



University Learning in Schools

Physics

Exoplanets and the Search for Earth 2

Module Rationale



The Brilliant Club



Lampton School
a DfE Outstanding Academy & Teaching School

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MAYOR OF LONDON



Department
for Education

University Learning in Schools

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Title of Module: Exoplanets
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Module Rationale	
Why did you choose your particular theme (consider: inspiration, ambition, creativity, new ways of thinking, pragmatism, tailoring research to exam requirements)?	The content is quite flexible. It can suit those of lower ability and be tailored to stretch and challenge those more able. It is found that Astrophysics is a topic that most students engage with and we hope that adapting the content to what is currently being researched and constantly in the news will promote interest in the subject.
What did you hope to achieve? (i.e. what was your over-arching objective?)	It is hoped to get students more interested in Physics by linking it to current news and events in the world. We want the students to know that Physics can be a very accessible field of research and that “you don’t have to be an Einstein” to pursue it.

<p>How did you decide on the time frame for your module? (To fit to a half-term? To fit with an assessment cycle? Based module on x number of lessons of y length over z number of weeks)</p>	<p>The time frame was based on the availability within our topic timetable. There was a spare 4 weeks I was able to find so it will be completed then. The module is 9-10 lessons long, of 50 minutes each, and two lessons a week.</p>
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<p>Overview of Module What are the components?</p>	
<p>Lesson plans/rationale</p>	<p>Yes</p>
<p>Presentations</p>	<p>Yes</p>
<p>Resources required for pupils (books, lab equipment, computer facilities, etc.)</p>	<p>Laptops (optional) Worksheets Lap equipment (attached documentation)</p>
<p>Resources provided in lessons by teacher (text extracts, images, journal articles, etc.)</p>	<p>Texts Worksheets Data sheets</p>

Unit overview			
Individual Lesson Objectives, Key Questions and Key Concepts & Terminology			
Lesson	Objective	Key Question(s)	Key Concepts & Terminology
1 Life on Earth	<p>Must be able to state the conditions required for life on earth</p> <p>Should be able to explain how conditions to support life on Earth came about</p> <p>Could be able to explain the evolution of the Earth to the condition it is in today</p>	<p>What is needed for life?</p> <p>How does Earth provide this?</p>	<p>Atmosphere, season, year, axis, orbit, radius</p>
2 Bodies in our Solar System	<p>Must be able to state the different types of bodies found in our solar system</p> <p>Should be able to describe the differences between the types of bodies in our solar system</p> <p>Could be able to explain how these bodies formed</p>	<p>What is a star?</p> <p>What is a planet?</p> <p>What is a moon?</p> <p>What is a galaxy?</p>	<p>Moon, Sun, Planet, Galaxy</p>
3 Life on Venus -- Why is it so Hot?	<p>Must be able to describe the conditions on Venus</p> <p>Should be able to link the conditions at Venus to Greenhouse Gases in the atmosphere</p> <p>Could be able to connect extreme outcomes from climate change on Earth with Venus</p>	<p>What is it like on Venus?</p> <p>What is it like on Mars?</p>	<p>Greenhouse effect, magnetic field, states of matter</p>

<p>4 Life on Mars – Where did all the Water Go?</p>	<p>Must be able to describe the conditions on Mars and evidence for water in the past Should be able to explain why life is not found on Mars Could be able to critically evaluate the possibility of life and reasons for manned missions to Mars</p>	<p>What is it like on Jupiter and its moons?</p>	<p>As Above</p>
<p>5 Life on Jupiter, Saturn or their Moons?</p>	<p>Must be able to state the moons of Jupiter Should be able to describe conditions on Jupiter’s Moons Could be able to critically evaluate the possibility of life on Jupiter’s Moons</p>	<p>Why do we use different EM radiation to look to space?</p>	<p>Optical/UV/Infrared radiation How telescopes work</p>
<p>6 Looking to the Sky: How Telescopes Work</p>	<p>Must be able to state how light travels Should be able to describe the operation of a simple optical telescope Could be able to compare telescopes; the EM radiation they use; what this radiation probes</p>	<p>Why doesn’t direct imaging work?</p>	<p>Transit Method, Doppler Method</p>
<p>7 Exoplanets: How do we find faraway planets? -- The Transit Method</p>	<p>Must be able to explain why direct imaging does not work for most exoplanets Should be able to describe in detail how the Transit method works Could be able to use the transit equation to measure the radius of a planet</p>	<p>What does the Doppler Method tell us? What does the Transit Method tell us?</p>	<p>Mass, volume, density, period</p>
<p>8 Exoplanets: How do we Measure their Volume, Mass and</p>	<p>Must be able to explain properties of a planet such as Mass, Volume, Density and Period Should be able to spot transits and know how we measure the volume of a planet (radius) from the</p>	<p>As per lesson 7</p>	<p>Data/graph analysis, calculations</p>

<p>Density?</p>	<p>transit method and the mass from the radial velocity method Could be able to explain Doppler effect and how it leads to red/blue shifting</p>		
<p>9 Characterising Exoplanets: Exoplanet Environments and Liquid Water</p>	<p>Must be able to explain what radial velocity and transit methods tell us about a planet and how they combine to provide density. Should be able to Explain the ‘Goldilocks Zone’ concept. Could be able to characterize a planet based on calculations made and form a hypothesis of its structure</p>	<p>How do we tell if Exoplanets are habitable? How will scientists work toward this over the next 20 years?</p>	<p>Goldilocks Zone Atmospheres of exoplanets “Hot Jupiters”</p>
<p>10 The Colour of Life and the Search for Earth 2</p>	<p>Must be able to Explain that a colour of light links to a specific atom/molecule Should be able to describe how to determine what is in the atmosphere of exoplanets Could be able to explain transit spectroscopy</p>	<p>Can students link material throughout the course?</p>	

Evaluation <i>What is the impact of the module? Consider the impact, if any, that planning, teaching and assessing the module has made on both pupil and teacher in each category:</i>		
Impact	On pupil	On teacher
Subject skills learned		
New conceptual understanding or new ways of thinking		

Reflection		
Stop	Start	Carry on
What should be excised or not repeated?	What should teachers add to the module next time it is taught?	What aspects worked well and should definitely be repeated next time the module is taught?