



Teacher Guide

Unit 4

Distant Light in the Universe

For first teaching from September 2013

For first assessment from Summer 2014

For first award in Summer 2014

space
science
technology

Level 2 Certificate

UNIT 3: Technology Impact on Society

Teacher Guide Unit 4

space science technology

UNIT 4: Distant Light in the Universe

Learning outcome 1: Understand that stars are different colours and sizes

1.1 Explain how the work of 3 astronomers from the past has developed our scientific or mathematics knowledge through the study of the cosmos

- The student may wish to use a timeline or diagram to follow the development of an astronomer and highlight significant milestones in the development of a theory or discovery e.g. Galileo, Kepler, Hubble

1.2 Identify and navigate to specific stars and constellations of the Night Sky

- Generate a piece of work that can help others to locate some of the constellations OR bright stars/other celestial objects in the night sky.

For Example: A planisphere and guidelines of how it can be used. See below

- Make a working star wheel or planisphere and demonstrate the ability to use effectively. Useful website is www.vcas.org/star-wheels.html This could be in the form of guidance notes to demonstrate navigation of the Night Sky using relevant software such as Stellarium (free download from www.stellarium.org) to identify constellations or stars from a local position e.g. Belfast, Lisburn etc..
- A useful 'App' that can be downloaded onto iPhone, iTouch or iPad is 'Pocket Sky'. This freely available application developed as a collaboration between Armagh Planetarium and Craic Design uses location based technology to provide an augmented reality version of the night sky, allowing pupils to point the device and identify an object in the Night Sky.
www.armaghplanet.com/html/free_stuff.html

1.3 Give a credible account of why stars are different colours and sizes

- Research and list the factors that account for star colour differences and sizes. Present the resulting data and findings as a presentation or written piece of work
- Choose TWO of the factors that affect either star colour and/or size and demonstrate understanding either through presentation, experimental evidence or media. A useful research website is www.le.ac.uk/ph/fulkes/web/stars/o_st_overview.html

Teacher Guide Unit 4

Learning outcome 2: Understand that starlight can be used to gain knowledge about stars

2.1 Develop a testable hypothesis through practical investigation using light sources and other appropriate resources to show how starlight provides information about stars

- The evidence for this assessment criteria could be in the format of a results table
- Carry out flame tests on various elements and record the results. Information on flame testing can be found at <http://www.creative-chemistry.org.uk/activities/flametests.htm> or <http://chemistry.about.com/od/analyticalchemistry/a/flametest.htm> An educational video on flame tests can be found at <http://video.about.com/chemistry/How-to-Do-a-Flame-Test.htm>
- Explain how the results from the flame test help us to build an understanding of the make-up of stars

2.2 Relate results to a real world application

- Evidence for this assessment criteria could be in a word document
- Explain how the colours from the flame test relate to 3 observable colours from various light sources around us. For example: Fireworks, Artificial lighting

Learning outcome 3: Be able to use the light spectrum to analyse starlight

3.1 Devise an experiment to split light and relate experimental outcomes to real observational data

- Develop an understanding of the term 'spectroscopy' and how astronomers can use this splitting of light to understand the nature of stars and the universe. This may be a series of presentation slides to explain understanding or a portfolio of evidence showing research undertaken
- Understand that visible light is only part of the Electromagnetic spectrum
- Build a simple spectroscope and use the resulting device to observe a variety of light sources such as fluorescent light, lit bulbs, neon signs etc. and record

Teacher Guide Unit 4

space science technology

findings. Pupils may wish to use gas discharge tubes if resource is available. Details on building a simple classroom spectroscope are provided at http://www.swpc.noaa.gov/Curric_7-12/Activity_1.pdf

- Research and identify 3 ways that spectroscopy can be used in areas other than astronomy. For example: Can spectroscopy be used in crime investigation?

3.2 Use research techniques to collect archive or live data pertaining to stellar spectra.

Learners could:

- Produce a poster or slide show for this assessment criterion.
- Provide evidence of data collection relating to the spectra of stars. A collage of archive images may be gathered showing spectra from various stars. A search engine tool such as 'Google images' may provide a starting point for gathering data. A good source for background information is <http://www.oneminuteastronomer.com/708/star-colors-explained/>
- Provide an explanation as to why there are no green stars?

3.3 Use findings to help explain stellar spectral classification

- Create a simple classification chart of star colour vs. temperature. A good reference is <http://www.enchantedlearning.com/subjects/astronomy/stars/startypes.shtml>
- Describe what is meant by the term 'Main sequence'. This could be in the form of a graph or Hertzsprung – Russell Diagram

Learning outcome 4: Understand the life cycle of a star

4.1 Effectively present a model of the life cycle of a star

- Provide evidence of understanding on how stars form, live and die. This could be in the form of a written piece of work, an interactive display or oral demonstration. A photograph and witness statement from the teacher will constitute evidence of collaborative work
- Give a brief account of why mass is critical to the life cycle of a star

Teacher Guide Unit 4

Learning outcome 5: Be able to use appropriate units to measure scale in the universe

5.1 Explain the scientific notation that is used to express the size and scale of the universe and convert examples of appropriate numbers into standard form

For example:

- Using everyday units of measurement, provide an account of the distance from home to school measured in kilometres, metres, centimetres and millimetres (Google Maps is an excellent reference for interrogating journey measurements). Discuss the relevance of appropriate units of measurements. Create a table of the results from this exercise using the appropriate standard form notation.
- Describe what is meant by an Astronomical Unit (AU) and use this unit to show distances from Earth to objects in the Solar System in AU and kilometres. For example, a graph or table would constitute evidence for this assessment criterion.
- Give a brief account of why the Astronomical Unit is an inappropriate unit to measure distances to the stars and show understanding of what units can be used to measure distances beyond the Solar System. A useful web based application for reference is the European Southern Observatory 'Birthday stars' calculator available at http://www.eso.org/public//outreach/eduoff/birthstars/index.html?locale=en_US

This will give students their age in Light Years from Earth. Re-calculate this distance in kilometres and show results in standard form.