# Westbury High School
## Science Department Lesson Plan

***A merger of Madeline Hunter's Lesson Cycle and the 5-E Method of Instruction***

***Teacher:*** *C. Williams* ***Subject:*** *Physics*

***Date:*** *02/16 - 02/20/2015* ***Lesson:*** *Wave Properties*

**Defining Success**

**LESSON OBJECTIVE:** What will your students be able to do by the end of the class?

Students will investigate and interpret a variety of waves, their characteristics, and properties such as velocity, amplitude, frequency, and wavelength. Students also calculate wave speed, frequency, and wavelength of different types of waves. Students will continue to investigate and calculate with the work-energy theorem in various situations and investigate examples of kinetic and potential energy and their transformations. After calculating momentum and energy in various situations, students demonstrate and apply the laws of conservation of energy and momentum.

**ESSENTIAL UNDERSTANDING/GUIDING QUESTIONS:**

1. **What are waves?**
2. **How do transverse and longitudinal waves compare?**
3. **What is simple harmonic motion?**
4. **How are wave speed, wavelength and frequency related?**
5. **What affects a pendulums period?**

| **STANDARDS ADDRESSED:** TEKS, ELPs and CCRS's. | **MISCELLANEOUS INFORMATION** Marzano's Strategies, key concepts or questions |
|---|---|

*READINESS AND SUPPORTING STANDARDS*

Ⓢ **PHYS.7A** Examine and describe oscillatory motion and wave propagation in various types of media.

Ⓡ **PHYS.7B** Investigate and analyze characteristics of waves including velocity, frequency, amplitude, and wavelength and calculate using the relationship between wave speed, frequency, and wavelength.

Ⓡ **PHYS.7D** Investigate behaviors of waves including reflection, refraction, diffraction, interference, resonance, and the Doppler effect.

Ⓡ **PHYS.6A** Investigate and calculate with the work-energy theorem in various situations.

Ⓡ **PHYS.6B** Investigate examples of kinetic and potential energy and their transformations.

Ⓡ **PHYS.6C** Calculate the mechanical energy of, power generated within, impulse applied to, and momentum of a physical system.

Ⓡ **PHYS.6D** Demonstrate and apply the laws of conservation of energy and conservation of momentum in one dimension.

*PROCESS SKILLS*

Ⓕⓢ **PHYS.2E** Design and implement investigative procedures including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness.

Ⓕⓢ **PHYS.2F** Demonstrate the use of course apparatus, equipment, techniques, and procedures.

Ⓕⓢ **PHYS.2G** Use a wide variety of additional course apparatuses, equipment, techniques, materials, and procedures as appropriate.

Ⓕⓢ **PHYS.2H** Make measurements with accuracy and precision and record data using scientific notation and International System (SI) units.

Ⓕⓢ **PHYS.2J** Organize and evaluate data and make inferences from data including the use of tables, charts, and graphs.

Ⓕⓢ **PHYS.2K** Communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.

Ⓕⓢ **PHYS.2L** Express and manipulate relationships among physical variables quantitatively including the use of graphs, charts, and equations.

*ENGLISH LANGUAGE PROFICIENCY STANDARDS*

**ELPS C.1.a** Use prior knowledge and experiences to understand meanings in English.

**ELPS C.2.f** Listen to and derive meaning from a variety of media such as audio, video, DVD, and CD-ROM to build and reinforce concept and language attainment.

**ELPS C.3.f** Ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments.

ELPS C.1.d Speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known).

ELPS C.2.g Understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar.

ELPS C.3.g Express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics.

*COLLEGE AND CAREER READINESS STANDARDS*

**CCRS VIII.D.1** Understand potential and kinetic energy.

**CCRS VIII.D.2** Understand conservation of energy.

**CCRS VIII.D.3** Understand the relationship of work and mechanical energy.

**CCRS VIII.C.3** Understand the concept of momentum

Collaborative Grouping

Making hypothesizes

How do I measure physical quantities to be able to calculate the distance traveled, displacement, speed and velocity of a moving object?

**Lesson Cycle**

**ANTICIPATORY SET:** ***(ENGAGE):*** A "hook" to get the students interest and attention. *(A question, picture, 2-3 minute long video clip, a demonstration).*

**M/T:** **Do Now** (Connected to previous homework - designed to engage incoming students quickly with today's academic content.)

**W/Th:** **Do Now** (Connected to previous homework - designed to engage incoming students quickly with today's academic content.)

**Fr:** **Do Now** (Connected to previous homework - designed to engage incoming students quickly with today's academic content.)

| Checks for Understanding | | |
|---|---|---|
| Oral / Written Debrief | Connect Correct Collect | Student Leadership |

**TEACHING/INSTRUCTIONAL PROCESS:** ***(EXPLORE/EXPLAIN)*****:** *Provide students with a common experience (Labs, hands on activities). Debrief activity, teach concept.*

**M/T:** **Activity** - Students begin to explore essential question (In pairs, triads and quads, students debrief/teach concept facilitated by teacher)

**W/Th:** **Activity** - Students begin to explore essential question (In pairs, triads and quads, students debrief/teach concept facilitated by teacher)

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| Checks for Understanding | | |
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| Oral / Written Debrief | Guiding / Essential Questions | Student Leadership |

**GUIDED PRACTICE AND MONITORING: (EXPLAIN).** Interactive discussions between teacher and students. Guide/help students as they solve problems and/or answer questions. Clarify misconceptions and check for understanding.

**M/T:** **Mini Lesson** – Interactive Teacher-Student *open discussion* (facilitated by multimedia, worksheets, and educational technology tools) that validates student knowledge and skill and uncovers and clarifies misconceptions and misunderstandings. (Prepares students to produce products)

**W/Th:** **Mini Lesson** – Interactive Teacher-Student *open discussion* (facilitated by multimedia, worksheets, and educational technology tools) that validates student knowledge and skill and uncovers and clarifies misconceptions and misunderstandings. (Prepares students to produce products)

**Fr:** **Mini Lesson** – Interactive Teacher-Student *open discussion* (facilitated by, multimedia. worksheets, and educational technology tools) that validates student knowledge and skill and uncovers and clarifies misconceptions and misunderstandings. (Prepares students to produce products)

**INDEPENDENT PRACTICE:** ***(ELABORATE)*** Students apply the information learned in the Explain to answer questions or solve problems.

**MATERIALS**

HUB
- Resources
- Activities

SmartBoard™

Meter sticks

Stopwatches

Masking tape

Graph paper

Camera

Tennis ball

Logger Pro™

PPT

Whiteboards

Dry Erase Marker

| | | |
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| | **M/T:** **Student Product** - Students apply knowledge and skills to an authentic task. (In pairs, triads and quads, students support each others learning – products are informally/formally assessed by teacher)<br>**W/Th:** **Student Product** - Students apply knowledge and skills to an authentic task. (In pairs, triads and quads, students support each others learning – products are informally/formally assessed by teacher)<br>**Fr:** **Student Product** - Students apply knowledge and skills to an authentic task. (In pairs, triads and quads, students support each others learning. | |
| | **EVALUATE:** Assess student mastery. (Quizzes, Lab Reports, Unit tests) | |
| | **M/T:** **Assessment** - Students products are assessed for mastery informally and formally by teacher (Completion of activity sheet, presentation, and/or exit ticket)<br>**W/Th:** **Assessment** - Students products are assessed for mastery informally and formally by teacher (Completion of activity sheet, presentation, and/or exit ticket)<br>**Fr:** **Assessment** - Students products are assessed for mastery informally and formally by teacher (Completion of activity sheet, presentation, and/or exit ticket) | |

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***A merger of Madeline Hunter's Lesson Cycle and the 5-E Method of Instruction***

***Teacher:*** *C. Williams* ***Subject:*** *Physics*

***Date:*** *02/23 -27/2015* ***Lesson:*** *Sound*

**Defining Success**

**LESSON OBJECTIVE:** What will your students be able to do by the end of the class?

The focus of this unit is on investigating characteristics and behaviors of longitudinal waves such as sound waves.

**ESSENTIAL UNDERSTANDING / GUIDING QUESTIONS:**

1. What properties do sound waves share with other waves?
2. How do the physical properties of sound waves relate to our perception of sound?
3. How are waves reflected and refracted at boundaries between mediums?
4. What is the principle of superposition?

| **STANDARDS ADDRESSED:** TEKS, ELPs and CCRS's. | **MISCELLANEOUS INFORMATION** Marzano's Strategies, key concepts or questions |
|---|---|

*READINESS AND SUPPORTING STANDARDS*

Ⓢ **PHYS.7C** Compare characteristics and behaviors of transverse waves including electromagnetic waves and the electromagnetic spectrum ***and characteristics and behaviors of longitudinal waves including sound waves.***

Ⓡ **PHYS.7D** Investigate behaviors of waves including reflection, refraction, diffraction, interference, resonance, and the Doppler effect.

*PROCESS SKILLS*

Ⓟⓢ **PHYS.2E** Design and implement investigative procedures including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness.

Ⓟⓢ **PHYS.2J** Organize and evaluate data and make inferences from data including the use of tables, charts, and graphs.

Ⓟⓢ **PHYS.2K** Communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.

*ENGLISH LANGUAGE PROFICIENCY STANDARDS*

**ELPS C.1.d** Speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known).

**ELPS C.2.g** Understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar.

**ELPS C.3.g** Express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics.

**ELPS C.1.c** Use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary.

**ELPS C.4.f** Use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language.

**ELPS C.5.f** Write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired.

*COLLEGE AND CAREER READINESS STANDARDS*

**CCRS VIII.C.3** Understand the concept of momentum.

**CCRS VIII.D.2** Understand conservation of energy.

**CCRS VIII.A.2** Understand states of matter and their characteristics.

**CCRS VIII.H.1** Understand the gain and loss of heat energy in matter.

**CCRS VIII.H.2** Understand the basic laws of thermodynamics.

Collaborative Grouping

Making hypothesizes

How do I measure physical quantities to be able to calculate the distance traveled, displacement, speed and velocity of a moving object?

Lesson Cycle

**ANTICIPATORY SET:** ***(ENGAGE):*** A "hook" to get the students interest and attention. *(A question, picture, 2-3 minute long video clip, a demonstration).*

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| Checks for Understanding | | |
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| Oral / Written Debrief | Connect Correct Collect | Student Leadership |

**TEACHING/INSTRUCTIONAL PROCESS:** ***(EXPLORE/EXPLAIN)*****:** *Provide students with a common experience (Labs, hands on activities). Debrief activity, teach concept.*

**M/T:** **Activity** - Students begin to explore essential question (In pairs, triads and quads, students debrief/teach concept facilitated by teacher)

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**GUIDED PRACTICE AND MONITORING: (EXPLAIN).** Interactive discussions between teacher and students. Guide/help students as they solve problems and/or answer questions. Clarify misconceptions and check for understanding.

**M/T:** **Mini Lesson** – Interactive Teacher-Student *open discussion* (facilitated by multimedia, worksheets, and educational technology tools) that validates student knowledge and skill and uncovers and clarifies misconceptions and misunderstandings. (Prepares students to produce products)

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**INDEPENDENT PRACTICE:** ***(ELABORATE)*** Students apply the information learned in the Explain to answer questions or solve problems.

**MATERIALS**

HUB
- Resources
- Activities

Meter sticks

Stopwatches

Masking tape

Graph paper

Camera

Logger Pro™

Multimedia

Whiteboards

Dry Erase Marker

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***Teacher:*** *C. Williams* ***Subject:*** *Physics*

***Date:*** *03/02 -06/2015* ***Lesson:*** *Electromagnetic Waves*

**Defining Success**

**LESSON OBJECTIVE:** What will your students be able to do by the end of the class?

Students investigate characteristics and behaviors of transverse waves such as electromagnetic waves and investigate and describe the role of wave characteristics in a variety of medical and industrial applications such as mirrors, lenses, and fiber optics.

**ESSENTIAL UNDERSTANDING / GUIDING QUESTIONS:**

- The amount of heat energy added to a system is equal to the increase in the internal energy of the system plus the work done by the system.
  1. How is the first law of thermodynamics expressed mathematically?
  2. Why is the first law of thermodynamics related to the law of conservation of energy?
- Natural processes go in a direction that maintains or increases the total entropy of the universe.
  1. How does the second law of thermodynamics predict that heat flows spontaneously from an object of higher temperature to an object of lower temperature?
  2. Why must some energy always be transferred as heat to a system's surroundings?
- Heat energy transfers by conduction, convection, and radiation resulting in an increasing amount of disorder.
  5. How are the processes of conduction, convection, and radiation similar and how are the different?
  6. Why does transfer of heat energy result in an increasing amount of disorder?

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*READINESS AND SUPPORTING STANDARDS*

Ⓢ **PHYS.7C** ***Compare characteristics and behaviors of transverse waves including electromagnetic waves and the electromagnetic spectrum*** and characteristics and behaviors of longitudinal waves including sound waves.

Ⓡ **PHYS.7D** Investigate behaviors of waves including reflection, refraction, diffraction, interference, resonance, and the Doppler effect.

Ⓢ **PHYS.7E** Describe and predict image formation as a consequence of reflection from a plane mirror and refraction through a thin convex lens.

Ⓢ **PHYS.7F** Describe the role of wave characteristics and behaviors in medical and industrial applications.

*PROCESS SKILLS*

Ⓟⓢ **PHYS.2E** Design and implement investigative procedures including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness.

Ⓟⓢ **PHYS.2J** Organize and evaluate data and make inferences from data including the use of tables, charts, and graphs.

Ⓟⓢ **PHYS.2K** Communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.

Ⓟⓢ **PHYS.3E** Research and describe the connections between physics and future careers.

*ENGLISH LANGUAGE PROFICIENCY STANDARDS*

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*COLLEGE AND CAREER READINESS STANDARDS*

**CCRS VIII.A.2** Understand states of matter and their characteristics.

**CCRS VIII.H.1** Understand the gain and loss of heat energy in matter.

**CCRS VIII.H.2** Understand the basic laws of thermodynamics.

**CCRS VIII.G.1** Understand basic oscillatory motion and simple harmonic motion.

**CCRS VIII.G.2** Understand the difference between transverse and longitudinal waves.

**CCRS VIII.G.3** Understand wave terminology: wavelength, period, frequency, and amplitude

Collaborative Grouping

Making hypothesizes

How do I measure physical quantities to be able to calculate the distance traveled, displacement, speed and velocity of a moving object?

**Lesson Cycle**

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| Checks for Understanding | | |
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| Student Products | Connect Correct Collect | Student Leadership |

**INDEPENDENT PRACTICE:** ***(ELABORATE)*** Students apply the information learned in the Explain to answer questions or solve problems.

**MATERIALS**

SmartBoard™

Constant velocity cars (Tumble Buggies)

Meter sticks

Stopwatches

Masking tape

Graph paper

Camera

Tennis ball

Logger Pro™

PPT

Whiteboards

Dry Erase Marker

Launcher
Water Balloons
Tape Measure

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