South Carolina
Department of Education

South Carolina Academic Standards and Performance Indicators for Science

Presentation for First Reading by

State Board of Education

October 9, 2013

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Cyclical Review Process requires alignment with national resources

- ***A Framework for K-12 Science Education*** (2012), National Research Council

- ***Science Framework for the 2011 National Assessment of Educational Progress*** (NAEP), National Assessment Governing Board

- ***Science College Board Standards for College Success*** (2009), College Board

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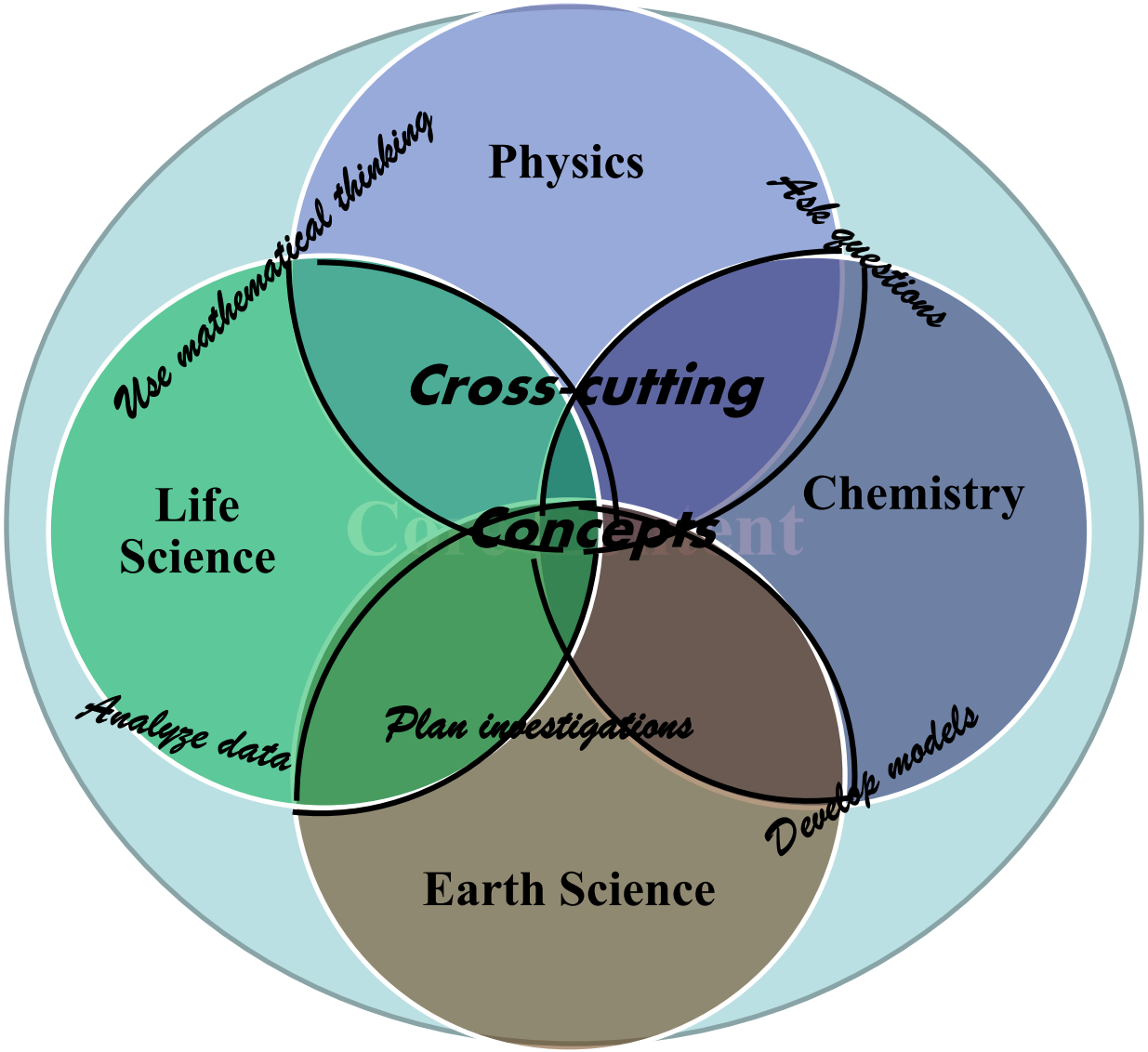
Three components of science standards

Science and Engineering Practices	Core Content	Crosscutting Concepts (Themes)
1. Ask questions and define problems 2. Develop and use models 3. Plan and carry out investigations 4. Analyze and interpret data 5. Use mathematical and computational thinking 6. Construct explanations and design solutions 7. Engage in scientific argument 8. Obtain, evaluate, and communicate information	1. Life Sciences 2. Physics 3. Chemistry and Physics 4. Earth and Space Sciences	1. Patterns 2. Cause and effect 3. Scale, proportion, and quantity 4. Systems and system models 5. Energy and matter: Flow, cycles, and conservation 6. Structure and function 7. Stability and change


Physics
Use mathematical thinking
Ask questions
Cross-cutting
Concepts
Life Science
Chemistry
Analyze data
Plan investigations
Develop models
Earth Science

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Major Improvements in the 2013 Standards based on EOC review panel recommendations

1. Require a greater degree of higher order cognitive skills
2. Integrate inquiry practices with the content standards
3. Incorporate engineering and real-life applications
4. Crosscutting concepts made explicit

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1. Increased Rigor in Cognitive Skills

Grade	2005	2013
Kindergarten	Identify, Use, Predict and explain, Compare	Ask, Develop and use models, Implement, Analyze and interpret, Use mathematical thinking, Construct, Obtain and evaluate information, Design solutions, Communicate
6th grade	Use, Differentiate, Classify	Ask, Develop, use and refine models, Plan and implement, Analyze and interpret, Use mathematical and computational thinking, Explain, Construct and analyze, Obtain and evaluate information, Design solutions, Communicate
High School	Apply, Use, Design, Organize and interpret, Evaluate, Communicate and defend	Ask, Generate hypotheses, Develop use and refine models, Test solutions, Formulate, Record and represent data, Analyze and interpret, Reveal patterns, Construct meaning, Use mathematical and computational thinking, Express relationships, Use statistics, Build and test, Communicate

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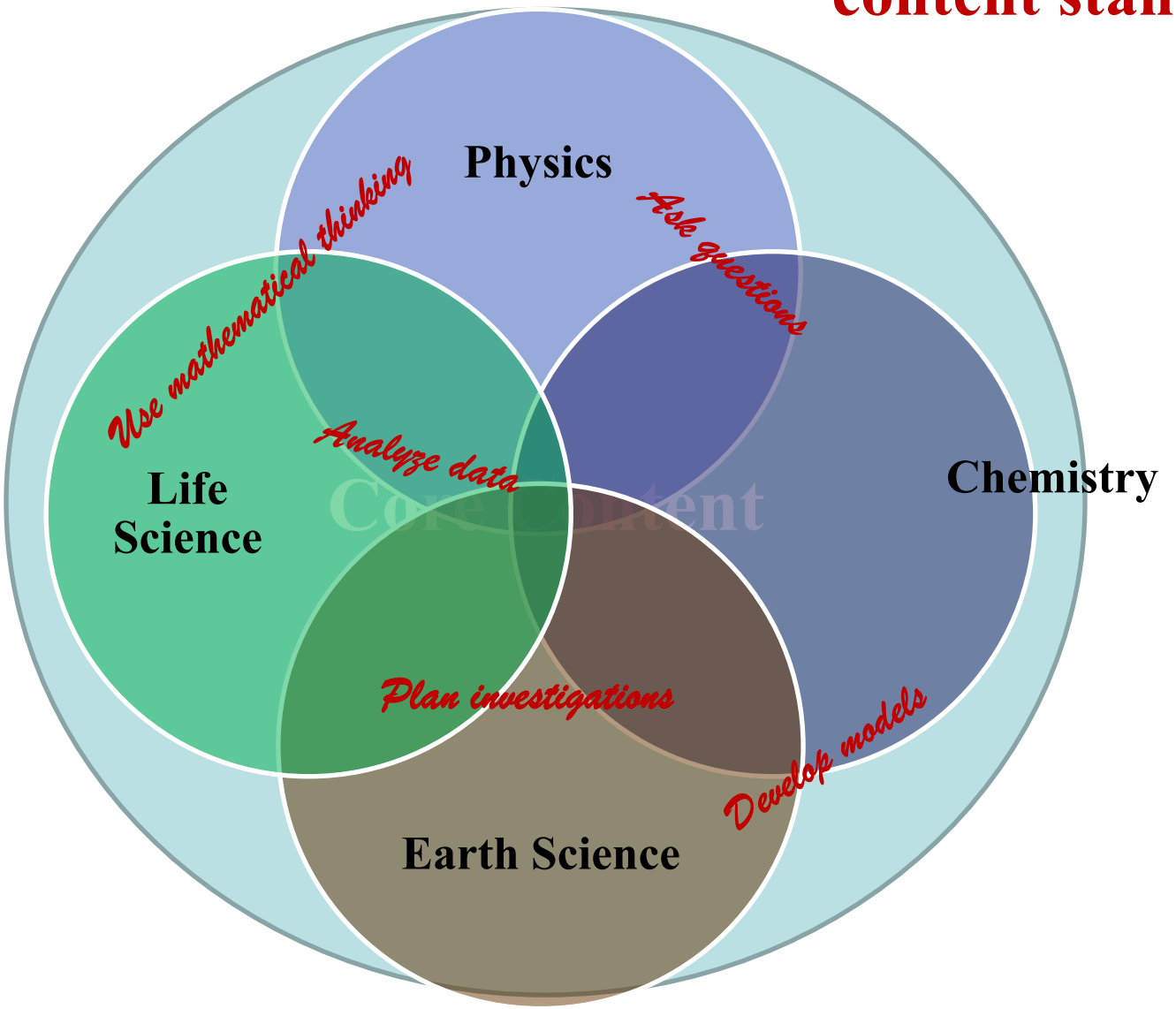
2. Practices are integrated into the content standards



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2. Inquiry practices are integrated into content

2005 Scientific Inquiry Standards

- Only indicated new skills for each grade level.
- Presented as separate standards.

2013 Science and Engineering Practices

- Explains all practices in each grade level
- Practices integrated into the content standards

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Inquiry practices integrated with content – Kindergarten example

2005

K-1.3 Predict and explain information or events based on observations or previous experience.

K-2.1 Recognize what animals need to stay alive (including air, water, food and shelter).

2013

K.L.2A.5 Construct explanations from observations of what animals need to survive and grow (including air, water, nutrients, and shelter).

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Inquiry practices integrated with content – 6th grade example

2005

6-1.1 Use appropriate tools and instruments (including a spring scale…barometer, and sling psychrometer) safely and accurately when conducting a controlled scientific investigation.

6-1.2 Differentiate between observation and inference during the analysis and interpretation of data.

6-4.3 Classify shapes and types of clouds according to elevation and their associated weather conditions and patterns.

6-4.5 Use appropriate instruments and tools to collect weather data (including wind speed and direction, air temperature, humidity, and air pressure).

6-4.6 Predict weather conditions and patterns based on weather data collected from direct observations and measurements, weather maps, satellites, and radar.

2013

6.E.2B.1 Analyze and interpret data from weather conditions (including wind speed and direction, air temperature, humidity, cloud types, and air pressure), weather maps, satellites, and radar to predict local weather patterns and conditions.

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Inquiry practices integrated with content - High school example

2005

- B-1.5 Organize and interpret the data from a controlled scientific investigation by using mathematics, graphs, models, and/or technology.
- B-4.2 Summarize the relationship among DNA, genes, and chromosomes.
- B-4.3 Explain how DNA functions as the code of life and the blueprint for proteins.

2013

- H.B.4A.1 Develop and use models at different scales to explain the relationship between DNA, genes, and chromosomes in coding the instructions for characteristic traits transferred from parent to offspring.

3. Incorporates engineering and real-life applications

- **K.E.3A.4** Define problems caused by the effects of weather on human activities and design solutions or devices to solve the problem.
- **6.P.3B.2** Design and test solutions that improve the efficiency of a machine by reducing the input energy (effort) or the amount of energy transferred to the surrounding environment as it moves an object.
- **H.B.6.6** Design solutions that reduce the impact of human activity on the biodiversity of an ecosystem.

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4. Cross-cutting concepts more explicit

1. Pattern
2. Cause and effect
3. Scale, proportion, and quantity
4. Systems and system models
5. Energy and matter: Flow, cycles, and conservation
6. Structure and function
7. Stability and change

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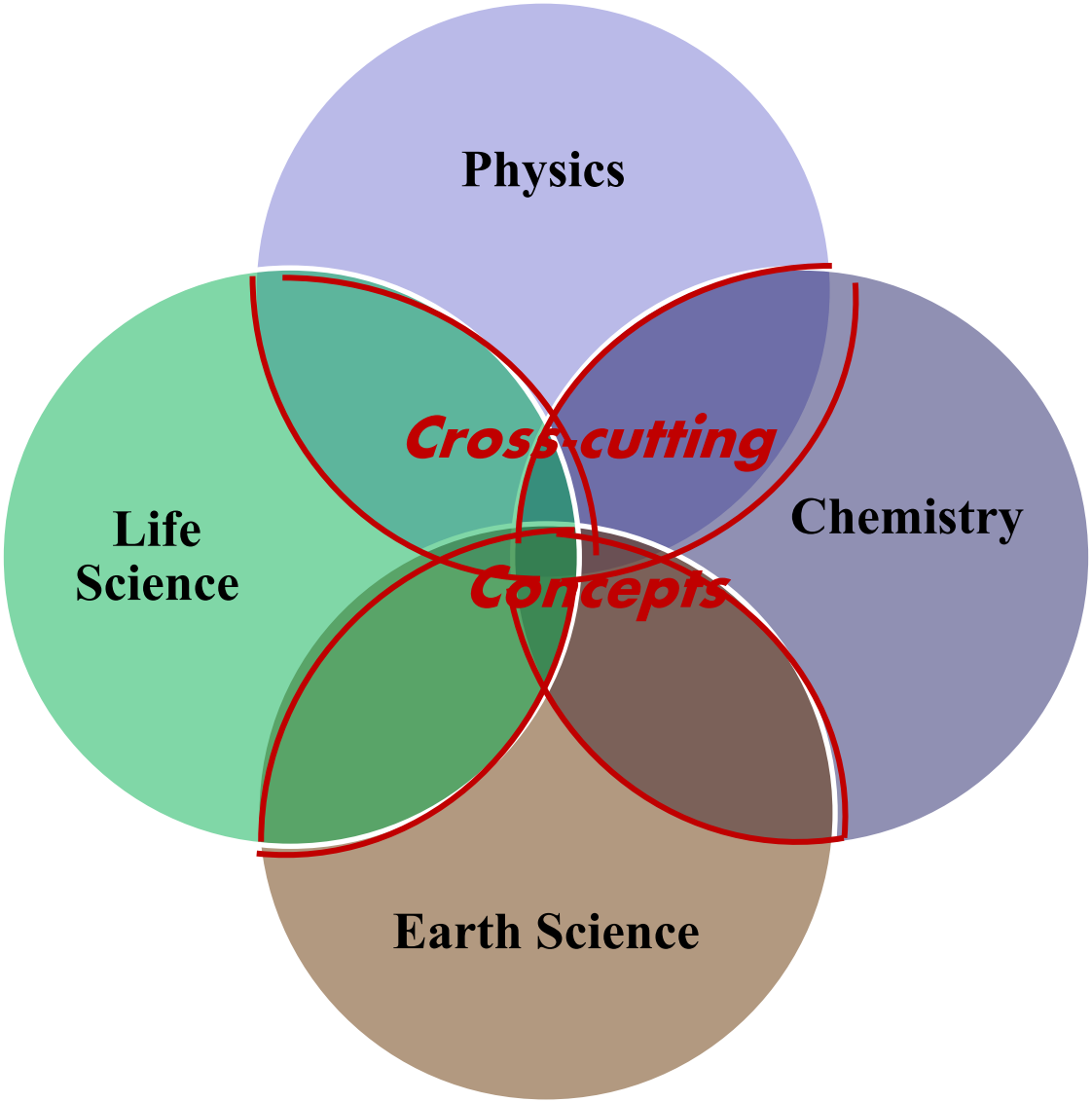
Cross-cutting concepts



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Crosscutting concept: Conservation of Matter

- **K.P.4.2** Develop and use models to describe and compare the properties of different materials (including wood, plastic, metal, cloth, and paper) and classify materials by their observable properties, by their uses, and by whether they are natural or man-made.

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Crosscutting concept: Conservation of Matter

- **6.E.2.2** Construct explanations of the processes involved in the cycling of water through Earth's systems (including transpiration, evaporation, condensation and crystallization, precipitation, and downhill flow of water on land).
- **6.L.5.5** Analyze and interpret data to explain how the processes of photosynthesis, respiration, and transpiration allow plants to survive.

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Crosscutting concept: Conservation of Matter

- **H.C.6.3** Plan and carry out controlled scientific investigations to produce mathematical evidence that atoms, and consequently mass, are conserved in chemical reactions.
- **H.B.6.3** Develop and use models of the carbon cycle, which include the interactions between photosynthesis, cellular respiration and other processes that release carbon dioxide, to evaluate the effects of increasing atmospheric carbon dioxide on natural and agricultural ecosystems.

Recap: 2013 Standards

- Require a greater degree of higher order cognitive skills
- Integrate inquiry practices with the content standards
- Incorporate engineering and real-life applications
- Cross-cutting concepts made explicit

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EOC Criteria for Standards

1. Comprehensiveness / Balance
2. Rigor
3. Measurability
4. Manageability
5. Organization / Communication

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Timeline

- Oct 9, SBE First Reading
- Nov 18, EOC ASA subcommittee
- Dec 9, EOC First Reading
- Jan. 8, SBE Final Reading

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EOC report and recommendations

- http://www.eoc.sc.gov/Home/Cyclical%20View%20of%20Science%20Standards/Science%20Standards%20Summary%20Report.pdf