

Lesson Plan: What is physics?

Class level	Class Time	Materials
Middle School	<ul style="list-style-type: none">• 3 min video• 15 min discussion• 45min in-class or homework extension	<ul style="list-style-type: none">• Computer & Projector• Internet access• Photocopy of images (or use projector)• Copies of questions during video• Copies of worksheets

Objectives:

- Explain physics in relation to other scientific fields and explain what a physicist does.
- Emphasize that anyone can be a physicist.
- Expand on interesting research pursuits in physics.

Overview:

As a class, the students will discuss ideas of what a physicist does/ looks like. The students will choose from a series of photos (including Albert Einstein and Big Bang Theory character Sheldon Cooper). Then the teacher should explain a bit about physics, and what physicists do. Then students will watch the video. After this the students will go through discussion questions. If there is extra class time, there is an optional in class assignment that could also be a homework assignment.

Place in Course?

Beginning Motivation and introduction (especially to physics section in a Physical Sciences course)
Middle For a substitute teacher; Between course units or after a test
End Include an extension where students find connections between the material they studied in class and what the women discuss in the video

Background:

HERStories is a series of videos recorded at the 5th International Conference on Women in Physics at Waterloo, Canada, August, 2014. All interviewees were delegates to the conference. The project was supported by the National Science Foundation Grant #1419453 and presented by the American Physical Society, the American Association of Physics Teachers and the Society of Physics Students. The videos share experiences and wisdom from women in physics in order to encourage young girls to explore a career in physics.

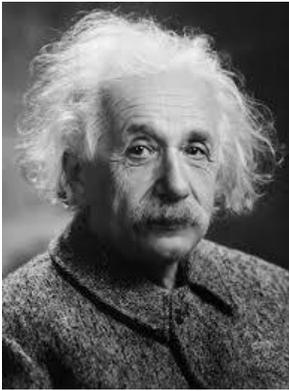
Common Core Standards:

CCS.ELA-LITERACY.SL6.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 6 (7 or 8) topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCS.ELA-LITERACY.SL7.1
CCS.ELA-LITERACY.SL8.1
CCSS.ELA-LITERACY.RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Teacher Guide:

1. Present Who Are Physicists photos below and ask students to identify which of these people they think are Physicists?

Answer Key: All except one.



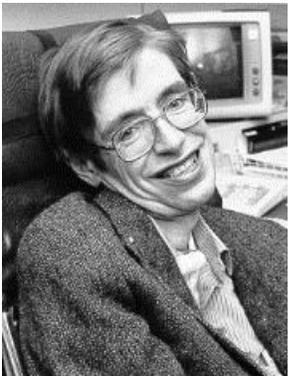
Albert Einstein



Marie Curie



Not a Physicist.
An actor: Jim Parsons



Stephen Hawking



Silvia Torres-Peimbert
(in the video)



Renee Horton
(in the video)

2. What do students think Physicist's do?

Answer (from <http://www.physics.org/article-questions.asp?id=18>):

- A physicist is a scientist who studies matter, energy, and the interaction between them, but what that really means is that physics is about asking fundamental questions and trying to answer them by observing and experimenting.
- Often physicists ask questions like how did the universe begin and what are the basic building blocks of matter.
- Physicists work as engineers, astronomers, computer scientists, biomedical engineers, scientific policy makers and in all kinds of other scientific fields. Some physicists work for NASA and others help develop video games and sports equipment. Some physicists work on how to treat cancer and predicting earthquakes.

3. Video: <https://www.youtube.com/watch?v=5o49H76Y2Xc>. Students watch and take notes (see sample questions).
4. Discussion questions:
 - What did the women say got them interested in Physics and science?
 - What do you think is interesting about science?
 - What things are the women working on in physics?
 - Do you think anyone can be a physicist? Do you think you could be a physicist one day?
 - What areas in science generally or physics specifically do you find compelling? What would you be interested in studying further? How might you pursue this field of study?
5. Possible Homework or In Class Assignment:

Have each student go home and look up an area of Physics (possible choices: atomic and molecular physics, astronomy, biophysics, chemical physics, computational physics, condensed matter physics, cosmology, laser physics, materials science, nuclear physics, and particle physics) and complete the attached worksheet or write a paragraph about that area of physics that answered the following:

- Why is this field important?
- How are scientists making discoveries in this field, are they conducting experiments, are they building models, are they doing calculations, etc.?
- Who is a scientist that has played a major role in this field? What are they famous for?
- What is one question in this field that you find particularly interesting?

Additional Resources: Seven Myths About High School Physics:

<http://www.aps.org/programs/education/highschool/teachers/7myths.cfm>

<http://www.aps.org/programs/education/upload/7-Myths-About-High-School-Physics.pdf>

Photo credits:

Silvia Torres-Peimbert: <http://icwip2014.wlu.ca/?id=page&slug=participants>

Marie Curie: AIP Emilio Segre Visual Archives, W.F. Meggers Gallery of Nobel Laureates:

<https://photos.aip.org/history-programs/niels-bohr-library/photos/curie-marie-a2>

Albert Einstein: Photograph by Oren Jack Turner.

https://en.wikipedia.org/wiki/Albert_Einstein#/media/File:Albert_Einstein_Head.jpg

Renee Horton: <http://uswip.org/Delegation.html>

Stephen Hawking: NASA. Public Domain.

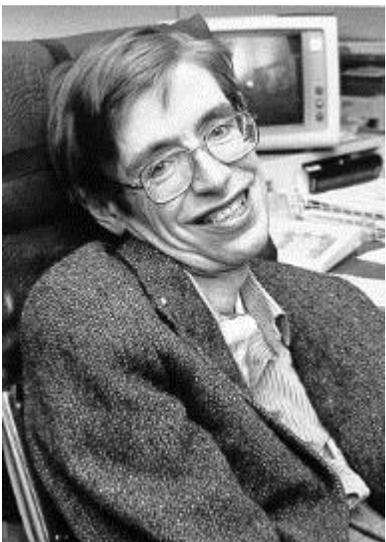
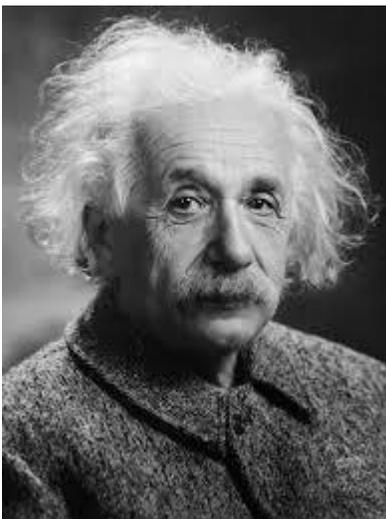
https://en.wikipedia.org/wiki/Stephen_Hawking#/media/File:Stephen_Hawking.StarChild.jpg

Credits for Big Bang Theory Photos (in worksheet and video):

CBS Networks. Jim Parsons as Sheldon Cooper. Digital image. CBS.com. Web.

CBS Networks. Sheldon and Cooper contemplate physics. Digital image. CBS.com. CBS Network, Web.

Who Are Physicists?



Worksheet: What is Physics?

Name _____

Date _____

Answer the following questions while watching the video:

1. What did the women say got them interested in physics? (list at least 2 reasons)

2. What are some of the things that the physicists in the video do? (list at least 2)

3. What advice do the women in the video have for future scientists?

4. What areas in science generally or physics specifically do you find interesting?

Homework: What is Physics?

Name _____

Date _____

1. What is the field of physics you are researching?

2. How are scientists making discoveries in this part of physics? For example, are they conducting experiments or making models or doing calculations? (Answer in complete sentences.)

3. Find the names of some scientists that work in this area. (List the names and locations.)

Describe what one of them is working on and why it is important for the field. (Answer in complete sentences.)

4. What would you ask of someone that works in this field? (Answer in a complete sentence.)
