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: *01/06 -13/2015* ***Lesson:*** *Work-Energy Theorem*

Defining Success

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

Students will be able to calculate mechanical energy of and the power generated within a physical system. Students will also be able to investigate and calculate with the work-energy theorem in various situations and investigate examples of kinetic and potential energy and their transformations.

ESSENTIAL UNDERSTANDING/GUIDING QUESTIONS:

- Mechanical energy can be transformed from one form into another, transferred from one object to another, or redistributed between the objects of the system by means of mechanical work done by the forces within or from outside the system.
  1. How do gravitational and elastic forces change the mechanical energy of the system?
  2. How do frictional forces change the mechanical energy of the system?
  3. What is the work-energy theorem and why is it related to kinetic energy?
- The sum of the kinetic and potential energy of an object results in mechanical energy.
  1. What are examples of the different forms of kinetic and potential energy?
  2. What is mechanical energy and why is it related to the law of conservation of energy?

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

READINESS AND SUPPORTING STANDARDS

Ⓡ **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.

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.

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.

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.)

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)

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

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.

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)

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)

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

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

		formally by teacher (Completion of activity sheet, presentation, and/or exit ticket) **W/Th:** **Assessment** - Students products are assessed for mastery informally and formally by teacher (Completion of activity sheet, presentation, and/or exit ticket) **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: *01/14 -26/2015* ***Lesson:*** *Conservation of Momentum & Energy*

Defining Success

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

Students will demonstrate and apply laws of conservation of momentum and energy.

ESSENTIAL UNDERSTANDING / GUIDING QUESTIONS:

- The law of conservation of momentum states that if no external force is acting on a system, the total momentum of the system remains unchanged.
  1. What is the law of conservation of momentum and how is it expressed mathematically?
  2. What is the difference between an elastic collision and an inelastic collision?
  3. Why does the total momentum of a system remain unchanged?
- The law of conservation of energy states that the total energy of a closed system remains constant.
  1. How is energy conserved in a closed system?
  2. Why is conservation of energy related to conservation of momentum?

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

READINESS AND SUPPORTING STANDARDS

Ⓡ **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.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.

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.

COLLEGE AND CAREER READINESS STANDARDS

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

CCRS VIII.D.2 Understand conservation of energy.

Collaborative Grouping

Making hypothesizes

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