertaken.

Learners would be expected to contribute their own time in addition to programmed learning time.

Effective partnership working can enhance the Science experience. Relevant local contexts should be studied, with visits where this is possible. Guest speakers from industry and Further and Higher Education could be used to bring the world of Science into the classroom.

Information and communications technology (ICT) makes a significant contribution to the Science Course. In addition to the use of computers as a learning tool, computer animations can be used to demonstrate microscopic particles, reactions and processes. Computer interfacing equipment can detect and record small changes in variables, allowing experimental results to be recorded over short or long periods of time. Results can also be displayed in real time, helping to improve understanding. Data-logging equipment, cameras and video cameras can be set up to record data and make observations which can then be downloaded and viewed for analysis.

Assessment should be integral to and improve learning and teaching. The approach should involve learners and provide supportive feedback. Self- and peer-assessment techniques should be encouraged wherever appropriate. Assessment information should be used to set learning targets and next steps.

Suggestions for possible contexts and learning activities to support and enrich learning and teaching are detailed in the table below.

The **key areas** are from the *Unit Specifications*. **Suggested learning activities** are not mandatory. This offers examples of suggested activities from which you could select a range. It is not expected that all will be covered. The contexts for key areas are open to personalisation and choice, so centres are likely to devise their own learning activities. **Exemplification of key areas** is not mandatory. It provides an outline of the level of demand and detail of the key areas.

Risk assessment should always be carried out prior to doing any of the experiments and demonstrations listed.

Fragile Earth	
In this Unit there are opportunities for personalisation and choice. Learners will focus on two from: ♦ energy ♦ metals ♦ water ♦ food They will investigate these resources through activities related to their source, origin, production and/or extraction. Uses and benefits will be explored. Conflicts and possible local or national solutions will be identified. Learners will gain knowledge of how science is involved in environmental issues.	
Fragile Earth — energy	
For one renewable and one non-renewable source, investigate and compare: ♦ source/origin ♦ production ♦ use (as appropriate) ♦ conflicts and benefits Possible solutions: local or national	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
Scenario You live in a small town on the coast. The nearest big city is about 75 miles away. Most people in your	Learners could investigate types of energy (potential, kinetic, chemical, etc) and the differences between them. Experiments using different machines, toys, etc, can be used

town work in agriculture and fishing, but the population is growing and communication with the outside world via internet and telephone is essential. At the moment, electricity is supplied via individual generators in people's homes, which need diesel to be transported to the town by road. The generators are unreliable and break down often. The town also regularly runs out of fuel as the roads are unusable during the rainy season. Some of the wealthier homes have solar panels which provide a backup when the generator breaks down. The town council have decided to provide a central source of energy to bring power to the growing population. You are a member of the town council — what would be your choice of energy for this town? Use the information available and the results from your experiments to help you reach a decision. **Thinking through the problem** The council need to consult the locals as some money will be required to fund the new system. At the first public meeting, a fight breaks out among the residents. Here are some of the things they say: What is energy anyway? What can we do to save more energy? We still need a reliable energy source! How can we generate energy cheaply? Will the cheapest method be safe or environmentally friendly?	to draw energy transfer equations. **Conduction, convection and radiation** Principles and mechanisms for heat transfer are available on the internet with animations and videos to support teaching. Practical activities could include investigating different materials for insulation and/or conduction. For instance: Thermal conduction through glass, steel and copper from a Bunsen burner, measured by the time it takes for a paperclip to fall when attached to each medium with Vaseline. Temperature drop from a polystyrene cup wrapped in different materials. Ways to insulate your home: the Energy Saving Trust is a good source of information for learners. A poster or diagram could be prepared. Learners might choose one area or room in the house to focus on and adapt to conserve heat, or build a model of a house with different insulating materials. Visit a building site for a view of how houses are designed to be energy efficient. Parsel University also has an activity that allows learners to investigate how to heat and insulate a house ('How to Heat My House?') — different activities can be selected to differentiate where necessary. Investigate the production of electricity from one renewable and one non-renewable source, eg wind power and natural gas. See the Energy Quest website for information on each of these sources. **Suggested practical activities** Use wind and water turbines or solar panels (equipment details available from SSERC) to generate power and compare different voltages achievable from the different methods. Try to power different devices using these methods and compare with the reliability of a rechargeable battery.

	Make a battery from a lemon, potato or conventional salt solution using different metal electrodes. Evaluate the practicality of powering a device in this way. Try to heat water using a homemade 'solar cooker' (see Wikipedia) and compare with the use of a Bunsen burner. This could be approached as a PowerPoint (eg a slide for each question) or a group/pair presentation. What is the source of your energy? How is it made into electricity for your home? Which energy sources are the cheapest and why? Is cheapest always best? Why or why not? Demonstrate the production of acidic gases from fossil fuels by burning sulphur in oxygen and using a universal indicator solution to test the gas produced. Sparking air can also be used to show how acidic nitrogen oxides are produced by the spark plug in a conventional internal combustion engine. Chemical weathering of limestone is a good illustrative experiment for emphasising the effects of acid rain. The RSC website — learn chemistry includes a lesson plan for this activity. For a larger class or more extensive activity, the effect of acid rain on a variety of building materials is investigated in an AiFL three-week activity (details also available on the RSC website — learn chemistry). Thinking about power stations and internal combustion engines, learners might consider less harmful ways of producing the energy needed for homes and cars. A list of pros and cons could be compiled and the class could stage a debate and vote on their choice in a mock council meeting.
Fragile Earth — metals	
For two different metals, investigate and compare: ♦ source/origin ♦ production and/or extraction ♦ use (as appropriate) ♦ conflicts and benefits Possible solutions: local or national	

Suggested contexts	Suggested learning activities and exemplification of key areas
Mobile metals of the future Who has got the metal you need? The centre chooses an application that they can research (the mobile phone, computer, solar cell, electric car etc).	**Background knowledge** As a preamble to the context, look at the properties and uses of metals. You may revise some of the practical activities at level 3 (3.15a, 3.17b and 3.19b). Investigate: conductivity (thermal and electrical), density, strength, malleability and ductility of at least two metals. Also, remember that metals are sonorous. Compare their properties with non-metals.
Scenario It is the 22nd century. We are running out of metals for communications and renewable energies. In an independent or post-recession Scotland (or a fictional future scenario of your choice) we need more metals for solar panels, optical cables and computer hard drives. These are rare earth metals. 'Rare earth' is an alternative name for the lanthanides — elements 57 to 71 — plus yttrium and scandium. These elements are integral to modern life, and are used in everything from disc drives, hybrid cars and sunglasses to lasers and military aircraft.	Use an interactive world map to investigate metal abundance, availability and cost. Some internet resources: ♦ Videos on RSC website — learn chemistry will provide an illustrative background to metal properties and uses. ♦ From the TES website you can download various teacher and pupil resources that will teach the properties and uses of metals. ♦ RSC website — learn chemistry will give metal uses in pigments and in colour. This is a practical application of why metals are useful and can be used in the introduction to this topic. You can use the RSC website — learn chemistry to show the 'flame colours — a demonstration'. This is an experiment with flame tests and explains why we see colours in metal pigments and fire works
Can you make a mobile phone, computer hard drive and solar panels out of the metals that can be dug up from your garden?	
Ethical resources Unethical use of children in mining valuable and rare metals used in touch-screen computers. How can you be sure the metals in your mobile phone or computer are ethically sourced?	**Ethical resources** Take a mobile phone to pieces and see which metals are used to make it. Similarly, find out about metals used for iPads and laptops. Lesson plans and class activities about recycling mobile phones, suitable for ages 12–16, can be accessed on the Oxfam website. These tie in with the topic of recycling valuable resources and using them to help others.

Precious metals Thieves steal and resell metals as they become more valuable. Look at where metals are stolen from and the prices they can be sold for. Investigate how they can be protected.	**Precious metals** To give some background to this context, there are some news articles on the Guardian website about thieves stealing metals. Investigate why these metals are being stolen by considering the following questions: ♦ What are they used for? ♦ Why are they so valuable? (The recession is making metal costs rapidly increase.) ♦ How reactive are they? ♦ Can these metals be recycled? ♦ How abundant are they?
New metals of the future New alloys can be made with different properties. For new technologies we need new materials. Which metals would we use to make a flying car or a space elevator?	**New metals of the future** An article in the New Scientist about making new alloys that are strong enough to make improved jet engines gives some background to this context. Investigate the uses of alloys and the new properties they give metals. Design a new alloy as a class activity. The RSC website — learn chemistry describes the following experiment: 'Making an alloy (solder).'
Metal catalysts These are used in many different ways to make new materials or to save energy. Investigate some of these, where they are found and how they are used.	**Metal catalysts** You can use the RSC website — learn chemistry to show 'The involvement of catalysts in reactions' — a demonstration of the oxidation of potassium sodium tartrate by hydrogen peroxide using a cobalt salt as a catalyst**.** This is an exciting and spectacular demonstration.
	'Sustainability is precious' is a series of activities and experiments from Johnson Matthey that explain how precious metals play a vital role in removing harmful pollutants from the air. It gives some insight into why these metals are precious, and can be downloaded from the TES website.
Gold on our doorstep Gold is to be mined at Cononish near Tyndrum. Work on constructing the mine first began in the 1980s but low gold prices forced closure before the mine became fully operational. The mine is now	**Gold on our doorstep** News articles about the discovery of gold in Cononish near Tyndrum can be found on the Glasgow Herald and BBC websites, to give some background to this context. Some suggested activities that fit in with the topic include:

viable because the price of gold has gone up. Research the pros and cons of having this resource on our doorstep. Does it bring wealth and new jobs, or irreparable environmental damage to this beautiful area?	♦ visiting a mine or mining museum (if available locally) ♦ gold panning, as a practical activity (this could be demonstrated with copper powder and sand in a sink!) designing and making a medal for the Commonwealth Games (choosing between a pure metal and an alloy, by researching cost, availability and abundance)
Fragile Earth — water For two different water supplies — one local and one global — investigate and compare: ♦ source/origin ♦ extraction ♦ use (as appropriate) ♦ conflicts and benefits Possible solutions: local or national	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
There is a problem with your local water supply. Either the main water pipe that supplies the town has been damaged, terrorists have poisoned the water supply, or accidental pollution has occurred. The water has been cut off. Due to an extreme weather event, your small isolated rural/large urban community has run out of water. Where will you find a new resource? For example, buy it in from another community, distil sea water, find a new source locally? Or: Due to an extreme weather event a small isolated rural/large urban community overseas has run out	**Background knowledge** As a preamble, look at the inherent properties of water: ♦ melting point and boiling point (SCN 3–05a) ♦ solvent properties (SCN 3.16b) ♦ chemical test for water (there is an experiment on the RSC website — learn chemistry that shows the colour change that occurs in copper sulphate due to the presence of water) ♦ Look at tap water under a microscope and compare it to untreated pond water. ♦ Investigate water related diseases. ♦ Investigate why chlorine makes water safe to swim in and/or drink (there is an experiment on the practical chemistry website that looks at the dissolved solids in tap water and sea water. ♦ There are experiments on the RSC website — learn chemistry that show the processes of desalination of water and the separation of water from a mixture by distillation.

of water. They want to buy an adequate supply of water from your abundant local resource. Can you provide enough good quality water for them?	♦ Design your own method for collecting water from the atmosphere. ♦ Use a rain gauge to measure rainfall and test this for mineral content and bacteria. ♦ Design and make water filters to clean muddy water, and discuss how safe the water would be for drinking. ♦ Investigate how commercially available water purification systems work. **Other suggested activities:** ♦ Visit a local water treatment plant, a swimming pool or another local facility that uses water. ♦ Use the Scottish Water (www.scottishwater.co.uk) and SEPA (www.sepa.org.uk) websites to find more information on water use, purification and pollution. **Practical activities that illustrate uses of water:** ♦ growing plants ♦ making paper ♦ investigating the effect hard and soft water on health and the effectiveness of laundry detergent. **Useful websites:** www.creative-chemistry.org www.sciencebuddies.org www.wateraid.org/uk/learn_zone www.practicalaction.org/water-and-sanitation-14 www.ewb-uk.org [Engineering Without Borders] www.groundwater.org [Water Filter Challenge]
Fragile Earth – food	
For more than one source, investigate and compare: ♦ source/origin ♦ production ♦ use (as appropriate) ♦ conflicts and benefits	

Possible solutions: local or national	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
The world Up to a billion people every day have nothing to eat, and half of children who die under the age of five do so because they are malnourished or starving. The world's population is more than 7 billion — and rising — but food shortages will continue and perhaps worsen due to climate change, damage to ecologies, using land for biofuels and other energy sources instead of for farming, increased energy costs and building cities. **Our country** Food is plentiful and this has led to different health problems such as obesity, diabetes and heart disease. In future, spiralling transport energy costs will make it prohibitively expensive to ship large amounts of food around the world. This will reduce the ability of rich countries to provide food aid for those countries that need it. The increase in fuel prices and concerns about carbon emissions will also make it less attractive to source out-of-season foods from distant parts of the world. As a result, it will be necessary to develop more sustainable ways of producing and consuming food locally. This will have a significant impact on food production that will see a focus on farmed local produce and a reduction in livestock with necessary changes in diet.	**Source, production and extraction** **Germination of seeds** ♦ Measure water content of stored and fresh seeds (eg peas) using dry weight and fresh weight. ♦ Test seeds for starch, sugar and protein. ♦ Grow a collection of plants from a variety of seeds (eg water cress, tomatoes, courgettes etc.) and investigate other sources of food, eg leaves, roots, flowers etc. ♦ Demonstrate the conditions needed for the germination of seeds. **Plant growth and photosynthesis** Test plants grown under different conditions to demonstrate the factors needed for photosynthesis. (There are internet resources to support this.) ♦ Measure changes in mass of germinating seeds and photosynthesizing seedlings. Plot the changes over time on a graph. ♦ Investigate the effect of the incorrect watering of plants. ♦ Design and make a watering system for houseplants that could run for a week or more. ♦ Monitor environmental conditions such as minimum and maximum temperatures, relative humidity and wind speed. ♦ Examine leaflets etc. on greenhouse design, heating systems and ventilation devices. ♦ Demonstrate the use of a thermostat. ♦ Investigate the effect of sunlight, shade and artificial lighting on plant growth. **Fertilisers** ♦ Grow plants with natural and artificial fertilisers and compare with growth when no fertiliser is used. ♦ Investigate which elements are needed in fertilisers (NPK) and examine the effect of adding each element. ♦ Encourage pupils to evaluate whether artificial fertilisers are necessary or dispensable.

	♦ Discuss the importance of nitrogen-fixing plants**.** ♦ Discuss alternative propagation techniques — pricking out seedlings sown earlier; potting on plants. ♦ Explore the effect of deadheading crop plants to improve yield. ♦ Compare different methods of controlling pests and diseases. ♦ Give examples of the ways in which genetically engineered plants are of economic importance — how they can be used to improve disease resistance, crop yield and taste/appearance. **Livestock production** ♦ Analyse and interpret data on the characteristics of selected species. ♦ Give two examples of improved characteristics resulting from selective breeding. ♦ Discuss economic importance of selective breeding. ♦ Genetic engineering of animals — the ethics of cases such as Dolly the sheep could be debated. **Biotechnology** ♦ Investigate various processing treatments for milk. ♦ Make yoghurt. ♦ Investigate different types of rennet. ♦ Make dough. ♦ Investigate the conditions necessary for fermentation to take place. ♦ Investigate artificial colouring and flavours. ♦ Investigate upgrading of waste materials from yeast or whey industry. **Use of foods** ♦ Consider several common foods and compare their contents (Internet resources are available: Chemical Industries; Food Basics). ♦ Revise the main food groups, examining food labels to find the different proportions of fat, protein and carbohydrate. ♦ Compare animal and plant food sources for content. ♦ Compare the main types of farming in different regions of the UK (or the world). ♦ Investigate why some farmers raise livestock while others prefer to grow crops.

	Conflicts and issues ♦ Identify on a world map regions where food shortages and food surpluses exist. Investigate the reasons for this. ♦ Pupils could conduct ICT based research and present or debate on some or all of the following issues: the impact of fertilizers on the environment the impact of pollution on food production genetic modification of plants and animals selective breeding air miles versus local produce change of diet in developing countries and the global effects
	From the TES website, use the following two activities: ♦ A PowerPoint presentation that asks a pupil to link the special properties of titanium to its specific uses (golf clubs, aircraft, piercing and hip replacements). The presentation includes links to websites with video clips showing titanium's uses and a titanium quiz. It also looks at the extraction of titanium from its ore, via displacement reactions. ♦ A series of questions about the extraction of metals and their properties, uses and alloys. Suitable websites are given to help students find the information they need, with links to a couple of short films for them to watch along the way. Also consider other ways of extracting metals from their ores: ♦ extracting copper from copper chloride using electrolysis ♦ extracting iron from iron (III) oxide using a match head ♦ extracting copper from fake malachite ore — use a mixture of cement and copper carbonate to make fake malachite and then design an experiment to extract the copper from this ♦ extracting copper from copper oxide using a Bunsen burner and a piece of wood (as well as two safety mats — and be sure to cool the reduced copper oxide with water) ♦ Research why the more valuable metals are more expensive to extract. ♦ Visit a local waste management site. ♦ Research local and national policy on metal recycling.

	♦ Do a school or class project on recycling metals. ♦ Make a new and useful item out of cans, bottle tops, foil wrappings etc. ♦ Build a sculpture using soldering.
Human Health	
This Unit covers personal health, expanding to taking responsibility for the collective health of the family and the community. It also looks at global issues affecting health. In this Unit there are opportunities for learner personalisation and choice. Teachers/lecturers may choose the appropriate health parameters for their learners — it is not are expected that all are covered. The World Health Organisation site (www.who.int) has lots of information on diseases worldwide.	
Human Health — what is health?	
♦ Establishing what is meant by health ♦ Social, physical and mental components	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
Learners can recognise and record the various healthy parameters for a teenage body, and how these relate to age and fitness levels. Measurements could include: ♦ poor health related to lack of exercise and diet ♦ relevance of high or low; heart rate, blood pressure and temperature	Suggested areas may include: ♦ draw the health triangle ♦ normal pulse rates, how to measure and what can affect them ♦ extremes of pulse rate ♦ understand how recovery time is affected by health ♦ measurement of blood pressure — causes and consequences of extremes ♦ identify high and low tech measuring techniques ♦ body temperature — measurement and significance of small changes — within key age groups. Students could attend a first aid course/invite medical/health professionals to give a talk/presentation; they could carry out a health assessment of themselves/peers/staff/fictitious people at the beginning of the Course, eg: ♦ blood pressure (using a digital sphygmomanometer/stethoscope and mercury manometer) ♦ pulse (using a pulsometer/heart rate monitor/stethoscope and finger) ♦ temperature ♦ body fat (using skinfold callipers) ♦ vaccinations

	♦ peak flow ♦ height ♦ weight (optional) Learners can watch videos, research or use info from informed speakers to identify causes and treatments for various health issues. Examine lungs from a sheep to compare clean lungs with photographs of smoke damaged lungs.
Human Health — threats to health	
Recognise contributory factors and preventative measures relating to social, physical and mental health.	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
Different family scenarios to analyse and discuss aspects of healthy living and supportive environments. Examples could include a nuclear working family with an elderly dependant compared with a single, unemployed mother of one. Mixing up of stereotypes should then be encouraged, to include some of the following: ♦ poverty ♦ hygiene ♦ drug and alcohol abuse ♦ smoking ♦ sexual health ♦ diet and obesity ♦ exercise ♦ stress and mental health ♦ mobility impairment Learners could then produce their own versions of specific scenarios, identifying individual circumstances, possibly self-perpetuating. These could be categorised as social, mental health or physical health issues. The presented information	These may include: ♦ energy balance study ♦ knowledge of various vitamins and minerals and effects of deficiencies/disorders ♦ examining labels on foods comparing nutritional values/food diaries ♦ burning foodstuffs to release energy and plotting results on a graph ♦ agar plates showing microbiological growth pre/post hand-washing ♦ hand-washing techniques and UV light ♦ researching meditation and relaxation techniques ♦ doctor/health practitioner visit to the school ♦ supermarket visit ♦ the *5 a day* campaign. ♦ outside speakers from the police/youth support services ♦ researching poor diets and producing posters highlighting possible outcomes (eg famine, kwashiorkor, obesity, rickets) ♦ PowerPoint presentation about a personality whose diet is specialised on account of their job (eg sportsperson, explorer) Collect and discuss newspaper/magazine cuttings relating to health and relate to the three aspects of health.

could then be expanded, developing the scenarios and predicting possible issues and necessary interventions. Discussions or presentations on: ♦ social aspects of unemployment ♦ aspects of dependency care ♦ physical and mental considerations ♦ home demands	
Human Health — health claims	
♦ media report/investigation ♦ understanding risk	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
Learners could choose a topical media health issue to investigate and on which to prepare a report.	Suggested areas may include: ♦ survey of vaccinations among classmates ♦ effects on the body of poor hygiene ♦ research project on worldwide diseases and vaccination programmes
Applications of Science	
This Unit lets learners explore sciences contribution to communication technologies, new materials and how science helps the understanding of risk and how it can be reduced in modern life. Teachers/lecturers may cover all key areas of the Unit using one context, a mixture of key areas in one context or as separate topics.	
Applications of Science — telecommunications	
Principles and applications of telecommunications: electromagnetic waves (radio, micro and light waves) and sound waves Applications — at least two from: ♦ satellite technology ♦ fibre optics ♦ electromagnetic wave technology ♦ storage technologies	

- opto-electronics
- screens
- speakers /ear phones etc
- amplifiers
- microphones
- radio
- other

Suggested contexts	Suggested learning activities and exemplification of key areas
Adventure race Adventure race involves a team of pupils that have to kayak, cycle, run, abseil and canoe around a 10-mile course. Materials suitable for these activities are explored. In particular, telecommunication and satellite technology can be explored when one of the participants gets lost or hurt and rescue or medical assistance is required. However, they find it difficult to maintain a signal possibly due to the terrain or weather. The way in which the news media report the incident and how this is communicated to an audience via television, radio and the internet could be explored. On being safely rescued one of pupils is taken to hospital where their leg is x-rayed. The x-ray is automatically digitised and displayed on one of the hospital monitors for analysis. **Car science** On a car journey a breakdown/accident occurs. Investigate the science in cars, eg music systems, voice recognition, satellite navigation storage systems. A hospital visit could lead to the science around x-rays.	Investigate the possible 'journey' of a mobile phone message. Suggest a possible reason as to why a mobile phone signal might not be received ie to great distance from a receiving station, a weak signal or a physical barrier such as a hill. Investigate the use of microphones, eg by speaking through a microphone connected to a CRO. Investigate the use of loudspeakers, eg by connecting a speaker to a signal generator. Take part in a demonstration on how an amplifier can be used to 'boost' an electrical signal. Carry out investigations into the reflection of light off a plane mirror and at the boundary between a glass block and air. Investigate the use of curve reflectors to focus rays of light. Build a simple circuit containing an LED (connecting an LED to a signal generator could be used to vary the flashing rate of the LED). Carry out an investigation into how a light signal can be transmitted in an optical fibre. How has GPS satellites enhanced our lives, from military systems to social applications? There are BBC class clips on mobile phone coverage GPS opinions including parents tracking children. Other Communication videos on the internet include: How do mobile phones work?, Submarine communication, Echolocation: dolphins, The satellite story, Satellites, How does GPS work?

Either approach as stand-alone unit on risk and safety relating to real life examples which are linked in to the areas covered in the Course or incorporate into all other sections/contexts. You could also approach Risk and Safety as a context or give a 'Bringing it all together' task at the end. For example: Imagine that you have been employed by the fire department to visit homes and schools to identify and minimise safety risks.	
Applications of Science — materials	
Source, production, use and issues At least one from: ♦ plastics ♦ fibres ♦ 'smart' materials ♦ alloys ♦ cosmetics ♦ composite materials ♦ biological materials ♦ recycled materials	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
Material design challenge Dragon's Den type activity. You have to pick novel material/product. This product must have a practical use. Investigate the use of plastic, fibres, biological, recyclable and smart materials.	Learners could investigate fibres/plastics/composite materials/biological materials.

Sport	Fashion	Child safety	Fabric TVs	
A skiing jacket with QTC. This substance conducts electricity and can be woven into clothes. Can be used with MP3 players etc.	A hat made from a material that is soft that copes with sudden impact.(D30)	A baby grow that changes colour when the baby is too cold or too hot.	A material that can have TV programmes projected on it.	Teflon coated material.

Investigate the properties of plastics and problems with them.

New specialised polymers: Examples — Biopol, Poly(ethenol) (disposable laundry/environmental bags can be purchased to demonstrate solubility), Polyvinylcarbazole, (SSERC experiment to make plastic that conducts), Kevlar
Shape Memory Plastic
Polymorph (thermosetting plastic) — can be purchased

Colour changing clothes — Thermochromic thread

Quantum Tunnelling Composite — material that conducts electricity when pressure is applied (used in ski/sport jackets to function mobile phones and iPods from the sleeve) Video on gadget show website.

Alloys/Shape Memory Alloys (medical stents, fire alarm sprinklers, GPS/Mobile phone satellites)

Carbon fibres — Possible new uses (tennis racquets, skis)
Fullerenes and nanotubes(1996 Nobel Prize)/Graphene (2010 Nobel Prize)

Cosmetic wonder products: the Science of personal hygiene A wonder product has appeared on the market. Examples of this product could be ♦ soap ♦ perfume ♦ hair products	Pupils can research the use of the material. How it can be applied and make a pitch to a panel of real-life Dragons. Literacy issues can be developed. Look at materials and videos on the internet concerning: RSC website — learn Chemistry and others: ♦ alloys ♦ plastics and polymers ♦ the invention of nylon **Cosmetic wonder products: the Science of personal hygiene** **Soap** Demonstrate that detergent can allow oil and water to mix. Make home-soap, shampoo and detergent. Investigate lathering. What is the difference between shower gel and soap? What are the differences between soap, detergents and shampoo? **Perfumes** Investigate the science of aromatherapy Issues around aromatherapy; are the claims made real? What are the ingredients of a perfume? Make a home-made perfume. Select information on types of perfume (eg Eau de Parfum, Eau de Cologne, Eau du Toilette etc). **Hair products** What is the structure of human hair? What is the difference of hair from different ethnic groups? What is the difference between different hair types; curly, thick, fine hair? What causes greasy hair? Perform a survey of pupils' use of hair products. Investigate how hair products work, eg hair gel, volumisers.

	Investigate problems with hair, eg alopecia, lupus, ringworm, dandruff, premature balding, premature greying. What are the effects of chemotherapy and radiation therapy on hair? Test home-made shampoo against a commercial shampoo (SERC). What differences are there between conditioner and shampoo ingredients? Use wool/hair extensions as model hair to investigate the effect of different conditioners and shampoo. What are the ingredients of hair-colouring products? What are the differences between temporary and permanent hair colouring?
Applications of Science – risk and safety	
Identifying, measuring (risk assessment) and minimising risk for at least one of the following: ♦ home safety (including safety devices) ♦ electrical safety – earth wire, fuses, circuit breakers, trip switches ♦ work safety ♦ transport safety (eg airbags, seat belts, response times) ♦ radiation safety	
Suggested contexts	**Suggested learning activities and exemplification of key areas**
Home safety Identify risks in the home and investigate safety equipment used to minimize risks. Look at safety devices used to alert and protect people from risks. Learners could investigate how safety devices work, eg carbon monoxide detectors, heat detectors, smoke detectors, fire extinguishers, alarms for open doors/windows/swimming pools, baby monitors, tamper proof lids, plug guards, safety devices on gas cookers and interconnected smoke alarms.	**Home safety** Many resources online can be used to find out how these safety devices work. Other online resources include: ♦ internet videos on carbon monoxide poisoning ♦ various websites promoting safety in the home, including fire safety, aimed specifically at pupils with videos, games and activities The idea to develop an interactive safety game for children came out of Crucial Crew — a series of workshops held all over the UK for schoolchildren aged 8–11. It may well have a different name in your area, such as Junior Citizen or Citizenship Courses. At these workshops the children are presented with various dangerous or challenging situations, such as a road accident or a gas leak, and they engage in role-play exercises in how to deal with these situations.

They could also investigate chemicals in the home and in the school laboratory, eg acids, alkalis, chemical cleaners and poisons.	Identify chemical hazard symbols. Identify risks in chemical safety and how they are minimised. Hazcard dominoes/safety symbol games on TES and numerous websites let you design your own hazcards. BBC Bitesize and EChalk have information and activities on hazard symbols. Pupils could investigate the dangers of the chemicals that they will come across in school science labs and in the home.

Developing skills for learning, skills for life and skills for work

Learners are expected to develop broad generic skills as an integral part of their learning experience. The *Course Specification* lists the skills for learning, skills for life and skills for work that learners should develop through this Course. These are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and must be built into the Course where there are appropriate opportunities. The level of these skills will be appropriate to the level of the Course.

For this Course, it is expected that the following skills for learning, skills for life and skills for work will be significantly developed:

Numeracy
This is the ability to use numbers in order to solve problems by counting, doing calculations, measuring, and understanding graphs and charts. This is also the ability to understand the results.

Learners will have opportunities to extract, process and interpret information presented in numerous formats including tabular and graphical. Practical work will provide opportunities to develop time and measurement skills.

2.1 Number processes
Number processes means solving problems arising in everyday life.
Learners have the opportunity to develop numeracy skills by carrying out calculations when working out averages and processing experimental results. Learners should deal with data and results from experiments/investigations and everyday class work and make decisions based on the results.

2.2 Money, time and measurement
Using time and measurement in practical work

2.3 Information handling
Learners will experience Information handling opportunities when dealing with data in tables, charts and other graphical displays to draw sensible conclusions throughout the Course.

Thinking skills
This is the ability to develop the cognitive skills of remembering, understanding and applying.

The Course will allow learners to develop skills of understanding and applying, Learners can apply knowledge to practical work. They can demonstrate understanding and apply knowledge to describe and interpret information and data.

5.2 Understanding
Throughout the Course, learners should be given the opportunity to develop their understanding of scientific ideas and topics. They should be given opportunities to use this understanding to demonstrate the meaning of items of information, to explain the order of events in a sequence and to interpret in a different setting or context.

5.3 Applying
Learners should be given opportunities to plan experiments throughout the Course and to use existing information to solve problems in a different contexts.

In addition, learners will have opportunities to develop skills in literacy, working with others, creating and citizenship.

Literacy
Learners develop the skills to communicate key scientific ideas, and describe scientific issues in various media forms. Learners will have opportunities to communicate knowledge and understanding with an emphasis on applications and environmental/social impacts. Learners will have opportunities to develop listening and reading skills when gathering and processing information.

Working with others
Learning activities provide many opportunities, in all areas of the Course, for learners to work with others. Practical activities and investigations in particular offer opportunities for group work, which is an important aspect of Science and should be encouraged.

Creating
Through learning in Science, learners can demonstrate their creativity. In particular when planning and designing experiments, learners have the opportunity to be innovative in their approach and do/make/say/write something new.

Citizenship
This Course has many opportunities for an extensive range of practical activities which provide learners with the opportunity to work cooperatively with others. Learners will develop citizenship skills when considering the applications of Science on society/the environment.

Approaches to assessment

Assessment should be integral to and improve learning and teaching. The approach should involve learners and provide supportive feedback. Self- and peer-assessment techniques should be used where appropriate.

See the *Unit Support Notes* for guidance on approaches to assessment of the Units of the Course.

Combining assessment across Units

If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units. If this approach is used then it is necessary to be able to track evidence for individual Outcomes and Assessment Standards.

Transfer of evidence
Evidence for the achievement of Outcome 1 and Assessment Standards 2.2, 2.3 and 2.4 for this Unit can be used as evidence of the achievement of Outcome 1 and Assessment Standards 2.2, 2.3 and 2.4 in the other Units of this Course.

National 3 Science: pulse

Assessment Standards can be achieved using one or more pieces of evidence covering work done on different occasions.

Assessors should record evidence of achievement of Outcomes and Assessment Standards. The table below shows one way of recording evidence. This table is not mandatory.

This candidate has passed all five Assessment Standards for Outcome 1.

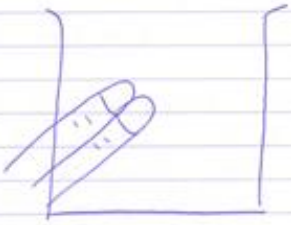
Assessment Standard	**Evidence**	**Result**
1.1 Following procedures safely	Procedures have been followed safely and correctly	The steps in the method were followed in the correct order. Exercise carried out safely
1.2 Making and recording observations/ measurements accurately	Observations/measurements taken are correct	Results recorded in a suitable format
1.3 Presenting results in an appropriate format	Results have been presented in an appropriate format	Bar chart of results correctly completed
1.4 Drawing valid conclusions	What the experiment shows, with reference to the aim	Conclusion relates to the aim and results
1.5 Evaluating experimental procedures	The suggestion given will improve the experiment	Suggestion given would bring about improvement

Candidate 1

Healthy Body Investigation.

Aim: How our pulse rate rises or decreases when we move and sit still.

what I used - stopwatch and fingers.



what I did	pulse in 1 minute			average pulse in 1 minute
	1	2	3	
Sitting still	68	68	85	74
walking on the spot	89	54	112	72
running on the spot	84	58	73	85

Conclusion

I found out that my results show me that they're is an increase in pulse rate after exercise. Using my results table you can see that

Candidate 1 (cont.)

gentle exercise didn't increase my pulse it actually went down. The harder exercise made my pulse go up to an average of 85. I think my experiment has answered my aim

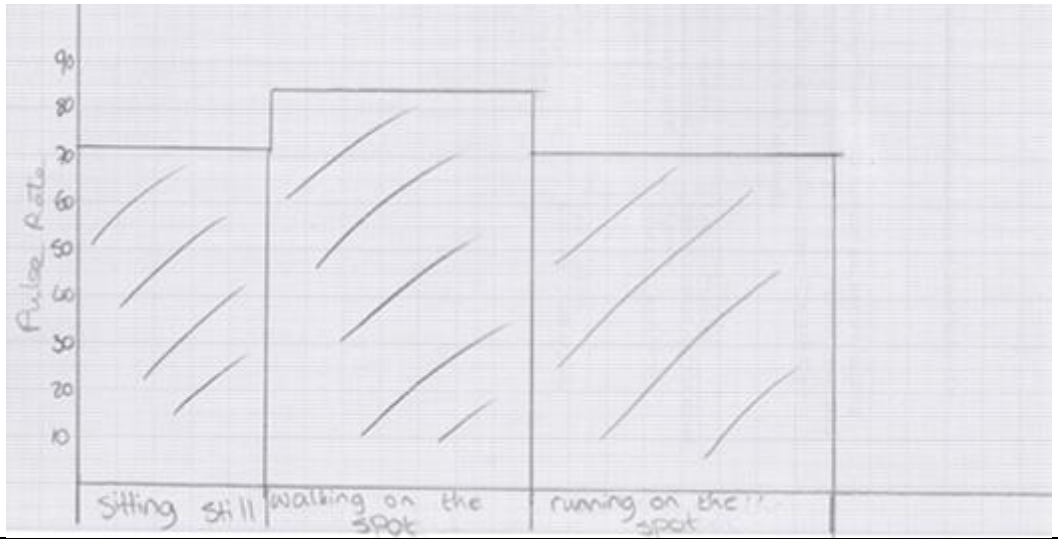
Evaluation

The experiment didn't exactly show what I expected because when I was walking on the spot my pulse decreased and I expected it to increase and when I started running it increased which is what I expected I would repeat this experiment on walking I would take my pulse for walking on the spot again.

Method

For my method I used my fingers to take my results of my pulse after every minute then exercised and then repeated this.

Pulse



National 3 Science
Assessment Standards 2.2 and 2.3 can be achieved using one or two pieces of evidence covering work done on different occasions.

Assessors should record evidence of achievement of Outcomes and Assessment Standards. The table shown is one way of recording the evidence. This table is not mandatory.

This candidate has passed both Assessment Standards 2.2 and 2.3

Assessment Standard	**Evidence required**	**Evidence produced**
2.2 Describing a given application	Appropriate science knowledge is used to describe a given application	Infection control — stop the spread of germs. Using gel to wash hands.
2.3 Describing a given issue in terms of the effect on the environment/society	Appropriate science knowledge is used to describe its effect	People get sick. Stops the spread of germs.

Hand-washing in hospitals
Nurses and doctors need to wash their hands with special gel before helping patients to stop them getting and all their patients gets sick. People have died when they get these germs in hospital. So even visitors have to wash their hands with gel in case they bring germs into hospitals.

Equality and inclusion

The following should be taken into consideration:

Situation	Reasonable Adjustment
Carrying out practical activities	Use could be made of practical helpers for learners with: ♦ physical disabilities, especially manual dexterity, when carrying out practical activities ♦ visual impairment, who have difficulty distinguishing colour changes or other visual information
Reading, writing and presenting text, symbolic representation, tables, graphs and diagrams	Use could be made of ICT, enlarged text, alternative paper and/or print colour and/or practical helpers for learners with visual impairment, specific learning difficulties and physical disabilities
Processing information using calculations	Use could be made of practical helpers for learners with specific cognitive difficulties (eg dyscalculia)
Drawing valid conclusions, giving explanations and making generalisations/predictions	Use could be made of practical helpers for learners with specific cognitive difficulties or autism

As far as possible, reasonable adjustments should be made for the Assignment, where necessary. This includes the use of 'practical helpers', readers, scribes, adapted equipment or assistive technologies.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Course Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Course.

It is important that centres understand SQA's assessment arrangements for disabled learners, and those with additional support needs, when making requests for adjustments to published assessment arrangements. Centres will find more guidance on this in the assessment arrangements section of SQA's website: www.sqa.org.uk/sqa//14977.html.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications are available on SQA's website at: www.sqa.org.uk/sqa//14977.html.
- Building the Curriculum 3: A framework for learning and teaching
- Building the Curriculum 4: Skills for learning, skills for life and skills for work
- Building the Curriculum 5: A framework for assessment
- Course Specifications
- Design Principles for National Courses
- Guide to Assessment (June 2008)
- Overview of Qualification Reports
- Principles and practice papers for curriculum areas
- SCQF Handbook: User Guide (published 2009) and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work
- Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool

Administrative information

Published: June 2013 (version 1.1)

History of changes to Course Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials added.	Qualifications Development Manager	June 2013

Unit Support Notes

Unit Support Notes — Science: Fragile Earth (National 3)

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the *Science: Fragile Earth* (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and the ability to apply knowledge and understanding in the context of the *Science: Fragile Earth* (National 3) Unit. Learners will apply these skills when considering the applications of *Fragile Earth* on our lives, as well as the implications on society/the environment. This can be done by using a variety of approaches, including investigation and problem solving.

In this Unit only two of the key areas should be covered. The key areas are:

- energy
- metals
- water
- food

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Progression into this Unit

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- National 2 Science in the Environment Course or relevant component Units

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 3 Science *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other qualifications in science or related areas
- further study, employment and/or training

Approaches to learning and teaching

Approaches to learning and teaching and suggested learning activities are covered in the *Course Support Notes*.

In this Unit, learners will focus on two of energy, food, metals and water resources. They will investigate these through activities related to their source or origin, production and/or extraction, use, conflicts, benefits, and issues and possible solutions, including one local, national, or global issue. Learners will gain knowledge of how basic science is involved in the cause, effect and resolution of environmental issues.

The contexts or scenarios for each curriculum area are retained between National 3 and National 4 to allow flexibility in teaching and permit differentiation. Progression between the two levels may involve studying two different areas at National 4 from those previously studied at National 3. Alternatively, the same area could be covered using the differentiated outcomes or tasks to develop breadth and increase challenge for the learner.

Safety is integral to all practical work and learners should be encouraged to see risk assessment as a natural part of the planning process for any practical activity. Outcome 1 provides an opportunity for learners to identify risks and plan the safety steps required.

Developing skills for learning, skills for life and skills for work

Information about developing skills for learning, skills for life and skills for work in this Unit is given in the National 3 Science *Course Support Notes*.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice on approaches to assessment for the Unit. There will be other documents produced for centres to provide exemplification of assessments and guidance on how to write them.

Approaches to the assessment of a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

Assessments must be valid, reliable and fit for purpose for the subject and level, and should fit in with learning and teaching approaches.

Unit assessment should support learning and teaching and, where possible, enable personalisation and choice for learners in assessment methods and processes.

Teachers and lecturers should select the assessment methods they believe are most appropriate, taking into account the needs of their learners and the requirements of the Unit.

There is no mandatory order for delivery of the Outcomes. These should be overtaken throughout the Unit and are an integral part of learning and teaching.

The box below gives guidance and advice on possible approaches to assessment and gathering evidence.

Strategies for gathering evidence

There may be opportunities, both planned and naturally occurring, in the day-to-day learning and teaching of the Unit to observe learners providing evidence which satisfies completely, or partially, an Outcome or Outcomes. Additional evidence may be required to supplement this evidence.

Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner by bringing together different Outcomes and/or Assessment Standards. If a holistic approach is used then it is necessary to be able to track individual Assessment Standard evidence.

Strategies for gathering evidence and ensuring that a learner's work is their own could include:

- personal interviews during which the teacher or lecturer can ask additional questions about completed work
- oral presentations on their work
- written reports
- checklists to record authenticity
- supplementary sources of evidence, such as witness testimony, film or audio clips

Evidence can be gathered from classwork, experiments, investigations and/or research carried out in this Unit. It can be obtained using one or more of the strategies outlined above or by alternative methods which could include a test of knowledge, understanding and skills.

Equality and inclusion

The National 3 Science *Course Support Notes* provide full information on equality and inclusion for this Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in this document is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that any alternative approach to assessment will generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 3: A framework for learning and teaching*
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: June 2013 (version 1.1)

Superclass: RH

History of changes to Unit Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials added.	Qualifications Development Manager	June 2013

Unit Support Notes

Unit Support Notes — Science: Human Health (National 3)

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the *Science: Human Health* (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and the ability to apply knowledge and understanding in the context of human health. Learners will apply these skills when considering the applications of human health on our lives, as well as environmental/societal implications. This can be done using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of:

- what is health?
- threats to health
- health claims

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Progression into this Unit

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- National 2 Science in the Environment Course or relevant component Units

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 3 Science *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other qualifications in Science or related areas
- further study, employment and/or training

Approaches to learning and teaching

Approaches to learning and teaching and suggested learning activities are covered in the *Course Support Notes*.

This Unit covers the individual's immediate health, expanding to taking responsibility for the family's health. It then looks at health within the community, and finally global issues affecting health. There is opportunity for learner personalisation and choice. Teachers/lecturers may choose the appropriate health parameters for their learners and not all are expected to be covered.

The contexts and scenarios for each key area are retained between National 3 and National 4 to allow flexibility in teaching and permit differentiation. Progression between the two levels may involve studying two different health issues at National 4 from those previously studied at National 3.

Safety is integral to all practical work and learners should be encouraged to see risk assessment as a natural part of the planning process for any practical activity. Outcome 1 provides an opportunity for learners to identify risks and plan the safety steps required.

Developing skills for learning, skills for life and skills for work

Information about developing skills for learning, skills for life and skills for work in this Unit is given in the National 3 Science *Course Support Notes*.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice on approaches to assessment for the Unit. There will be other documents produced for centres to provide exemplification of assessments and guidance on how to write them.

Approaches to the assessment of a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

Assessments must be valid, reliable and fit for purpose for the subject and level, and should fit in with learning and teaching approaches.

Unit assessment should support learning and teaching and, where possible, enable personalisation and choice for learners in assessment methods and processes.

Teachers and lecturers should select the assessment methods they believe are most appropriate, taking into account the needs of their learners and the requirements of the Unit.

There is no mandatory order for delivery of the Outcomes. These should be overtaken throughout the Unit and are an integral part of learning and teaching.

The box below gives guidance and advice on possible approaches to assessment and gathering evidence.

Strategies for gathering evidence

There may be opportunities, both planned and naturally occurring, in the day-to-day learning and teaching of the Unit to observe learners providing evidence which satisfies completely, or partially, an Outcome or Outcomes. Additional evidence may be required to supplement this evidence.

Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner by bringing together different Outcomes and/or Assessment Standards. If a holistic approach is used then it is necessary to be able to track individual Assessment Standard evidence.

Strategies for gathering evidence and ensuring that a learner's work is their own could include:

- personal interviews during which the teacher or lecturer can ask additional questions about completed work
- oral presentations on their work
- written reports

- checklists to record authenticity
- supplementary sources of evidence, such as witness testimony, film or audio clips

Evidence can be gathered from classwork, experiments, investigations and/or research carried out in this Unit. It can be obtained using one or more of the strategies outlined above or by alternative methods which could include a test of knowledge, understanding and skills.

Equality and inclusion

The *Course Support Notes* provide full information on equality and inclusion for the Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in this document is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that any alternative approach to assessment will generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
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- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
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- Overview of Qualification Reports
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- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: June 2013 (version 1.1)

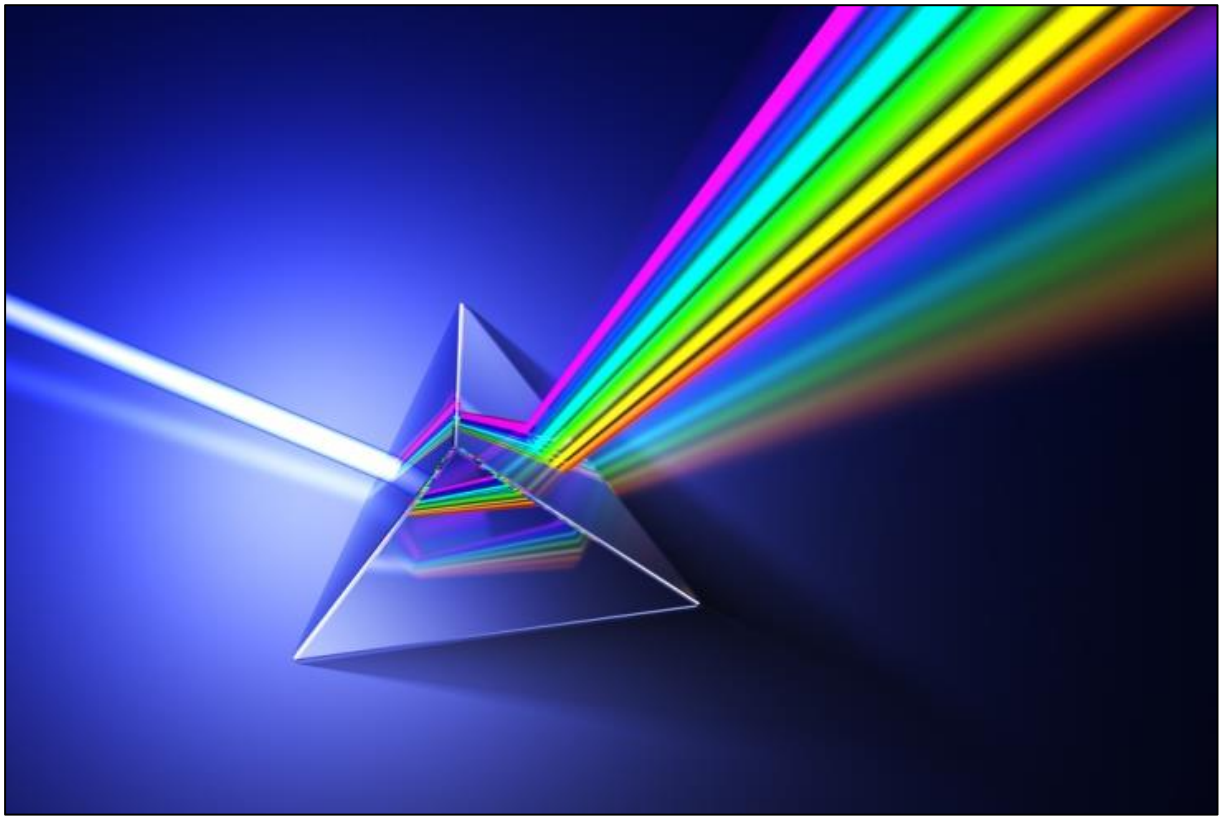
Superclass: RH

History of changes to Unit Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials added.	Qualifications Development Manager	June 2013

Unit Support Notes

Unit Support Notes — Applications of Science (National 3)



Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the *Applications of Scie*nce (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and the ability to apply knowledge and understanding in the context of applications of science. Learners will apply these skills when considering the topics in the *Applications of Science* Unit, as well as their implications on society/the environment.

This can be done by using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of:

- telecommunications
- materials
- risks and safety

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Progression into this Unit

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- National 2 Science in the Environment Course or relevant component Units

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 3 Science *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other qualifications in Science or related areas
- further study, employment and/or training

Approaches to learning and teaching

Approaches to learning and teaching and suggested learning activities are covered in the National 3 Science *Course Support Notes*.

This Unit lets learners explore Science's contribution to communication technologies, new materials and how Science helps the understanding of risk and how it can be reduced in modern life.

Teachers/lecturers may cover all key areas of the Unit using one context, a mixture of key areas in one context, or as separate topics.

The contexts and scenarios for each key area are retained between National 3 and National 4 to allow flexibility in teaching and permit differentiation. Progression between the two levels may involve studying different applications/materials at National 4 from those previously studied at National 3.

Examples of possible contexts for developing the Unit are 'adventure race' and 'car science'. These are exemplified in the *Course Support Notes*.

Safety is integral to all practical work and learners should be encouraged to see risk assessment as a natural part of the planning process for any practical activity. Outcome 1 provides an opportunity for learners to identify risks and plan the safety steps required to safeguard against them.

Developing skills for learning, skills for life and skills for work

Information about developing skills for learning, skills for life and skills for work in this Unit is given in the National 3 Science *Course Support Notes*.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice on approaches to assessment for the Unit. There will be other documents produced for centres to provide exemplification of assessments and guidance on how to write them.

Approaches to the assessment of a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

Assessments must be valid, reliable and fit for purpose for the subject and level, and should fit in with learning and teaching approaches.

Unit assessment should support learning and teaching and, where possible, enable personalisation and choice for learners in assessment methods and processes.

Teachers and lecturers should select the assessment methods they believe are most appropriate, taking into account the needs of their learners and the requirements of the Unit.

There is no mandatory order for delivery of the Outcomes. These should be overtaken throughout the Unit and are an integral part of learning and teaching.

The box below gives guidance and advice on possible approaches to assessment and gathering evidence.

Strategies for gathering evidence

There may be opportunities, both planned and naturally occurring, in the day-to-day learning and teaching of the Unit to observe learners providing evidence which satisfies completely, or partially, an Outcome or Outcomes. Additional evidence may be required to supplement this evidence.

Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner by bringing together different Outcomes and/or Assessment Standards. If a holistic approach is used then it is necessary to be able to track individual Assessment Standard evidence.

Strategies for gathering evidence and ensuring that a learner's work is their own could include:

- personal interviews during which the teacher or lecturer can ask additional questions about completed work
- oral presentations on their work
- written reports
- checklists to record authenticity
- supplementary sources of evidence, such as witness testimony, film or audio clips

Evidence can be gathered from classwork, experiments, investigations and/or research carried out in this Unit. It can be obtained using one or more of the strategies outlined above or by alternative methods which could include a test of knowledge, understanding and skills.

Equality and inclusion

The National 3 Science *Course Support Notes* provide full information on equality and inclusion for this Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in this document is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that any alternative approach to assessment will generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 3: A framework for learning and teaching*
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

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Superclass: RA

History of changes to Unit Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials added.	Qualifications Development Manager	June 2013