

Subject Spotlight Lesson Plan

Title of Session	Subject Spotlight: Physics – Illuminating Dark Matter
Description:	Over the last century, physics has revealed the world is not quite as it seems. Our daily experiences, atoms and molecules as we know them, compose less than 5% of the universe. In this workshop, we explore how that can be possible and take a look at how we've come to these astounding conclusions. It's a journey that will take you through our galaxy and to those beyond it, using Einstein's ground-breaking theory of General Relativity as our torch to illuminate the reality of Dark Matter.

Duration of session:	~40 mins	Target Audience:	Y10/11/12/13
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Regional Progression Framework - Learning Outcomes:
LO1 - Awareness of HE and the different opportunities available. Be able to challenge any myths relating to HE.
LO2 - Identify the link between GCSE attainment and progression opportunities and how these can support life or career goals
LO5 - Learner knows how to research different routes into HE and how to make an application
Gatsby Benchmarks:
7. Encounters with Further and Higher Education - All students should understand the full range of learning opportunities that are available to them. This includes both academic and vocational routes and learning in schools, colleges, universities and in the workplace.

Timings:	Activity/Task/Information:	Instructions for teacher:	Resources needed:
BEFORE WORKSHOP	<ul style="list-style-type: none"> • True or False worksheet 	Supply the students with a worksheet each, and ask them to try it. Do they already know any of the answers? Give a few minutes. Answers given at the end of the workshop.	True or False worksheet
0:00-2:34	<ul style="list-style-type: none"> • Intro – PhD student introduces themselves and Dark Matter 		
2:34-6:02	<ul style="list-style-type: none"> • General Relativity Demonstration 	Follow instructions in video to set up demonstration. Video explains how a sheet and spheres of varying size can be used to demonstrate general relativity. Teacher will need to choose some students to hold the sheet taut, and then roll the lightest sphere across it. The teacher should then place the heavier spheres on the sheet in turn, and allow students to roll the lighter sphere. Observe the path the sphere takes. Pause video at 4:10 and give students a few minutes to try and experiment with different spheres and speeds. Allow 10 minutes for the whole activity.	Sheet and spheres of varying size.
6:03-11:59	<ul style="list-style-type: none"> • Dark Matter 	Video explains how dark matter has been discovered. A couple of questions are asked during this explanation. Teacher should pause the video at these points and encourage students to discuss what they think the answers might be. They should discuss in smaller groups, then larger groups and then share with the class.	
11:59-14:58	<ul style="list-style-type: none"> • Consolidation 	Make sure students look at the worksheet from the start again – do they now know all the answers now? A list of sources for further information and self-study will also be provided here, please share this with the students.	True-or-false worksheet answers, list of sources for further information

Overview of all resources:	
A sheet or blanket of medium size	The students will have to spread this out and hold it taut, so consider the space in your classroom when picking a blanket size.
3 balls of varying weight	Suggested - ping pong ball, tennis ball and a football. These will have to rest on the blanket, so consider the size of the balls in relation to your chosen blanket size.
True or false worksheet	To be used as a starter activity. The answers are provided at the end.
Resources to share with students:	<p>Quantum Theory Cannot Hurt You – Marcus Chown</p> <p>How to Teach Quantum Physics to Your Dog – Chad Orzel</p> <p>Paradox: The Nine Greatest Enigmas in Physics – Jim Al-Khalili</p> <p>Physics of the Future – Michio Kaku</p> <p>A Brief History of Time – Stephen Hawking</p> <p>Physics Girl YouTube: https://www.youtube.com/channel/UC7DdEm33SyaTDtWYGO2CwdA</p> <p>Physical Sciences UCAS Guide: https://www.ucas.com/explore/subjects/physical-sciences</p>