Westbury High School
Science Department Lesson Plan

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

Teacher: *Boyd, Coleman, Greiner, Williams, Saidy* ***Subject:*** *Physics*

Date: *10/13-17/2014 and 10/20-24/2014* ***Lesson:*** *Forces and Laws of Motion*

Defining Success

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

Students describe the effect of forces on the motion of objects. Students calculate the effect of forces including the law of inertia, the relationship between force, mass, and acceleration, and effect of forces. Students will also review kinematic equations to describe motion in one dimension including speed, velocity, distance, displacement, and acceleration. Students will use their knowledge developed from free fall motion covered earlier in analyzing motion in one dimensional lessons to study gravitational force.

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

READINESS AND SUPPORTING STANDARDS

Ⓡ **PHYS.4A** Generate and interpret graphs and charts describing different types of motion including the use of real-time technology such as motion detectors and photogates.

Ⓡ **PHYS.4B** Describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, average velocity, instantaneous velocity, and acceleration.

Ⓢ **PHYS.4F** Identify and describe motion relative to different frames of reference.

Ⓢ **PHYS.5A** Research and describe the historical development of the concepts of gravitational, electromagnetic, weak nuclear, and strong nuclear forces.

Ⓡ **PHYS.5B** Describe and calculate how the magnitude of the gravitational force between two objects depends on their masses and the distance between their centers.

Ⓡ **PHYS.4D** Calculate the effect of forces on objects including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects.

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.e** Use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language.
* **ELPS.C.3.e** Share information in cooperative learning interactions.
* **ELPS.C.1.b** Monitor oral and written language production and employ self-corrective techniques or other resources.
* **ELPS.C.2.b** Recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters.

COLLEGE AND CAREER READINESS STANDARDS

* **CCRS II.A.2** Use exponents and scientific notation.
* **CCRS II.F.1** Select and use appropriate Standard International (SI) units and prefixes to express measurements for real world problems.
* **CCRS II.F.2** Use appropriate significant digits.
* **CCRS VIII.C.1** Understand the fundamental concepts of kinematics.

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 PPT, 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 PPT, 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 PPT, 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

		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)	