# What is Rigor?

# What is “rigor”?

Different people define rigor in different ways

| | | | |
|---|---|---|---|
| *challenges students' thinking in new and interesting ways* | Volume of Content | Difficulty or amount of Homework | Requiring critical thinking (Science skills and practices) |
| More chapters! More reading! | Breadth over Depth | Depth over breadth | High fail rate |
| will prepare them to succeed in college or the world of work | *focused, coherent, and appropriately challenging* | determined not just by what is taught, but how it is taught and how it is assessed | engenders critical-thinking skills as well as content knowledge |
| Expand access to high quality vertically aligned courses | Students read at least one book every two to three weeks - ideally more | Low number of students earning As | **Really hard homework and test questions** |

## Rigor at Risk: Reaffirming Quality in the High School Core Curriculum, ACT

*High school teachers and college faculty also disagree about the depth and breadth of essential state standards needed to prepare students for college... high school teachers rated a much larger number of topics and skills as being "important" or "very important" for college success than did college instructors.*

*And where high school teachers give equal emphasis to numerous content topics and skills,* ***college instructors believe that a more thorough study of fewer but essential content and skills is a better foundation for postsecondary success.***

# Why We Are Changing AP Biology and Other AP Science Courses?

**To Emphasize** scientific inquiry and reasoning

**To Respond** to changes recommended by the National Research Council and the National Science Foundation

**To Reduce** the emphasis on broad content coverage and focus on depth of understanding



**To Support** teachers in their efforts to foster students' deep understanding of science

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## The Development of an Index of Academic Rigor for College Readiness (College Board)

By Jeffrey N. Wyatt, Andrew Wiley, Wayne J. Camara, and Nina Proestler

*"Only 28% of college instructors believe that public high schools adequately prepare students for the challenges of college (Achieve, 2005). Similarly, Conley (2007) argued that high school often does not adequately prepare students with the skills required of college level courses, which are generally faster paced and require students to engage in more high level tasks. The requisite skills can include* ***drawing inferences, interpreting results, analyzing conflicting sources of information, supporting arguments with evidence, and thinking deeply about material.****"*

# Emphasis on Science Practices

The science practices enable students to establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena

SCIENCE PRACTICES

- 1.0 The student can use representations and models to communicate scientific phenomena and solve scientific problems
- 2.0 The student can use mathematics appropriately
- 3.0 The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course
- 4.0 Student can plan and implement data collection strategies in relation to a particular scientific question
- 5.0 The student can perform data analysis and evaluation of evidence
- 6.0 The student can work with scientific explanations and theories
- 7.0 The student can connect and relate knowledge across various scales, concepts, and representations in and across domains

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# Illinois Adopts Science Learning Standards

## Science Learning Standards

Illinois' current science standards became effective in February 2014 and are based on the Next Generation Science Standards (NGSS). Forty-one experts, including three Illinois educators, wrote the NGSS. State-level committees in 26 states reviewed the learning benchmarks. These groups confirmed that the design and development of the NGSS were guided by the best available evidence to ensure that students who meet these standards are prepared for postsecondary education and careers in the 21st century. The NGSS can be viewed at 23 Illinois Administrative Code 1 Appendix D .

# NGSS

"How does this affect what a classroom looks like?"

| Classroom activities in High School will look less like this: | And more like this: |
|---|---|
| **Physical Sciences** | **Physical Sciences** |
| Students learn the periodic table by rote memorization. | Students use the periodic table as a tool to explain and predict the properties of elements. |
| Students learn that substances combine or react to make new substances. | Students characterize chemical reactions and use that knowledge to explain various biological and geophysical phenomena. |
| Students calculate energy transfer. | Students design, build, and refine devices to optimize the conversion of energy. |
| **Life Sciences** | **Life Sciences** |
| Students learn the stages of mitosis. | Students create scientific arguments for how mitosis can produce complex organisms with different kinds of body parts. |
| Students learn about trophic levels in ecosystems. | Students construct explanations for the role of energy in the cycling of matter in organisms and ecosystems. |
| Students create Punnett squares to learn about Mendelian genetics. | Students use statistics and probability concepts in written essays explaining how traits are expressed in a population. |
| **Earth & Space Sciences** | **Earth & Space Sciences** |
| Students learn about the composition of asteroids and meteors. | Students use evidence from meteorites and other planetary surfaces to form hypotheses about the early history of Earth. |
| Students learn about different Earth systems, including water systems and weather systems. | Students analyze geoscience data to determine the feedback effects between Earth systems. |
| Students study different types of natural hazards, such as hurricanes and tornadoes. | Students conduct research to gather data on how different types of natural hazards have influenced human activity. |

# Key ideas related to the NGSS and its development

NGSS is designed to...

- Promote **in-depth understanding** of a focused set of core concepts and interdisciplinary ideas.
- Reflect the **interconnected** nature of science as it's practiced and experienced in the real world.
- Build science concepts and practices **coherently** K–12.
- Focus on **deeper understanding** of **content** as well as **application** of content.
- Align with "College Board Standards for College Success," which defines the content and skills needed to be **college- and career-ready**, including to transition into AP courses

Source 1, Source 2, Source 3