

SCIENCE GIANTS
Science and English/Language Arts

Grades: 9-12

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Acceleration Approach

Standard has been accelerated by using the CIM and PASS standards.

7	8	9	CIM	CRLS/ CAM	PASS

Organizing Overarching Concept (e.g., systems, patterns of change, models, scales)

Models

Organizing Higher Order Skills (e.g., Bloom’s, Paul’s Model of Reasoning)

Bloom’s: evaluate, analyze and infer.

Paul’s: concepts, evidence and consequences and implications

Differentiation Features – Students

- Study a concept in multiple applications
- Make cross-disciplinary applications
- Use advanced resources
- Make reasoning explicit

COMMON CURRICULUM GOAL

Science– History and Nature of Science

Understand science as a human endeavor, the nature of scientific knowledge and the history of science as it relates to and clarifies scientific inquiries.

Science-Personal and Social Perspectives

Understand that science provides a basis for understanding and acting on personal and social issues.

Science and Technology

Understand the interconnections among science, technology, and society

Understand the relationships that exists between science and technology.

Understand the process of technological design to solve problems and meet needs.

English/Language Arts—Writing

Use a variety of modes in appropriate context.

Use a variety of written forms to express ideas appropriate to audience and purpose.

PASS – Standard A

Write for varied purposes.

BENCHMARKS

English/Language Arts

CIM – Write analytical essays and research reports.

PASS

Quality of thinking

Organization and Coherence

Style and Technique

Convention and format

Writing process

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Archetypal Model

Students research the great defining theories of a select group of “science giants” and evaluate, support and criticize an accompanying statement that characterizes their work. Students will understand “cause and effect,” dependent and independent variables and how changing one affects the other.

TASK DEMAND

Sample Task Activity

Students research the following physicists and specified theories using at least three resources including at least one advanced level book and one electronic source.

- Einstein – photoelectric effect
- Rutherford – model of the atom
- Newton – gravitational force
- Hawking – theory of origin of universe
- Students will criticize the following statement, “Great scientific advances occur when an outstanding intellect looks at existing evidence through a lens that differs from the current paradigm.”
- The criticism should include specific references, evidence from the readings that support the conclusions.
- The students create an alternative statement that better characterizes the nature of scientific breakthrough.
- Students exchange statements with other students. They critique each other’s work.

Questions

1. How does one design an experiment that can isolate and determine such a relationship between variables?
2. What prompts scientific discovery?
3. What factors (personal, social, environmental) stimulate scientific discovery?

Implementation Time

Suggestion but teacher may want to expand time:

- 1-week research and prep (allow 2 days of class time. Make it due 1 week later so they may work outside of class).
- 2-3 days create/exchange piece.

Scoring Guide	6 Exemplary	5 Proficient	4 Strong	3 Developing	2 Emerging	1 Beginning
Students will be able to:						
Write clear, coherent and focused essays exhibiting awareness of the audience and purpose.						
Provide supporting evidence.						
Support thesis or conclusions with analogies, paraphrases, quotations, opinions from authorities, comparisons and similar devices.						
Demonstrate understanding of Einstein – photoelectric effect Rutherford – model of the atom Newton – gravitational force Hawking – theory of origin of universe						

See Standards and Assessments Section VII for Scoring Guide:
Writing
Ideas and Content
Voice
Word Fluency
Sentence Fluency
Conventions

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Internet Resources

Internet Einstein References

- Columbia Encyclopedia <http://www.bartleby.com/65/ph/photelef.html>
- Physics Link <http://www.physlink.com/Education/AskExperts/ae24.cfm>
- University of Colorado Physics Dept. <http://www.colorado.edu/physics/2000/quantumzone/photoelectric.html>
- University of Winnipeg <http://theory.uwinnipeg.ca/physics/quant/node3.html>

Internet Rutherford References

- The New Zealand Edge <http://www.nzedge.com/heroes/rutherford.html>
- Office of Radiation, Chemical & Biological Safety, Michigan State University <http://www.orcbs.msu.edu/radiation/radhistory/ernestrutherford.html>
- Science World <http://scienceworld.wolfram.com/biography/Rutherford.html>
- University of Colorado Physics Dept. <http://www.colorado.edu/physics/2000/quantumzone/frequency.html>

Internet Newton References

- Caltech Particle Theory Group <http://www.theory.caltech.edu/people/patricia/grava.html>
- Online Journey for Astronomy <http://csep10.phys.utk.edu/astr161/lect/history/newtongrav.html>
- The Physics Classroom <http://www.physicsclassroom.com/Class/circles/u6l3c.html>
- University of Winnipeg <http://theory.uwinnipeg.ca/physics/circ/node7.html>

Internet Hawking References

- Professor Stephen W. Hawking's web page <http://www.hawking.org.uk/lectures/life.html>
- Pomona College Astronomy Web Site <http://www.astronomy.pomona.edu/Projects/moderncosmo/Josh's%20Bigbang.html>
- School of Mathematical and Computational Sciences
Top Biographies <http://www.top-biography.com/9132-Stephen%20Hawking/BibBang.htm>
- University of St Andrews <http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Hawking.html>

The editor used the internet for many resources listed in this document. The listed books and internet sites should be reviewed and evaluated by the teacher before using.

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TAG NEEDS ADDRESSED

INTELLECTUALLY GIFTED	ADVANCED SCIENCE KNOWLEDGE/SKILLS	ACADEMICALLY TALENTED ENGL/LA	CAREER RELATED LEARNING STANDARDS FOR CAM - Certificate of Advanced Mastery	TEACHER CHECKS THE BENCHMARK LEVEL STUDENT IS PURSUING
<input checked="" type="checkbox"/> Advanced Critical Reasoning <input checked="" type="checkbox"/> Scholarly Interaction <input checked="" type="checkbox"/> Continuous Progress for Level and Rate* <input checked="" type="checkbox"/> Challenging Resources <input type="checkbox"/> Effecting Change <input type="checkbox"/> Decision Making; Ethical Use of Influence <input type="checkbox"/> Leadership Training/Career <input type="checkbox"/> Realistic Goal Setting <input type="checkbox"/> Regular Interaction with Intellectual Peers <input type="checkbox"/> Social-Emotional Issues; Support; Coping Strategies <input type="checkbox"/> Advanced Academic Planning <input type="checkbox"/> Opportunity for Competition/Failures/Successes <input type="checkbox"/> Creative Problem Solving with Real Problems/Audiences <input type="checkbox"/> Pursuit of Advanced Level Research <input type="checkbox"/> Advanced Vocabulary Development	<input type="checkbox"/> Advanced Critical Thinking in Science <input checked="" type="checkbox"/> Continuous Progress/Level and Rate* in Science <input checked="" type="checkbox"/> Challenging Science Resources <input type="checkbox"/> Creative Problem Solving Strategies in Science <input checked="" type="checkbox"/> Science Advanced Vocabulary Development <input type="checkbox"/> Leadership Training/Career <input type="checkbox"/> Decision Making; Ethical Use of Influence <input type="checkbox"/> Regular Interaction with Talented Science Peer <input type="checkbox"/> Realistic Goal Setting <input type="checkbox"/> Opportunity for Competition/Failures/Successes <input type="checkbox"/> Advanced Academic Planning in Science	<input type="checkbox"/> Advanced Critical Thinking in LA <input type="checkbox"/> Continuous Progress/Level and Rate* in LA <input checked="" type="checkbox"/> Challenging LA Resources <input type="checkbox"/> Creative Problem Solving Strategies in LA <input checked="" type="checkbox"/> Advanced Vocabulary Development <input type="checkbox"/> Leadership Training/Career <input type="checkbox"/> Decision Making; Ethical Use of Influence <input type="checkbox"/> Regular Interaction with Talented LA Peer <input type="checkbox"/> Realistic Goal Setting <input type="checkbox"/> Opportunity for Competition/Failures/Successes <input type="checkbox"/> Advanced Academic Planning in LA	<input checked="" type="checkbox"/> Personal Management <input checked="" type="checkbox"/> Problem Solving <input checked="" type="checkbox"/> Communication <input type="checkbox"/> Teamwork <input type="checkbox"/> Employment Foundations <input type="checkbox"/> Career Development	<p>Science:</p> <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> CIM <input type="checkbox"/> CAM
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> * Rate requires monitoring to ensure that the student was allowed to move ahead upon acquiring concepts. </div>				
<p>Student _____ Grade _____</p> <p>Teacher _____ School _____</p> <p>Date Initiated _____ Date Completed _____</p> <p>Check TAG Identification category:</p> <p style="text-align: center;"> <input type="checkbox"/> Intellectual <input type="checkbox"/> Academic Math <input type="checkbox"/> Academic LA </p>				