

2019

CYCLICAL REVIEW OF THE 2014 SC ACADEMIC STANDARDS & PERFORMANCE INDICATORS FOR SCIENCE

RECOMMENDED REVISIONS



SC EDUCATION
OVERSIGHT COMMITTEE

PO Box 11867 | 227 Blatt Building | Columbia SC 29211 | WWW.SCEOC.ORG

INTRODUCTION

The South Carolina Education Accountability Act of 1998 establishes an accountability system for public education that focuses on improving teaching and learning so that students are equipped with a strong foundation in the four primary academic disciplines and a strong belief in lifelong learning. Academic standards are used to focus schools and districts toward higher performance by aligning the state assessment to those standards. The implementation of quality standards in classrooms across South Carolina is dependent upon systematic review of adopted standards, focused teacher development, strong instructional practices, and a high level of student engagement. Pursuant to Section 59-18-350(A) of the Education Accountability Act, the Education Oversight Committee (EOC) and the State Board of Education are responsible for reviewing South Carolina's standards and assessments to ensure that high expectations for teaching and learning are being maintained.

The State Board of Education, in consultation with the Education Oversight Committee, shall provide for a cyclical review by academic area of the state standards and assessments to ensure that the standards and assessments are maintaining high expectations for learning and teaching. At a minimum, each academic area should be reviewed and updated every seven years. After each academic area is reviewed, a report on the recommended revisions must be presented to the Education Oversight Committee and the State Board of Education for consideration. After approval by the Education Oversight Committee and the State Board of Education, the recommendations may be implemented. However, the previous content standards shall remain in effect until approval has been given by both entities. As a part of the review, a task force of parents, business and industry persons, community leaders, and educators, to include special education teachers, shall examine the standards and assessment system to determine rigor and relevancy.

In September 2019, the EOC activities under the cyclical review of the South Carolina Science Academic Standards were completed. This document presents recommendations for modifications to the 2014 South Carolina Science Academic Standards and Performance Indicators from the EOC. These recommendations were compiled under the advisement of two review teams: a national review team of science educators who have worked with national or other state organizations and a state committee composed of parents, business representatives, community leaders, science educators, and teachers of English Learners and exceptional education. The state team drew from various geographical areas in South Carolina.

It is important to note that the adopted 2014 South Carolina Science Academic Standards represent the work of many educators, and that this review of the standards was undertaken to identify ways in which their work could be strengthened and supported. The EOC expresses its appreciation to those educators and commends their utilization of national source documents and their belief in the achievement of all students. The EOC intends to enhance the work of school level educators and, ultimately, to ensure that all students are knowledgeable and capable.

I. CYCLICAL REVIEW PROCESS

The review of the South Carolina Science Academic Standards began with a focus on the accomplishment of goals articulated in the Education Accountability Act (EAA) of 1998. The law, as amended through 2008, specifies: "The standards must be reflective of the highest level of academic skills with rigor necessary to improve the curriculum and instruction in South Carolina's schools so that students are encouraged to learn at unprecedented levels and must be reflective of the highest level of academic skills at each grade level." (Article 3, 59-18-300)

The Standard Operating Procedures for the Review of Standards (SOP) agreed upon by the State Department of Education (SDE) and the Education Oversight Committee (EOC) during the summer 2003 were followed for this review. A timeline established during the spring of 2019 outlined the timeframe in which the required review teams were to review the standards adopted in 2014 by the end of fall 2019. The SOP also outlines the steps to be taken to revise the current standards should the completion of the reviews indicate that revision is needed.

A. CRITERIA DESCRIPTIONS

The South Carolina Science Academic Standards Review Process followed by all four review teams emphasized the application of the criteria addressing comprehensiveness/balance, rigor, measurability, manageability, and organization/ communication. SDE representatives, district and university curriculum leaders, and EOC staff collaborated to identify the standards review criteria in 2003. Decisions on the criteria to be used were based on a comprehensive review of professional literature, and the goals for the standards review as specified in the Education Accountability Act of 1998. The identified criteria were each applied through the two review panels: (1) leaders in the discipline drawn from across the nation and (2) science educators, special education and English Learners educators from the South Carolina's education community; and parents, business representatives, and community leaders.

CRITERION ONE: COMPREHENSIVENESS/BALANCE

The criterion category for Comprehensiveness/Balance is concerned with how helpful the South Carolina Science Academic Standards document is to educators in designing a coherent curriculum. The criterion is directed at finding evidence that the standards document clearly communicates what constitutes Science content, that is, what all students should know and be able to do in science by the time they graduate. The criterion includes consideration of the following areas:

- The standards address essential content and skills of science;
- The standards are aligned across grades as appropriate for content and skills;
- The standards have an appropriate balance of the content and skills needed for mastery of each area in science; and
- The standards reflect diversity (especially for ethnicity and gender) as appropriate for the subject area.

CRITERION TWO: RIGOR

This criterion calls for standards that require students to use thinking and problem-solving skills that go beyond knowledge and comprehension. Standards meeting this criterion require students to perform at both national and international benchmark levels.

- Standards should focus on cognitive content and skills (not affect);
- Standards should be developmentally appropriate for the grade level;

- Standards should include a sufficient number of standards that require application of learning (application, analysis, synthesis, and evaluation);
- Standards should be informed by the content and skills in national and international standards; and,
- Standards should be written at a level of specificity that will best inform instruction for each grade level.

CRITERION THREE: MEASURABILITY

Knowledge and skills presented in the standards are assessable for school, district and state accountability. The primary element of measurability is:

- The content and skills presented in the standards should be assessable (are observable and demonstrable).

CRITERION FOUR: MANAGEABILITY

This criterion applies to instructional feasibility, that is, whether the complete set of science standards at a particular grade level can reasonably be taught and learned in the class time allotted during one year. The primary element of manageability is:

- The number and scope of the standards for each grade level should be realistic for teaching, learning, and student mastery within the academic year.

CRITERION FIVE: ORGANIZATION/COMMUNICATION

The Organization/Communication criterion category stipulates that the expectations for students are to be clearly written and organized in a manner understandable to all audiences and by teachers, curriculum developers, and assessment writers. Organization includes the following components:

- The content and skills in the standards should be organized in a way that is easy for teachers to understand and follow;
- The format and wording should be consistent across grades;
- The expectations for student learning should be clearly and precisely stated for each grade; and,
- The standards should use the appropriate terminology of the field but be as jargon free as possible.

B. PANEL MEMBERSHIP

The EOC's cyclical review of the 2014 South Carolina Science Academic Standards was conducted from May 2019 to September 2019. The national review was conducted from May until September 2019. The state review was conducted in September 2019. The overall directive for both the national and state panels was based on the following guiding questions.

1. Do the standards support students designing and conducting investigations, solving problems, and engaging in discussions that build a deeper understanding of the content as well as the application of the knowledge?
2. Do the standards support student thinking of science by analyzing and explaining phenomena and experiences of the world around us?

3. Do the standards support a K-12 learning progression through student learning experiences that are designed and coordinated over time to ensure students build an understanding of the three dimensions of science?
4. Are the expectations of students in the standards clearly articulated and organized in a manner that is understandable to all audiences?
5. Can the content and skills presented in the standards be assessed as part of the state accountability system?
6. Can the standards presented at a given grade level be taught in the allotted time?

The national review team members consisted of recognized leaders in science education that have participated in the development/writing of national and state science standards. As national leaders on science standards all have reviewed a number of state science standards. Additional materials shared included: *A Framework for K-12 Science Education*¹, *Profile of the South Carolina Graduate*², *Charting a Course for Success: America's Strategy for STEM Education*³; along with additional current research documents. Members of the team received the materials for the review in early May and continued their review process through September. After an independent review period, the members of the panel participated in a telephone conference call that produced a set of findings listed later in this document. Members of the National Review Panel included:

- Mr. Randy LaCross, Vice President for Outreach and Research, South Carolina Governor's School for Science and Mathematics
- Dr. Christine Lotter, Associate Professor, University of South Carolina
- Mr. Peter McClaren, Executive Director, Next Gen Education, Rhode Island
- Dr. Robert Tai, Associate Professor, University of Virginia
- Dr. Judith Salley, Executive Director, South Carolina State University

For the state panel review, the EOC contacted all school district superintendents and instructional leaders in the state as well as the legislature and EOC members for nominations to state review panel. Approximately 115 names were provided to the EOC. The state review panel consisted of 43 people representing science educators, teachers of English Learners and exceptional education, parents and representatives of business/community. Also, in attendance was a representative from the South Carolina Department of Education, Dr. Renee Lyons, who served as an observer.

The panel members worked over two days to compose individual responses to the standards review and then develop consensus as a group on a set of findings listed later in this document. The panel used as reference materials standards recently approved in Massachusetts⁴, Virginia⁵ and Georgia⁶. Also included was the set of standards from the Next Generation Science Standards⁷. The state panel reviews were conducted September 9 and 23, 2019 and

¹National Research Council. 2012. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press. <https://10.17226/13165>.

² <https://ed.sc.gov/about/profile-of-sc-graduate/>

³ <https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf>

⁴ <http://www.doe.mass.edu/frameworks/scitech/2016-04.pdf>

⁵ http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml#2018

⁶ <https://www.georgiastandards.org/Georgia-Standards/Pages/Science.aspx>

⁷ NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. Washington, DC: National Academies Press.

facilitated by Rainey Knight, EOC. The task force reached consensus on insights and specific recommendations about the 2014 South Carolina Science Academic Standards.

Members of the task force included:

Mrs. Marianne Blake, Beaufort	Ms. Kristen Bolin, Gaffney
Ms. Tracy Brown, Conway	Ms. Sandy Bradshaw, Anderson
Ms. Urica Brown, Pawley's Island	Ms. Ashley Bryan, Allendale
Ms. Christine Burras, Greenville	Dr. G. Nate Carnes, Columbia
Mr. Chip Chase, Kingstree	Mr. Steve Coolidge, Duncan
Mr. Rick Eitel, Moore	Dr. Bert Ely, Columbia
Mr. Ray Funnye, Georgetown	Ms. Deborah Hardison, Bennettsville
Ms. Betty Harrington, Manning	Ms. Lisa Hartley, Union
Dr. Eric Hayler, Boiling Springs	Dr. John Holton, Columbia
Mr. Hubert Jayakumar, Chester	Mr. Thomas Kelly, Varnville
Ms. Caroline Lemay, Rock Hill	Ms. Cathy Little, Laurens
Mr. Thomas Moore, Irmo	Dr. Bridget Miller, Columbia
Ms. Eileen Fleming-Patona, North Myrtle Beach	Dr. Tom Peters, Clemson
Dr. Mark Pesnell, Easley	Mrs. Jamey Porter, Beaufort
Ms. T'Sheila Praileau, Winnsboro	Mr. Robert "Chris" Rice, Lexington
Dr. Akil Ross, Columbia	The Honorable Stu Rodman, Hilton Head
Ms. Elizabeth Roorda, York	Dr. Holly Sullivan, Cassatt
Ms. Virginia "Brooke" Sledge	Ms. Cynthia Spratley, York
Dr. Pam Vereen, Hemmingway	Ms. Janet Walker, Union
Ms. Christine Ware, Simpsonville	Mrs. Rosemary Wilson, Lexington
Ms. Audrey Winters, Laurens	Mr. Hank Wortley, Myrtle Beach
Ms. Marilyn Young, Varnville	

C. THE STANDARDS DOCUMENT

The 2014 South Carolina Science Academic Standards and Performance Indicators are organized by grade levels for grades kindergarten through eighth grade to include discipline areas of life science, earth science, and physical science and four high school core areas: biology, chemistry, physics, and earth science. The complete set of 2014 South Carolina Science Academic Standards and Performance Indicators can be found at the link below.

https://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf

Each standard is stated as one full sentence that begins with the clause “The student will demonstrate an understanding of ...” and goes on to specify the particular topics to be addressed by that standard. Following each standard is the conceptual understanding statement of the core ideas for which students should demonstrate an understanding. Some grade level topics include more than one conceptual understanding with each building upon the intent of the standard.

Then the Performance Indicators are presented, which are intended to help meet teachers’ needs for specificity. The main verbs in the indicators are taxonomic – that is, they identify specific assets of the cognitive process as described in the revised Bloom’s Taxonomy⁸.

⁸ *Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives.* Anderson, L.W., Krathwohl, D.R., et al. (2001).

In addition to the academic standards, each grade and high school core area has a separate set of science and engineering practices standards. Included in the overview of the standards are crosscutting concepts that connect knowledge across the science disciplines such as patterns, cause and effect, models, etc.

An example of a grade level science standard is shown below.

GRADE FOUR
LIFE SCIENCE: CHARACTERISTICS AND GROWTH OF ORGANISMS⁹

Standard 4.L.5: The student will demonstrate an understanding of how the structural characteristics and traits of plants and animals allow them to survive, grow, and reproduce.

4.L.5A. Conceptual Understanding: Scientists have identified and classified many types of plants and animals. Each plant or animal has a unique pattern of growth and development called a life cycle. Some characteristics (traits) that organisms have are inherited and some result from interactions with the environment.

Performance Indicators: Students who demonstrate this understanding can:

4.L.5A.1 Obtain and communicate information about the characteristics of plants and animals to develop models which classify plants as flowering or nonflowering and animals as vertebrate or invertebrate.

4.L.5A.2 Analyze and interpret data from observations and measurements to compare the stages of development of different seed plants.

4.L.5A.3 Develop and use models to compare the stages of growth and development in various animals.

4.L.5A.4 Construct scientific arguments to support claims that some characteristics of organisms are inherited from parents and some are influenced by the environment.

II: ISSUE WITH THE STANDARDS PRIOR TO THE REVIEW

The 2014 South Carolina Science Academic Standards and Performance Indicators were adapted using national frameworks for science. However, the reality of the science standards is found in the student performance results. Unfortunately, too few students have reached the expectations set for them causing us to determine issues to be addressed as the current

⁹https://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf

standards are reviewed. The following table documents the percentage of students scoring Proficient or above on the South Carolina Palmetto Assessment of State Standards (SC PASS) science test and scoring a “C” or better on the End of Course test in Biology I in science in 2019 for all students and by subgroups.

Table 1

2019 SC PASS Science¹, % of Students Meets or Exceeds Expectations

2019	All	Hispanic	African American	White	Disabled	Limited English Proficiency	Students in Poverty
Grade 4	52.0	41.3	30.4	67.8	21.2	42.9	40.2
Grade 6	47.2	40.2	26.1	62.0	12.7	40.5	34.6
Grade 8	47.4	39.4	24.8	61.9	11.6	40.8	34.0

South Carolina Biology End of Course² (percentage of students scoring a C or above)

2019	All	Hispanic	African American	White	Disabled	Limited English Proficiency	Students in Poverty
	47.0	39.3	24.9	61.2	9.7	39.0	33.0

Source: South Carolina Department of Education, <http://ed.sc.gov/data/pass/2019/>.

Notes:

¹ For 2019, students in South Carolina are administered the SC PASS science assessment in grades 4, 6 and 8. For 2019-20, students will be administered science in grades 4 and 6 only.

² A high school student is administered an End of Course test in the year in which he/she is enrolled in Biology I.

A concern found in reviewing the SC science standards revolves around the breadth of the standards versus the depth. National science standards and input from state science educators provided the content to be included in the 2014 science standards. The science standards provide a wealth of content to be learned from kindergarten through high school. All science content is considered important because science builds on prior background knowledge. In order for students to obtain a true understanding of science concepts, a determination needs to be made as to what content is essential for the students to be successful in their school careers as well as in their work careers. In addition, the teaching of science should be expected to be centered on an inquiry-based approach.

III: FINDINGS

The discussion below summarizes reviews of national and state panels and presents consensus findings from both panels.

A: COMMENDATIONS

1. Overall, the standards address a wide variety of content and skill-building areas that are highly relevant to science learning such as designing and conducting investigations, solving problems, and engaging in discussions that build a deeper understanding of science.
2. The standards are two-dimensional focusing on content expectations and science practices.
3. The majority of standards require students to demonstrate learning at higher levels of Revised Bloom's taxonomy¹⁰.
4. The standards' document references cross cutting skills and science and engineering practices. The science and engineering practices (e.g., modeling, investigation, and argumentation) are integrated into the standards.
5. The standards are easy to follow and user friendly for teachers.
6. The standards appear to be of consistent style and formatting.
7. Most standards are written for students to learn science through investigations and/or analyzing data and constructing explanations, which is indicative of higher rigor.
8. The 2014 South Carolina Science Academic Standards and Performance Indicators used the national science framework in its development.

B: CONCERNS COMMON TO ALL REVIEW PANELS

1. The learning skills across grade levels should be further delineated with examples of the degree of complexity among grade levels; i.e., the use of similar phrases across grade levels should be clarified as to what is expected when students in second grade and eighth grade "analyze and interpreted data." Care should be taken to ensure language such as "obtaining information" should be followed by higher-level skills such as "to generate arguments or explanations."
2. Science concepts that are repeated in different grade bands should ensure there is an increase in complexity.

¹⁰ *Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* Anderson, L.W., Krathwohl, D.R., et al. (2001).

3. The number of standards and performance indicators are too numerous to teach with any depth during an academic school year.
4. An appendix of the levels of progression of science and engineering practices should be created across grade bands so teachers can see the sophistication of how the practices progress. For teachers to successfully implement the standards, the learning progressions must be made clearer and show teachers how to integrate content and practices in performance.
5. Cross cutting concepts (e.g., patterns, modeling, and cause and effect) should be integrated in all standards to provide teachers with the specific concepts/practices most appropriate for the standards.
6. The standards and academic indicators are not well stated for K-2 grades. The rigor, content and level of comprehension may not be appropriate for the primary grades. The performance indicators should be focused on foundational science skills such as observation, posing questions, measurement, seeking answers, and recognizing patterns.
7. The Next Generation Science Standards¹¹ should be consulted in the revision of the science standards, especially for the “big ideas” and processes in science over disconnected factual knowledge.
8. The high school biology standards, B-5: Biological Evolution and Diversity of Life are not aligned with the other 2014 science standards.
9. Science assessments should match with the teaching of science as an inquiry-based approach.

C: ADDITIONAL FINDINGS OF THE NATIONAL REVIEW TEAM

1. Based on the need to assess student performance in science, investigate the use of adaptive computer assessments that incorporate simulations and critical thinking applications needed to assess the higher-level standards as well as performance-based assessments.
2. An analysis of the K-8 grade level appropriateness of the standards should be conducted. The analysis should include comparison of South Carolina science standards at each grade level to national science standards. Examples include energy transfer is taught before students have been exposed to the concept of energy and the properties of magnets are taught before students have an understanding of what a force is.
3. There is a lack of clarity in differentiating rigor across all grade levels. The same terminology is used at various grade levels without providing specifics as to what is expected from the learner. For example, middle school students would be expected to

¹¹ *NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: National Academies Press.*

develop more sophisticated degree of skill related to “planning and conducting scientific investigations” than second grade students.

4. A greater emphasis should be placed on investigation across all grade levels, but especially in upper elementary and high school. Students should be engaged in learning science like a scientist: designing and implementing investigations, creating models to explain phenomenon and communicating finding based on these investigations.
5. Evolution is a major theoretical framework within the biological sciences and should be included within all grade levels of life science/biology standards. Early grades should focus on diversity and adaptations while older students could investigate evidence for change over time, natural selection and human impact on biodiversity. The evolution-based indicators should to be integrated with the science and engineering practices.

D. ADDITIONAL FINDINGS OF THE PARENT/BUSINESS/COMMUNITY LEADER REVIEW PANEL

1. Science lends itself to collaboration, group work and presentation of findings. Emphasize essential skills for a well-rounded student.
2. Physical science is not a high school level course and thus, a student could graduate without knowledge of high school physics. If physical science is not to be offered in high school, then offer it as a course in middle school.
3. Standards should be more concise. Use simple, clear and jargon-free statements. The panel recommended looking at the Virginia and Massachusetts science standards as examples.
4. Math is a critical component in learning science concepts and practices. Include opportunities for students to use math skills including measurement.
5. Include ways to make science more engaging and exciting for students. Use current events to make science more relevant for students.
6. An essential part of science is laboratory based. An active laboratory component can provide engagement and motivation for science leading to extended interest in post-secondary education and careers. Schools must be provided the resources and equipment for a viable science laboratory focus.
7. As part of the science support documents for teachers, include the number of hours per week expected for the teaching of science. Also, use Key Ideas as a way to inform teachers as to what is going to be assessed. The panel referenced Massachusetts’s science standards.
8. The panel recommended the addition of human anatomy and astronomy.
9. The panel would like to see fewer multiple choice and more performance-based assessments in science.

E. ADDITIONAL FINDINGS OF THE TEACHERS OF STUDENTS WITH DISABILITIES AND ENGLISH LEARNERS

1. The standards document needs a simplified continuum of standards added to inform teachers of the prerequisite skills and application level of the standards across grade levels, especially for exceptional education and English Learners' teachers.
2. The relationship between the science standards and other content areas needs to be investigated. A cross over document would benefit exceptional education and English Learners' teachers in thematic or integrated instruction.
3. Standards sometimes contain verbiage that can be confusing. Exceptional education and English Learners' teachers need more specific language, which uses explicit and direct words, as well as words that do not have multiple meanings.
4. In the revision of science standards, consider the grade level sequence and formatting of the Next Generation Science Standards¹², including the integration of cross cutting concepts.
5. The standards need to be built on a progression of learning to meet the needs of students of all abilities.
6. Science should make connections to the "real world." There is a need to explain "why" students are being instructed on these standards, "how" they will be relevant to the students now and in the future and is particularly beneficial to students with disabilities.

F. ADDITIONAL FINDINGS OF THE SCIENCE EDUCATORS

1. Based on the need to assess student performance in science, investigate the use of adaptive computer assessments that incorporate simulations and critical thinking applications needed to assess the higher-level standards as well as performance-based assessments.
2. Standards are clear; however, support document specifies content that is essential but not included in the performance indicator, e.g. 4.E.3B.1.
3. Hyperlinks to the supporting documents should be included in the online version of the standards' documents.
4. Many teachers struggle with science content (particularly those without a science background). Teacher education programs should focus on science content and process. In addition, professional learning that is evidence-based, for teachers should be a critical piece of the science standards implementation process.
5. Consider rewriting the standards in ways that make them clear what the goal is for students by integrating more clearly science and engineering practices.

¹² *NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: National Academies Press.*

6. In several instances the standards are outdated or redundant and should be revised, i.e., 4.E.3A, 7.L.3A, 8.P.2A.4, 8.E.4B.3, H.C.2A.3, H.C.2B.4, H.P.2D.4, H.E.2B.4, H.E.3A.8, H.B.2A.1, and H.B.2A.2.
7. The number and scope of the standards for each grade level is not realistic for teaching in a given school year. Recommendation for the writing team to consider fewer standards and performance indicators to promote deeper learning.
8. Progression levels of science and engineering practices should be created across grade bands so teachers can see the sophistication of how the practices progress. For teachers to successfully implement the standards, the learning progressions must be made clearer and show teachers how to integrate content and practices in performance.
9. The Next Generation Science Standards¹³ were developed using international standards in science. Vet current South Carolina science standards against the Next Generation Science Standards to ascertain the alignment.
10. Be specific about exactly what students should be learning. Align the learning with the Profile of the South Carolina Graduate.
11. Given learning new material is based on prior knowledge, consider rewriting the elementary science standards as cross disciplinary.

IV. EOC RECOMMENDATIONS

The recommendations that are listed below are based on the detailed review of the 2014 South Carolina Science Academic Standards and Performance Indicators and are supported by the evidence and detailed comments that appear in the national and state panel findings included in this report.

1. According to national and international research, science standards should be built upon key core ideas in science; limiting the breadth of “good to know” content and focusing on the depth of the standards for increased student understanding. Limit the number of standards and/or performance indicators explored each year while increasing their depth and revisiting the concepts periodically.
2. The indicators should be clearly stated and more concise as to the specified outcomes for students as well as teachers especially for exceptional education teachers and teachers of English Learners.
3. Science is innately an activity-based content area. Students are more engaged and motivated through hands-on opportunities. The science and engineering practices standards should be more clearly integrated into the science standards to ensure inclusion of science practices in instruction with specific student outcomes. A

¹³ *NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: National Academies Press.*

progression of science and engineering skills specified across grade bands should be created to clarify for all teachers what is expected for student learning.

4. As standards are written at a higher level, assessments must appropriately measure the performance of students at higher levels. New adaptive computer assessments that incorporate simulations and critical thinking applications are needed to adequately measure these standards as well as other alternative measures including performance-based assessments.
5. Science should make connections to the “real world.” There is a need to explain to students of all ability levels “why” students are being instructed on the standards and “how” they will be relevant to all students now and in the future. Therefore, teachers must be aware how modern science is addressed in the work world.
6. Alignment of standards with other content areas is greatly needed. In elementary grades, teachers face the dilemma of more content to be taught in a given year than there is time. In all grades, math and English/language arts is a critical component of learning science concepts and practices. Crossover documents need to be developed to align standards for appropriate learning opportunities.
7. In the rewriting of the standards, consider the performance indicators for primary grades (K-2) to focus on foundational science skills such as observation, posing questions, measurement, seeking answers, and recognizing patterns.
8. Crosscutting concepts (e.g., patterns, modeling, and cause and effect) should be integrated in all standards to provide teachers with the specific concepts/practices most appropriate for the standards. The crosscutting concepts could be integrated into the conceptual understanding.
9. Attention should be given to teacher preparation for all teachers instructing in the science areas. The key to improved science performance is execution of the standards. Teachers who teach science without a science background hinder successful implementation of the standards. Efforts should be made to work closely with post-secondary science educators in providing a student based instructional model for pre-service opportunities. An evidence-based model for effective professional development should be developed to ensure all teachers of science have the tools and support needed to teach science.
10. Development of supplemental/support documents and materials for use in the classroom to assist teachers in instructing all students towards performance indicators should be developed. This would include a curriculum guide and an adaptability document for exceptional education teachers and teachers of English Learners.
11. Biology standards regarding evolution and diversity of life should focus on how organisms change over time in response to changes in the environment and should be aligned from the 2005 version in the expected revisions.

12. The Next Generation Science Standards¹⁴ should be consulted in the revision of the science standards, especially for the “big ideas,” processes in science over disconnected factual knowledge and alignment of content.
13. Consideration should be given to include Physical Science as the 9th grade science to include and specify laboratory experiences for students.

¹⁴ *NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: National Academies Press.*

The SC Education Oversight Committee is an independent, non-partisan group made up of 18 educators, business persons, and elected leaders. Created in 1998, the committee is dedicated to reporting facts, measuring change, and promoting progress within South Carolina's education system.

ADDITIONAL INFORMATION

If you have questions, please contact the Education Oversight Committee (EOC) staff for additional information. The phone number is 803.734.6148. Also, please visit the EOC website at www.eoc.sc.gov for additional resources.

The Education Oversight Committee does not discriminate on the basis of race, color, national origin, religion, sex, or handicap in its practices relating to employment or establishment and administration of its programs and initiatives. Inquiries regarding employment, programs and initiatives of the Committee should be directed to the Executive Director 803.734.6148.