TITLE: Secondary Science Grade 8 Model Lessons

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Secondary Chief Instructional Officer

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ROUTING
Local District Superintendents
Local District Administrators of Instruction
Local District Secondary Science Personnel
Middle School Principals
Middle School Assistant Principals
Middle School Department Chairpersons
UTLA Chapter Chairpersons
Middle School Science Coordinators
Middle School Science Lead Teachers
8th Grade Science Teachers

POLICY: To ensure that all Los Angeles Unified School District 8th grade science students have access to a rigorous science standards-based education that enables them to meet District and state requirements and prepare for A-G high school instruction, the Los Angeles Unified School District will implement science model lesson sequences for use in all Grade 8 science classrooms as the intended curriculum in the 2007-2008 school year.

PURPOSE: This Bulletin identifies three science model lesson sequences, professional development support, instructional support, and resources for Science 8A (36-01-05) and Science 8B (36-01-06).

BACKGROUND: The science model lessons are based on research-based practices and student data from the 2006-2007 school year. They provide the content and rigor to meet grade level content standards. The lessons were co-developed with district science teachers, local and national college professors, industry partners, and district science leadership in 2006-2007. These lessons were then piloted in selected schools representative of each Local District for additional feedback and revision based on teacher feedback. The focus of the lessons will help prepare students for periodic assessments and the 8th grade science California Standards Test (CST). Besides providing rigorous standards based content, the science model lessons provide examples that teachers should use for planning, implementing, and assessing the 8th grade science curriculum across the year. 8th grade teachers will receive training from their Local District secondary science personnel. These grade level science model lessons are core to the intended District curriculum for all students enrolled in Science 8A and Science 8B. Training and implementation will begin with all grade 8 teachers (three or more sections per day) in the 2007-2008 school year.

MODEL LESSONS:

The three model lesson sequences aligned to the District instructional guides to be implemented in all 8th grade science classes are as follows:

Component I: Science model lesson: Physics: *Forces and Motion*
Component II: Science model lesson: Chemistry: *Matter Matters*
Component III: Science model lesson: Astronomy*: The Stars*

PROFESSIONAL DEVELOPMENT/ INSTRUCTIONAL SUPPORT:

Training and implementation will begin with all grade 8 teachers (three or more sections per day) in the 2007-2008 school year. Each 8th grade science teacher will receive the printed lessons and all science instructional materials to implement in the classroom. The *Forces and Motion Lesson* professional development for 3 and 4 track year round schools, specifically for tracks B, C, and D, will commence in 2008. To ensure the effective implementation of the District science model lesson sequences for grade 8, each Local District Secondary Science personnel is responsible for delivering a minimum of two days of professional development for each lesson sequence. To support professional development, each Local District has been allocated resources to support implementation. Local Districts have been given an implementation guide for consideration (see ATTACHMENT A).

INTENDED CURRICULUM:

The science model lesson ensure that all students have access to rigorous standards based content by providing lessons in each component of the 8th Grade curriculum and are intended for usage in all 8th Grade Science Courses (See ATTACHMENT B). These lessons should be placed in the *Middle School Science Instructional Guide*. These lessons also provide teachers with examples on planning, implementing and assessing student learning which are intended for usage in the implementation of the 8th Grade Science curriculum. The lessons provide explicit connections to the 5 E instructional model (Roger Bybee, 1997), essential features of inquiry (National Research Council, 1999), and the standard(s) covered by each lesson. Moreover, the lessons call out explicit strategies that make science accessible to English Learners (Carr, 2006), Standard English Learners (SEL), and Students With Disabilities (SWD). The Local District Secondary Science personnel have research-based literature to support using graphic organizers, accessing prior knowledge, and key teaching strategies for creating instructional conversations among students and teachers. Cited instructional resources can be found in ATTACMENT C.

ASSISTANCE:

For assistance or further information, please contact Central Secondary Science Branch at (213) 241-6880 or your Local District Secondary Science personnel.

ATTACHMENT A

Grade 8 Model Lesson Professional Development Plan at Local Districts, 2007-08

Professional Development	Calendar	Proposed Dates for PD/Training	No. of PD Days	PD Facilitators	Implementation Considerations
Force & Motion	4T-Trk A	Sep 17 – 28, 2007*	2	**LD Science Staff** (supported by Central Science Staff and co-facilitated by Science Staff of other LDs, if available)	**PD Participants:** *All 8th grade science teachers* **PD Planning Logistics:** • LD Science Staff will plan, coordinate, and implement all Gr 8 Model Lesson (ML) Professional Development at LD • LD Science Staff will inform Science Branch (at least 21 days in advance) of all ML trainings, so that science materials (kits) can be delivered to LD for participants • Each ML PD requires 2 full-days **Funding and Science Materials:** • Each Local District will receive an allocation to provide training, on each of the 3 Grade 8 Model Lessons, for all 8th grade teachers • All science materials (kits) for each ML will be provided by Science Branch **Capacity:** • To help develop science leadership capacity, FT teachers, SLTs, & DCs should be encouraged to assume co-facilitation roles during PD **Other:** * Consider combining proposed dates to reduce total number of PDs necessary to train all teachers
	Traditional 3T-Trk A	Sep 24 – Oct 5, 2007*	2		
	3T-Trk B 3T-Trk C 4T-Trk B 4T-Trk C 4T-Trk D	SY 2008-09 (Year 2)			
Chemistry: ***Matter Matters***	3T-Trk C 4T-Trk B 4T-Trk D	Sep 4 – 14, 2007	2	**LD Science Staff** (supported by Central Science Staff and co-facilitated by Science Staff of other LDs, if available)	
	4T-Trk A 4T-Trk C	Oct 15 – 28, 2007*	2		
	Traditional 3T-Trk A	Oct 22 – Nov 2, 2007*	2		
	3T-Trk B	Nov 5 – 16, 2007	2		
Astronomy: ***The Stars***	3T-Trk B 3T-Trk C 4T-Trk B 4T-Trk C 4T-Trk D	Jan 14 – 25, 2008	2	**LD Science Staff** (supported by Central Science Staff and co-facilitated by Science Staff of other LDs, if available)	
	Traditional	Jan 29 – Feb 29, 2008	2		
	4T-Trk A	Mar 3 – 14, 2008*	2		
	3T-Trk A	Mar 10 – 21, 2008*	2		

ATTACHMENT B

Science 8 AB	
Annual Course—Grade 8	
Prerequisite: None	
36-01-05	**SCIENCE 8A**
36-01-06	**SCIENCE 8B**

Course Description: The major purpose of this course is to provide all students with science concepts and ideas that build upon the students' K–7 experience. Emphasis should be placed on Investigation and Experimentation and the Science Standards. This course is planned to help students gain the knowledge and skills necessary for leading a successful and productive life in a technological society and to give them the foundation for future science studies that will enable them to become scientifically literate citizens. The middle school teacher uses a balanced (inquiry/text) approach and establishes connections between the various disciplines of Earth/Space Science, Physical Science, and Life Science with an emphasis on Physical Science in this introductory secondary science course. Inter-connections with other curricular areas are also made.

COURSE SYLLABUS

Instructional Component 1

Standard Set 1: Motion -*The velocity of an object is the rate of change of its position. As a basis for understanding this concept:*

1a. *Students know* position is defined in relation to some choice of a standard reference point and a set of reference directions.

1b. *Students know* that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.

1c. *Students know* how to solve problems involving distance, time, and average speed.

1d. *Students know* the velocity of an object must be described by specifying both the direction and the speed of the object.

1e. *Students know* changes in velocity may be due to changes in speed, direction, or both.

1f. *Students know* how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.

Standard Set 2: Forces--*Unbalanced forces cause changes in velocity. As a basis for understanding this concept:*

2a. *Students know* a force has both direction and magnitude.

2b. *Students know* when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.

2c. *Students know* when the forces on an object are balanced, the motion of the object does not change.

2d. *Students know* how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.

2e. *Students know* that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).

2f. *Students know* the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.

Standards set 8: Density and Buoyancy - *All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:*

8a. *Students know density is mass per unit volume.*

8b. *Students know* how to calculate the density of substances (regular and irregular solids and liquids)

from measurements of mass and volume.
8c. *Students know* the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.
8d. *Students know* how to predict whether an object will float or sink.
Standard Set 9: Investigation and Experimentation - *Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.*
9a. Plan and conduct a scientific investigation to test a hypothesis.
9b. Evaluate the accuracy and reproducibility of data.
9c. Distinguish between variable and controlled parameters in a test.
9d. Recognize the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.
9e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
9f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance / time, density = mass / volume, force = pressure x area, volume = area x height).
9g. Distinguish between linear and nonlinear relationships on a graph of data.

Instructional Component 2
Standard Set 3: Structure of Matter - *Each of the more than 10 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:*
3a. Students know the structure the atom and know it is composed of protons, neutrons and electrons.
3b. Students know that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.
3c. Students know atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.
3d. Students know the states of matter (solid, liquid, gas) depend on molecular motion.
3e. Students know that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.
3f. Students know how to use the periodic table to identify elements in simple compounds.
Standard Set 5: Reactions - *Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept,:*
5a. Students know reactant atoms and molecules interact to form products with different chemical properties.
5b. Students know the idea of atoms explains the conservation of matter. In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
5c. Students know chemical reactions usually liberate heat or absorb heat.
5d. Students know physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
5e. Students know how to determine whether a solution is acidic, basic, or neutral.
Standard Set 7: Periodic Table - *The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:*
7a. Students know how to identify regions corresponding to metals, nonmetals, and inert gases.
7b. Students know each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.
7c. Students know substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.

Standard Set 9: Investigation and Experimentation - *Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.*
9a. Plan and conduct a scientific investigation to test a hypothesis.
9b. Evaluate the accuracy and reproducibility of data.
9c. Distinguish between variable and controlled parameters in a test.
9d. Recognize the slope of the linear graph as the constant in the relationship y =kx and apply this principle in interpreting graphs constructed from data.
9e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
9f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance / time, density = mass / volume, force = pressure x a rea, volume = area x height).
9g. Distinguish between linear and nonlinear relationships on a graph of data.

Instructional Component 3:
Standard Set 6: Chemistry of Living Systems (Life Science) - *Principles of chemistry underlie the functioning of biological systems.*
6a. *Students know* that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.
6b. *Students know* that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.
6c. *Students know* that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.
Standard Set 2: Forces – *Unbalanced forces cause changes in velocity.*
2g. *Students know* the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.
Standard Set 4: Earth in the Solar System (Earth Science) - *The structure and composition of the universe can be learned from studying stars and galaxies and their evolution.*
4e. *Students know* the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.
4d. *Students know* that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.
4c. *Students know* how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.
4b. *Students know* that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color.
4a. *Students know* galaxies are clusters of billions of stars and may have different shapes.
Standard Set 9: Investigation and Experimentation - *Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.*
9a. Plan and conduct a scientific investigation to test a hypothesis.
9b. Evaluate the accuracy and reproducibility of data.
9c. Distinguish between variable and controlled parameters in a test.
9d. Recognize the slope of the linear graph as the constant in the relationship *y =kx* and apply this principle in interpreting graphs constructed from data.
9e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
9f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression,

given the two remaining terms (including speed = distance / time, density = mass / volume, force = pressure xare a, volume = area x height).
9g. Distinguish between linear and nonlinear relationships on a graph of data.

Representative Performance Outcomes and Skills

In accordance with their individual capacity, students will grow in the ability to:

- Use science process skills such as observing, communicating, comparing, ordering, categorizing, relating, inferring, and applying.
- Demonstrate skills in the area of speaking, listening, writing, reading, graphing and mathematics.
- Demonstrate the connections between Earth/Space Science, Physical Science, Life Science and Health.
- Demonstrate the interdisciplinary connections between the sciences and other curricular areas.
- Communicate the steps and results of investigations in written and oral presentations.
- Identify evidence that supports or opposes a proposed explanation or event.
- Investigate current significant scientific issues.
- Apply scientific inquiry and problem solving techniques projects and investigations.
- Use the metric system, scientific equipment, and technology properly to make quantitative measurements.
- Understand the significance of historical and current contributions of major scientists.
- Evaluate humans' responsibility toward the Earth's natural resources.
- Establish the relevance of science and its applications to careers and real-life situations.
- Evaluate the contributions of science and technology and their relevance to improving our daily lives in preparation for the future.
- Use community resources

Assessments

Instruction in our district is assessment-driven. The Framework states "that effective science programs include continual assessment of student's knowledge and understanding, with appropriate adjustments being made during the academic year (p.11)."[1] Assessments can be on demand or over a long period of time. The District Periodic Assessments and STAR State Testing play a significant role in Student Assessments.

The chart below, adapted from *A Guide for Teaching and Learning*, NRC (2000), gives some examples of on demand and over time assessment.

On Demand → Over Time			
answering questions multiple choice true false matching Periodic Assessments California Standards Tests	constructed response, essays	investigations, immersion projects research reports	portfolios, journals lab notebooks projects

Chart 1 - Assessment Examples

Texts/Materials

- LAUSD *Science Instructional Guide for Middle School Grades 6 – 8*
- *Science Framework for California Public Schools*
- State Adopted Textbooks and ancillary materials
- *Science Safety Handbook for California Public Schools*
- Appropriate science laboratory materials

ATTACHMENT C

CITED INSTRUCTIONAL RESOURCES

Bybee, R.W. (1997). *Achieving scientific literacy*: *From purposes to practices*. Portsmouth, NH: Hienemann.

Carr, J. et. al. (2006). *Making Science Accessible to English Learners: A guidebook for teachers*. San Francisco: WestEd Publications.

Los Angeles Unified School District Science Branch. (2004*). Middle School Science Instructional Guides*.

National Resource Council. (1999). *How people learn: Bridging research and practice.* Washington D.C.: National Academies Press. [See also NRC's *How students learn: History, mathematics, and science in the classroom* (2005).]