

Science College Board Standards for College Success: Examining Earth Science Standards for Middle and High School Students

**Linking AP Courses and Earth Science Literacy with Departmental
Sustainability**

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For more information, please contact:

Christopher C. Lazzaro, Associate Director of Science Education

clazzaro@collegeboard.org

212.520.8628



The College Board Standards for College Success

The College Board Standards for College Success were created with the goal of increasing the number and diversity of students who are prepared to succeed in college.



The College Board has developed college readiness standards in English Language Arts, Mathematics, and Science. These Standards were developed to provide teachers, schools and states with clear definitions of college readiness to help students successfully transition into Advanced Placement (AP) and college-level courses.

Why did the College Board develop Science Standards?

Key goals:

- *Define college readiness in science* to better prepare students for readiness in introductory level science courses.
- Provide teachers, schools, districts, and states with a *model set of standards* to support NCLB focus on science standards, assessments, and accountability.
- Articulate a *way of understanding* science that will better prepare students for college-level work as well as AP courses.

The College Board Standards for College Success

Knowledge & Skills

- Define the knowledge and skills students need to be successful in AP and first year college coursework.

Model Set of Standards

- Provide a model set of standards for rigorous middle school and high school courses that lead to college readiness.

Increases Rigor

- Provide teachers, districts, and states with tools for increasing the rigor and alignment of courses across grades 6-12 to college and workplace readiness.

Assists Teachers

- Offer valuable insight and guidance to teachers by describing how students are expected to use and build their knowledge, while at the same time allowing for curriculum to be tailored to the specific needs of students at the local or district level.

Development of the Science CBSCS

Leading Frameworks that Informed the Standards

- *College Board AP Science Redesign and Course Frameworks*
- *Benchmarks for Science Literacy (American Association for the Advancement of Science, 1993)*
- *National Science Education Standards (National Research Council [NRC], 1996)*
- *ICT Literacy Map — Science (Partnership for 21st Century Skills, 2004)*
- *Assessing Scientific, Reading and Mathematical Literacy: A Framework for PISA 2006 (Organisation for Economic Co-Operation and Development [OECD], 2006)*
- *Science Framework for the 2009 National Assessment of Educational Progress (NAEP) (National Assessment Governing Board [NAGB], 2008)*
- *Trends in International Math and Science Study (TIMSS) 2003 National Center for Educational Statistics*

Development of the Science CBSCS

Diversity of the Standards Committees and Reviewers

■ Science Advisory Committees :

- Learning Specialists
- Chemistry
- Physics
- Earth Science
- Biology

■ Advisory Committee Composition:

- Middle School Teachers
- High School Teachers
- Scientists
- Professors of Science
- Professors of Science Education
- National Professional Organizations

■ External Reviewers:

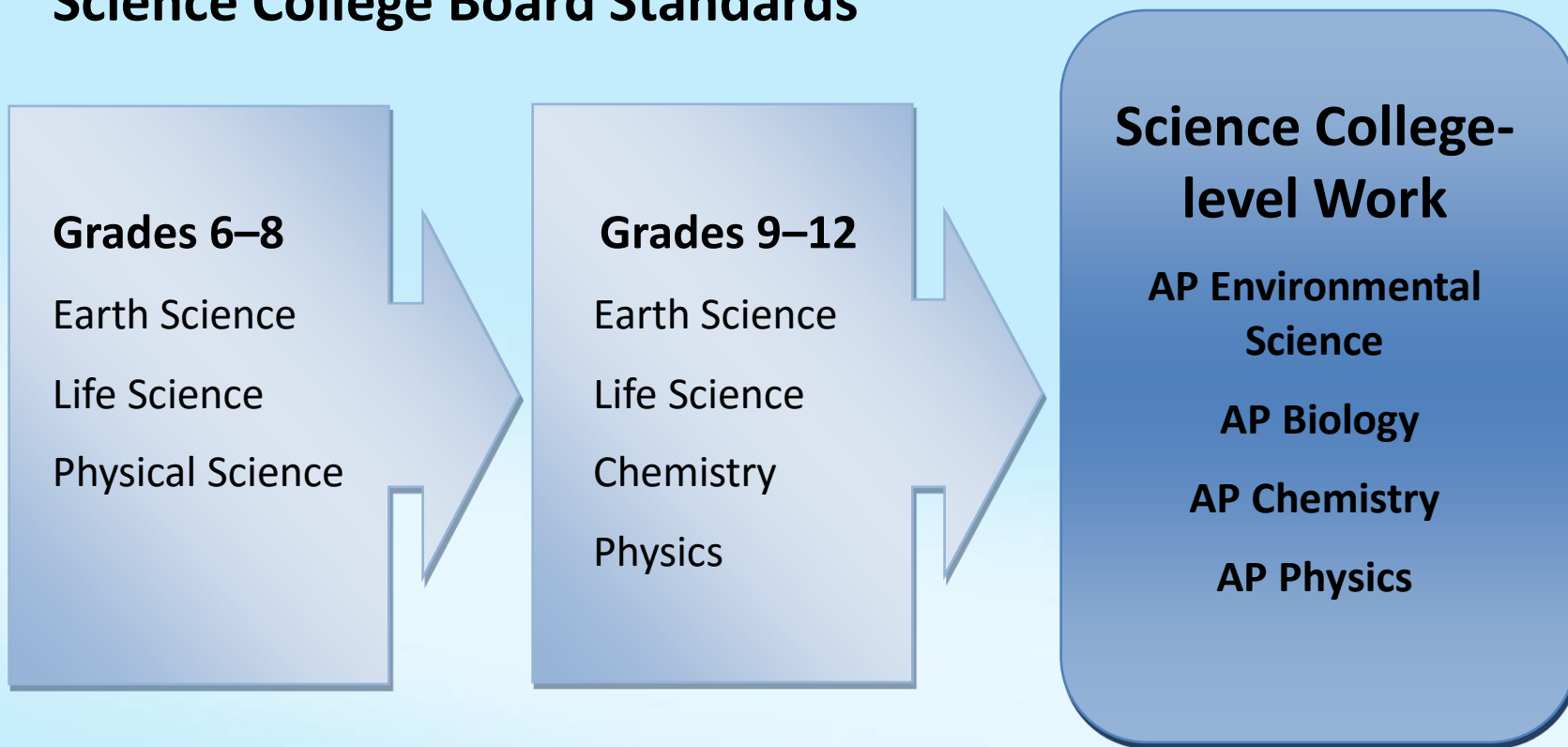
- Achieve Inc.
- Science Academic Advisory Panel
- High School Teachers
- Middle School Teachers
- Two former Presidents from the NSTA
- Scientists
- Professors of Science
- Professors of Science Education
- National Professional Organizations

How are the College Board Science Standards different than other frameworks?

- The Science CBSCS target college readiness as the end goal as opposed to general scientific literacy.
- Science Literacy is a very broad goal. Students can only be considered more or less developed in their scientific literacy, but a bar can be set for college readiness.
- The Science CBSCS outline clear and interdisciplinary scientific practices that all students should engage in – how to approach science as a scientist.

Science College Board Standards for College Success Organizing Structure

Science College Board Standards



Science College Board Standards for College Success

Organizing Structure

Standards represent the core, overarching ideas of each discipline. Each standard has its own unique code or letter/number combination with the letter(s) representing the relevant discipline.

Objectives describe the target understanding for college readiness; they explain specific learning goals that relate to the corresponding standard.

Performance expectations (PEs) specify what students should know, understand, and be able to do in order to be successful in college. They also illustrate how students engage in science practices to develop a better understanding of the essential knowledge statements and the objective.

Essential knowledge (EK) statements describe conceptual targets for student learning that support the corresponding objective. They provide language and boundaries of the performance expectations.

EARTH SCIENCE OUTLINE

Standard 1

Dynamic processes shape and order Earth.

1.1 Earth's Surface

1.2 Energy Transfer

1.3 Tectonism

1.4 Weather Processes

1.5 Rock-Forming Environment

Standard 2

Earth is composed of interdependent and interacting systems.

2.1 Atmosphere as a System

2.2 Oceans as a System

2.3 Lithosphere as a System

2.4 Climate

2.5 Planetary Evolution

Standard 3

Earth's history can be inferred from evidence left from past events.

3.1 Relative and Absolute Dating

3.2 Rock and Fossil Records

Standard 4

Matter on Earth is finite and moves through various cycles that are driven by the transformation of energy.

4.1 Water Cycle

4.2 Carbon Cycle

Standard 5

Humans and the environment impact each other.

5.1 Humans and Natural Resources

5.2 Humans and Natural Hazards

5.3 Humans' Impact on the Environment

Example Objective

- **Objective - *Oceans as a System***

Students understand that Earth's oceans act as a system that absorbs and distributes matter and energy.

- **Performance Expectation –**

Describe the chemical processes of limestone formation in seafloor sediments (such as limewater/carbon dioxide reactions).

- Identify the variables, such as water temperature, CO₂ content and salinity, that control the rate of sediment deposition.
- Predict how seafloor sediment deposition changes as melting ice sheets cause changes in the chemistry and temperature of seawater.

Next Steps for the Science Standards

Standards and Curriculum Alignment Work

- Preparing for Alignment Work
- Early State Interest (Massachusetts, Indiana, Alabama, California)

National Promotion and Outreach

- Establishing a presence at key conferences
 - *National Association of Research in Science Teaching (NARST)*
 - *Council of Chief State School Officers (CCSSO)*
 - *National Science Teachers Association (NSTA)*
- National Science Framework (Common Science Standards)
 - *Informing the early dialogue on national standards convened by the National Research Council (NRC)*

For more information on the Science College Board Standards for College Success please contact:

Christopher C. Lazzaro
Associate Director of Science Education
Research & Development
The College Board
45 Columbus Avenue
New York, NY 10023-6992
p:212.520.8628
f: 212.649.8427
clazzaro@collegeboard.org

Web location of the Science CBSCS: PDF Version of the Science College Board Standards for College Success: <http://professionals.collegeboard.com/k-12/standards>

Thank you!