2014 Summary of Key Evidence for UCORE
Science Literacy Concept Inventory Pilot - Spring 2014
Prepared by the Office of Assessment of Teaching and Learning (ATL)

Background

Citizen-level science literacy involves being able to use scientific reasoning, assess the quality of sources of scientific information, understand the nature of scientific evidence and processes, and recognize how science literacy affects everyday life. WSU includes scientific literacy as one of its Seven Learning Goals for all undergraduates.

WSU's Science Literacy Goal and Outcomes of the Bachelor's Degree

Goal: Graduates will have a basic understanding of major scientific concepts and processes required for personal decision-making, participation in civic affairs, economic productivity and global stewardship.

Outcomes:

1. Identify scientific issues underlying global, national, local and personal decisions and communicate positions that are scientifically and technologically informed.
2. Evaluate the quality of scientific and health-related information on the basis of its source and the methods used to generate it.
3. Pose and evaluate arguments based on evidence and apply conclusions from such arguments appropriately.
4. Recognize the societal benefits and risks associated with scientific and technological advances.

Science Literacy Concept Inventory (SLCI)

The SLCI measures the degree to which students recognize science as a way of knowing and employ science's framework of reasoning under circumstances that a citizen may encounter in everyday life. SLCI was developed by a multi-disciplinary team, which distilled science literacy to twelve core concepts. Concepts and questions do not require specific knowledge in any science discipline, making it appropriate for any student regardless of major.

12 Concepts in the Science Literacy Concept Inventory:

1. Science explains physical phenomena based upon *testable* information about the physical world.
2. In modern life, science *literacy* is important to both personal and collective decisions that involve science content and reasoning.
3. *Doubt* plays necessary roles in advancing science.
4. Scientists use *evidence-based reasoning* to select which among several competing working hypotheses best explains a physical phenomenon.
5. A *theory* in science is a unifying explanation for observations that result from testing several hypotheses.
6. *Peer review* generally leads to better understanding of physical phenomena than can the unquestioned conclusions of involved investigators.
7. Science can test certain kinds of hypotheses through controlled *experiments*.
8. All science rests on fundamental assumptions about the *physical world*.
9. Science differs from *technology*.
10. Scientific knowledge is *discovered*, and some discoveries require an important history.
11. Science employs *modeling* as a method for understanding the physical world.
12. Scientific knowledge imparts power that must be used *ethically*.

Spring 2014 Results

Context: A total of 14 instructors in 15 science courses participated in a pilot to measure science literacy using the SLCI. The results represented in this section are the highest overall score of all unique individual students (1470 students) who submitted the SLCI in the Spring 2014 semester. The results reported are not longitudinal, but represent a cross-section of students.

Science Literacy Concept Scores: Seniors scored higher than freshmen on all twelve science literacy concepts (Table 1). This difference was true of both science majors and non-majors.

Table 1

SLCI Average Score by Concept, Class Rank, and Major Spring 2014, All Unique Participants (N=1470)					
Science Literacy Concept	**Percent Correct Responses on SLCI**				
	Freshman Non-Science Major	**Freshman Science Major**	**Senior Non-Science Major**	**Senior Science Major**	**Overall: All Majors/ Levels**
1. Science explains physical phenomena based upon testable information about the physical world.	64%	70%	83%	84%	71%
2. In modern life, science literacy is important to both personal and collective decisions that involve science content and reasoning.	60%	66%	69%	76%	67%
3. Doubt plays necessary roles in advancing science.	68%	74%	86%	82%	75%
4. Scientists use evidence-based reasoning to select which among several competing working hypotheses best explains a physical phenomenon.	63%	73%	80%	82%	71%
5. A theory in science is a unifying explanation for observations that result from testing several hypotheses.	80%	82%	93%	91%	84%
6. Peer review generally leads to better understanding of physical phenomena than can the unquestioned conclusions of involved investigators.	57%	62%	77%	75%	63%
7. Science can test certain kinds of hypotheses through controlled experiments.	61%	63%	74%	77%	65%
8. All science rests on fundamental assumptions about the physical world.	66%	64%	78%	74%	67%
9. Science differs from technology.	28%	40%	38%	45%	36%
10. Scientific knowledge is discovered, and some discoveries require an important history.	64%	69%	77%	81%	70%
11. Science employs modeling as a method for understanding the physical world.	59%	69%	74%	83%	68%
12. Scientific knowledge imparts power that must be used ethically.	63%	68%	80%	80%	69%
Average Score	**61%**	**67%**	**76%**	**77%**	**67%**

Science Literacy Misconceptions: Concept inventories are often designed to reveal common misconceptions. Incorrect responses on the SLCI indicate student misconceptions about science literacy concepts (Table 2).

Table 2

Science Literacy Misconceptions Spring 2014, All Unique Participants (N=1470)	
Science Literacy Misconception	**Percent Incorrect Responses on SLCI**
A. Confuse science for technology	72%
B. Unable to identify an example of science generating better technology	55%
C. Cannot perceive the role of peer review in science	50%
D. Unable to recognize assumptions important to all science given list of statements	41%
E. Unable to interpret results from a scientific study	41%
F. Cannot distinguish science as the method of knowing and/or explaining the physical world through testable information	38%
G. Fail to understand how scientists use reproducible experiments to confirm hypotheses	37%
H. Fail to understand the development of theory in science	36%
I. Fails to recognize modeling as a method of knowing in science	33%
J. Fails to perceive relevance of understanding science's way of knowing to everyday life	32%
K. Unable to distinguish an ethical response given an ethical dilemma	31%
L. Unable to explain how science employs the method of reproducible experiments to understand the physical world	28%
M. Misunderstands the role of doubt in science	25%
N. Fails to comprehend the nature of "theory" in science	19%
O. Misunderstands hypotheses: given several approaches to testing a hypothesis, one cannot discern which approach constitutes a legitimate test	17%
P. Fails to comprehend that human thoughts/beliefs about physical reality do not alter or suspend physical law	15%
Q. Misunderstands hypotheses: given several statements, a person cannot discern which is a testable statement about the physical world	8%