

UCF RET Site: Research Experiences in Computer Vision and Bio-Medical Imaging Lesson/Unit Plan

AP Physics 1

2018

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AP Physics 1

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READ THIS FIRST

- Write all lessons and activities in present tense.
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- Remember to do your 3R reflection include and updated copy of your lesson plan, developed assessment tools, presentation materials, to the evaluator. See implementation plan instructions developed by the evaluator. Send within a week after completing the lesson to bonnie.swan@ucf.edu

RET Site: Research Experiences in Computer Vision and Bio-Medical Imaging Lesson/Unit Plan

Course(s): AP Physics
Grade Level: 10-12
Suggested Length of Lesson: 3 days

Materials/Technology Needed:
- Printed Materials
- Power points
- Teacher Computer
- Projector

Where this Fits:
- To be used in AP Physics 1
- All days- After Waves and Doppler Effect unit.
  - Relates to Forces, Torques, Waves and Doppler Effect.

Lesson Objective(s)/Learning Goal(s):

Big Idea 3: The interactions of an object with other objects can be described by forces.
- 3.A.2.1: The student is able to represent forces in diagrams or mathematically using appropriately labeled vectors with magnitude, direction, and units during the analysis of a situation. [SP 1.1]
- 3.A.3.1: The student is able to analyze a scenario and make claims (develop arguments, justify assertions) about the forces exerted on an object by other objects for different types of forces or components of forces. [SP 6.4, 7.2]
- 3.F.1.2: The student is able to compare the torques on an object caused by various forces. [SP 1.4]
- 3.F.1.5: The student is able to calculate torques on a two-dimensional system in static equilibrium, by examining a representation or model (such as a diagram or physical construction). [SP 1.4, 2.2]

BIG IDEA 6: Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.
- 6.B.5.1: The student is able to create or use a wave front diagram to demonstrate or interpret qualitatively the observed frequency of a wave, dependent upon relative motions of source and observer. [SP 1.4]

Standard(s)/Benchmark(s) Addressed:

Science Practice 1 - The student can use representations and models to communicate scientific phenomena and solve scientific problems.
- The student can create representations and models of natural or man–made phenomena and systems in the domain.
- 1.2 The student can describe representations and models of natural or man–made phenomena and systems in the domain.
- 1.3 The student can refine representations and models of natural or man–made phenomena and systems in the domain.
- 1.4 The student can use representations and models to analyze situations or solve problems qualitatively and quantitatively.
- 1.5 The student can reexpress key elements of natural phenomena across multiple representations in the domain.

Science Practice 3 - The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.
- *3.1 The student can pose scientific questions.*
- *3.2 The student can refine scientific questions.*
- *3.3 The student can evaluate scientific questions.*

Science Practice 5 - The student can perform data analysis and evaluation of evidence.
- 5.1 The student can analyze data to identify patterns or relationships.
- 5.2 The student can refine observations and measurements based on data analysis.
- 5.3 The student can evaluate the evidence provided by data sets in relation to a particular scientific question.

Science Practice 6 - The student can work with scientific explanations and theories.

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6.1 The student can justify claims with evidence.
6.2 The student can construct explanations of phenomena based on evidence produced through scientific practices.
6.3 The student can articulate the reasons that scientific explanations and theories are refined or replaced.
6.4 The student can make claims and predictions about natural phenomena based on scientific theories and models.
6.5 The student can evaluate alternative scientific explanations.

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<tr><td>Standards for Mathematical Practice:
Science Practice 2 - The student can use mathematics appropriately.

2.1 The student can justify the selection of a mathematical routine to solve problems.
2.2 The student can apply mathematical routines to quantities that describe natural phenomena.
2.3 The student can estimate numerically quantities that describe natural phenomena.

</td><td rowspan="2">Instructional Strategies:

Guided Reading
Group Discussion
Small group white board
Practice problems
AP Style Prompt

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<tr><td>Evidence of Learning (Assessment Plan):

Student generated responses to the AP Style question based on information they were just presented and previous knowledge on experimental design.

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<tr><td colspan="2">Description of Lesson Activity/Experiences:

Day One – Bridges Buy in
1. Bell work: Bridge Torque equilibrium problems
2. Article: “Bridges” with guided reading questions
3. Group discussion with leading questions- White boards
4. PPT on current state of bridges in the US with video clips embedded

Day Two – Modern Physics application
1. Bell work: Doppler Effect problems
2. Recap discussion about bridges
3. Ppt on Raman scattering and modern physics
4. AP Style Prompt-Raman Scattering Experimental Design Question
5. Discussion of UCF Research

Day Three – Computer Vision Tie In
1. Bell work: Student response on computers and physics (how important/uses/etc)
2. Recap
3. Student activity</td></tr>
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4. Computer vision demo
5. Computer vision ppt and video clips
6. Group Discussion

Recommended Assessment(s) and Steps

- Day one - small group white board responses as formative assessment
- Day two - AP style experimental design question
- Day three – Reflection exit ticket

List of Materials/Resources Used

- Power Points
- Article with guided reading questions
- Whiteboards
- Sample pictures
- Gridded transparencies
- AP Physics FRQ

Important Vocabulary

Term	Definition
Raman Effect	A change of wavelength exhibited by some of the radiation scattered in a medium.
Raman Spectroscopy	The measurement of the wavelength and intensity of inelastically scattered light from molecules.
Structural Deficiency	Bridges that require significant maintenance, rehabilitation, or replacement. These bridges must be inspected at least every year since critical load-carrying elements were founds to be in poor condition due to deterioration or damage.
Functionally obsolete	Bridges that do not meet current engineering standards, such as narrow lanes or low load-carrying capacity. A bridge that is both structurally deficient and functionally obsolete is only counted as structurally deficient**.**

Troubleshooting Tips

Add anything helpful here.

Other Helpful Information

Add anything helpful here.

Attachments

- Day 1 Folder
  - Bridges PowerPoint
  - Bridges Article
  - Guided reading questions and answers
  - Imbedded videos
- Day 2 Folder
  - Raman spectroscopy PowerPoint
  - AP Physics FRQ
  - Imbedded videos
- Day 3 Folder
  - Computer Vision PowerPoint
  - Imbedded Videos
  - Example Pictures for Student Activity
  - Pre/Post Survey

References

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