



Teacher Guide

Unit 1

Human Space Flight

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

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UNIT 1: Human Space Flight

Learning outcome 1: Understand the story of human spaceflight past, present and future

1.1 Identify key milestones and present a timeline associated with human spaceflight

- Students will create a timeline of *significant* events leading to human beings travelling into space. The timeline should consider:
 - The Space race and the race to the Moon
 - Animals in space
 - Space technology
 - Current manned spaceflight and the future of manned spaceflight
- Students can provide evidence in the form of an annotated timeline, poster or media presentation such as a quiz or application.

An excellent online resource for researching this topic can be found at:
http://www.windows2universe.org/space_missions/manned_table.html

1.2 Give examples of 3 vertebrates and invertebrates that have been sent into space and the reasons they were selected for space travel

- Students can produce evidence of research by creating a presentation on their findings and conclusions. The research should show reasoning for selection, the mission and how this developed human knowledge of space travel

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1.3 Explain the important role of the International Space Station in furthering our knowledge of the space environment and microgravity

Students should investigate one of the following options

- The International Space Station provides a platform for human beings to carry out experiments and research in a space environment that otherwise cannot be done on the ground. 'Microgravity', sometimes referred to as weightlessness or zero gravity, affects the human condition in many ways.
- Students should research the effects on human homeostasis and the consequences of long duration space flight on the body. This evidence can be supplied as a written piece of work highlighting specific effects on various organs and body function. Students may wish to create an annotated diagram of the human body or use a model of the body or skeletal structure to highlight specific areas where exposure to microgravity has an impact. Evidence can also be in the format of a presentation with speaker notes or an animation.
- Students may wish to carry out this exercise as part of the project outlined in 2.1-2.3

A good introductory video can be viewed at

http://www.youtube.com/watch?v=cxTZhdWy6_k

A fun video that explains what would happen to the human body in space *without* a spacesuit can be viewed at:

<http://videos.howstuffworks.com/science-channel/33466-spaced-out-the-human-body-in-space-video.htm>

OR

- Students create a portfolio or piece of work highlighting at least 3 projects that have been carried out on board the International Space Station and how these projects have developed our understanding of the space environment. There are a wide variety of experiments to choose from over the last decade. A very good resource to help with this project can be found at:
http://www.nasa.gov/mission_pages/station/research/experiments_category.html

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- Students may wish to consider carrying out an experiment in the classroom and report how this differs from results on board the space station. An excellent resource to plan this activity is the International Space Station Education kit supplied by the European Space Agency. A free pdf of the pack and a wide range of useful teacher and student resources can be downloaded from the ESA website:
<http://esamultimedia.esa.int/docs/issedukit/en/html/index.html>

The UK European Space Education and Resource Office (ESERO) is the central repository for a wide variety of school piloted and tested European space based education projects www.esrro.org.uk The regional ESERO office is based at the Armagh Planetarium and teachers may wish to contact the planetarium to discover more about their programs or support for these projects

1.4 Investigate the future role that space will play in commercial activities such as space tourism and how this may transpire

- Students should provide evidence to support their understanding on how space tourism or space commercial activities will shape the future of space based endeavour. This evidence can be in the form of a portfolio of work outlining the main players and what they are hoping to achieve. Students should include at least one example of space tourism and the spacecraft being developed to carry tourists into space

A range of potential topics and major commercial space stakeholders can be viewed at: <http://science.howstuffworks.com/10-major-players-in-private-sector-space-race.htm>

The UK Space Agency website contains an interesting article on the topic at: <http://www.bis.gov.uk/ukspaceagency/discover-and-learn/discovering-space/getting-into-space/space-tourism>

1.5 Identify 3 applications of human spaceflight technology transfer or 'spin-off' in non-space activities and their impact on society

Space provides opportunities for technology used in space to be transferred into society and non-space activities.

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- Students can show that they understand what is meant by 'spin-in' and spin-out' technologies or products
- Students will research 3 technologies and provide evidence of understanding by showing research undertaken. The evidence, in any chosen format, should show how the space technology was initially used in the space domain and for what purpose and how this has been transformed for terrestrial activities

Information on space technology transfer can be accessed from the European Space Agency Technology Transfer Programme website: <http://www.esa.int/SPECIALS/TTP2/> or the NASA Technology Spin-Off portal <http://spinoff.nasa.gov/> Examples of spin-off technologies in the home and city environments can be viewed in the interactive flash player 'NASA@Home and City' <http://www.nasa.gov/externalflash/nasacity/index2.htm>

Learning outcome 2: Homeostasis and the human condition

2.1 Develop a healthy living plan, including fitness regime, food and nutritional requirement for the human body as part of a simulated astronaut training program

- The purpose of this exercise is to provide the student with skills that will inform them on how to make healthy living choices.
- Teamwork and collaborative learning opportunities should be encouraged. However, if working as a team member, students must show and identify own work outputs as part of the team. Students consider how to develop a healthy living plan using resources such as http://www.bbc.co.uk/health/treatments/healthy_living/your_plan/ or <http://www.nhs.uk/LiveWell/Pages/Livewellhub.aspx> Consideration should be taken as to what programmes would be most beneficial to the school 'trainee' astronaut for fitness, hygiene and mental health within the constraints of a school or leisure centre environment. An example of some basic fitness tests can be viewed at <http://motherboard.vice.com/2011/7/22/astronaut-training-test-yourself-to-see-if-you-have-the-right-stuff-to-be-shot-into-space> Students are encouraged to come up with their own ideas on how to test and improve overall health and wellbeing.

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- Students should record their healthy living plan in a format that can be accessed and considered for development by others

2.2 Create a healthy living package for self to better understand the importance of exercise, food and nutrition to maintain a healthy body

- Using data and information gathered from 2.1 to develop the healthy living plan the student must develop a table/graph to measure, track and monitor important aspects of health for use over a six week period. Consideration should be given to the most appropriate or relevant metrics to evaluate the success and impact of a plan of activities.
- Working as a team member, students may wish to actively participate in a fitness or mental agility component of a healthy living plan that they have set or one that has been developed by another team mate. Team members can monitor record and evaluate the effectiveness of the program. Health & Safety considerations must be assessed and approved by a fitness/physical education teacher/instructor before beginning any fitness component of the activity.
- Students may wish to carry out a school astronaut 'trainee' fitness activity as part of a wider school programme to encourage others to develop healthy living habits.
- Thought may also be given to use these activities to encourage local primary schools to participate through teacher supervised mentoring to test their own programme to encourage young people to take up the challenge. The 'Mission X: Train like an Astronaut' programme is an excellent challenge and resource for primary school children to develop healthy living through astronaut training type experiences. Useful information on potential challenges and activities can be viewed at <http://www.nasa.gov/audience/foreducators/trainlikeanastronaut/home/index.html> The UK Mission X programme is supported by the UK Space Agency. The UK website is: <http://www.bis.gov.uk/ukspaceagency/discover-and-learn/mission-x-in-the-uk>

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2.3 Explain the consequences of poor diet and little exercise

- Students must consider the key contributors to modern day poor lifestyle choices and highlight the consequences of those choices on health. Evidence of research and conclusions may be provided as a poster, interactive animation or presentation that can be viewed by others to inform them of the consequences of a poor diet or little exercise.