

# Proposed K-12 Science Standards

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# Updates to Proposed Standards

2 updates:

- The Physical Science writing team revised several of verbs in the standards.
- The introduction for each grade and course was updated to include information regarding the scientific method.

# Updates to Proposed Standards

The North Carolina 2023 K-12 Science Standards are intended to foster conceptual understanding and help develop scientifically literate students. The standards provide foundational knowledge and practices within each grade band and course. The standards are organized within 11 strands which articulate vertical alignment. As students progress from one grade to the next, the depth of knowledge and level of sophistication increases.

Engaging in science encourages students' curiosity, interests, and prepares them for the broadest range of postsecondary opportunities, be it college, career, or military service. The 2023 K-12 Science Standards are designed to allow students to become active participants in science - building their understanding of the natural world through observations and investigations.

The scientific method provides a common framework for introducing the traditional experimental design and hypothesis-testing process. The methodologies or approaches utilized by scientists can vary depending on the nature of their research questions and available tools. Steps that all scientists follow when conducting scientific investigations usually involve asking questions, the collection and analysis of relevant data, the use of logical reasoning, opportunities to communicate and collaborate with others, and the development of explanations.

The Science and Engineering Practices (SEP) are embedded in the standards to support a greater emphasis on how students develop science knowledge and the durable skills within the NC Portrait of a Graduate. While one practice is identified in each objective, teachers should utilize other practices to support students' progress towards mastering the standards.

The North Carolina Science Standards maintain the respect for local control of each Public School Unit (PSU). These standards and objectives are not intended to be the curriculum, nor do they indicate the whole of a curriculum which will be written by a PSU or school. The K-12 Science Standard Course of Study has been developed to serve as the framework for a well-planned science curriculum which provides opportunities for investigations, experimentation, and technological design.

# State Board Policy SCOS-012

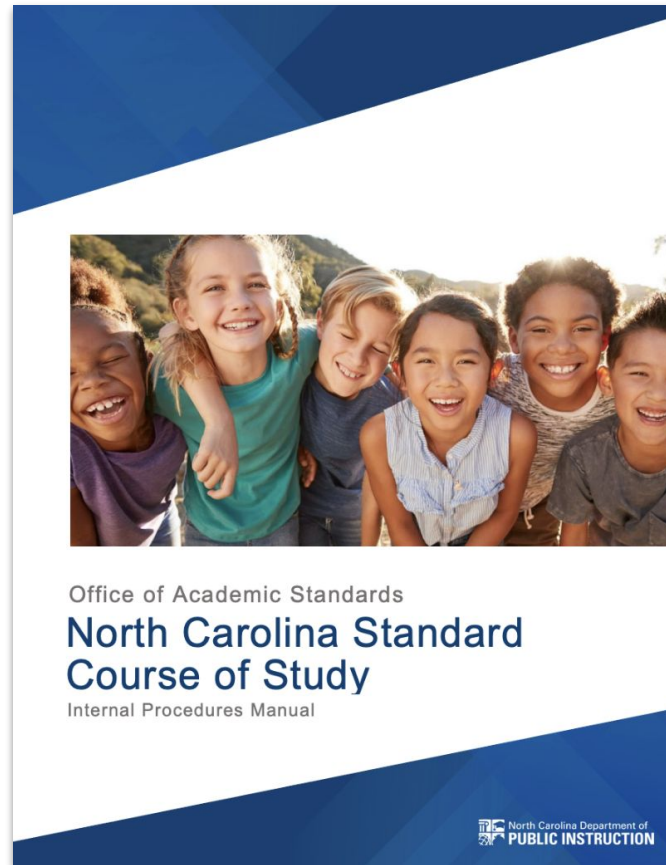
## State Board Policy SCOS-012

- NCDPI facilitates the review of each set of content standards every five-to-seven years to ensure clear, relevant standards and objectives.
- NCDPI uses a uniform and formalized system built on four guiding principles:
  - Feedback-based
  - Research-informed
  - Improvement-oriented
  - Process-driven



# Internal Procedures Manual

Pages 17-23



# The Process

- Established by State Board Policy SCOS-012 and the NC Standard Course of Study Internal Manual first adopted in February, 2022 and revised in April 2023.
- Office of Academic Standards received SBE approval to begin the review process in May, 2022 using a hybrid approach to complete the process.
- Emphasis was placed on the **guiding principles**:
  - Obtaining and using Stakeholder feedback
  - Research and data driven
  - Led by a community of NC Educators

# Guiding Principles

## Obtaining and using Stakeholder feedback

- 8 regional focus groups conducted with K-12 educators from each State Board Region.
- Interviews with community members, representative from institutes of higher education, civic groups, and professional science educator organizations.
- Advisory Team to support review of Draft 1
  
- 5 large scale surveys with 14,000+ responses
  - 2 All-Stakeholder Standard-by-Standard Surveys (2009 Standards and Draft 1)
  - 2 Public School Unit (PSU) Standard-by-Standard Surveys (2009 Standards and Draft 1)
  - 1 All Stakeholder Review of Draft 2

# Guiding Principles

## Research and data driven

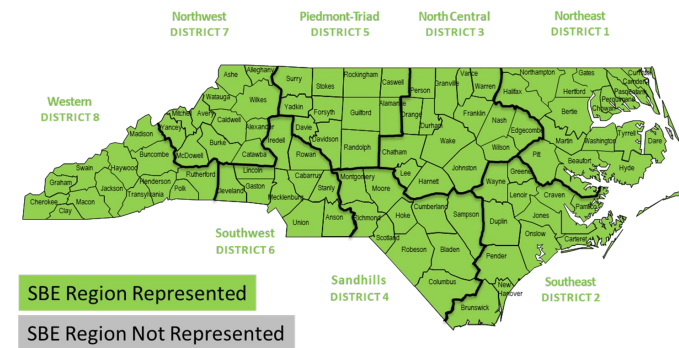
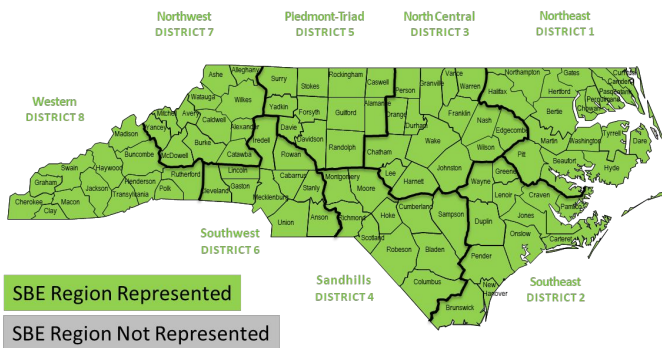
- Research of science standards from across the country, international standards, and frameworks from national science organizations
- Quantitative and qualitative analysis of stakeholder feedback provided by the Office of Learning Recovery for all interviews, focus groups and surveys
- Established a Data Review Committee to examine results and complete reports detailing finding and conclusions with recommendations for the Standard Writing Team.
  - DRC reports prior to the writing of each draft following stakeholder input on the 2009 Standards and Drafts 1 and 2 of proposed 2023 Standards.



# Guiding Principles

Led by a community of NC Educators

- Data Review Committee(DRC) - 27 members including classroom teachers, instructional coaches, school leaders, district leaders, non formal educators, members of Institutes of Higher Education representing all SBE Regions
- Standard Writing Team (SWT) - Initially 39 members primarily represented by classroom teachers, with school leaders, instructional coaches, non formal educators, and members of Institutes of Higher Education representing all SBE Regions (Lost 4 members over the past year)

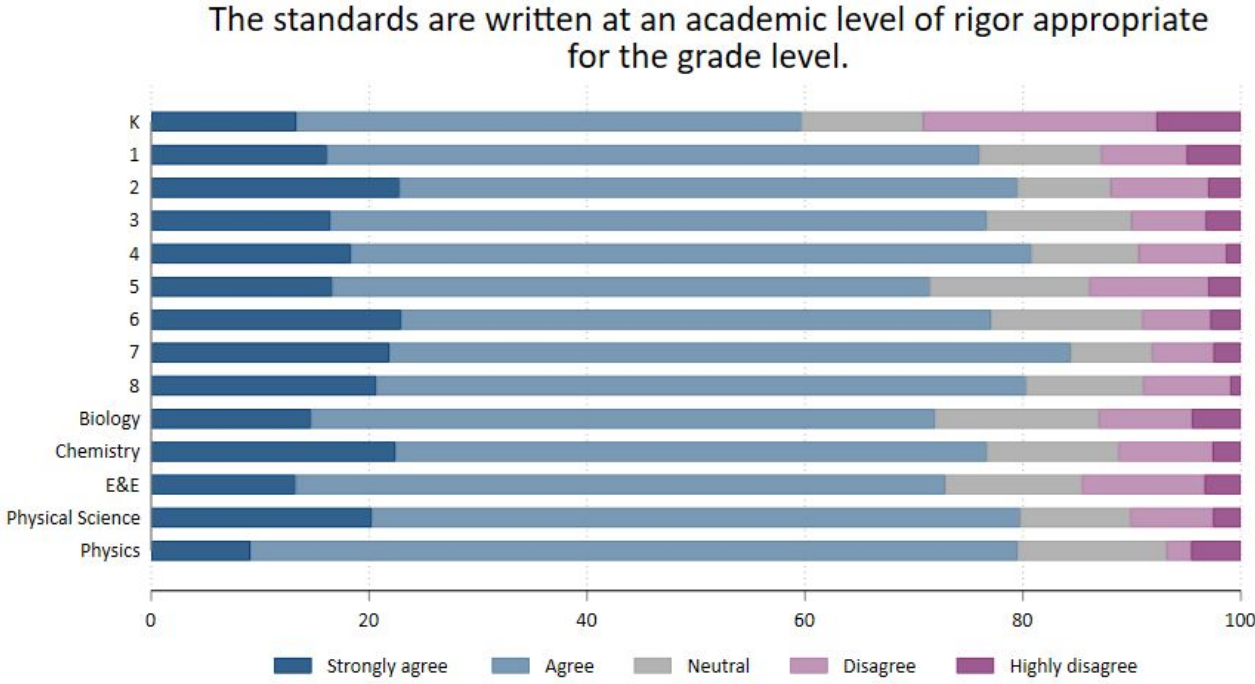


# Draft 3 of Proposed K-12 Science Standards

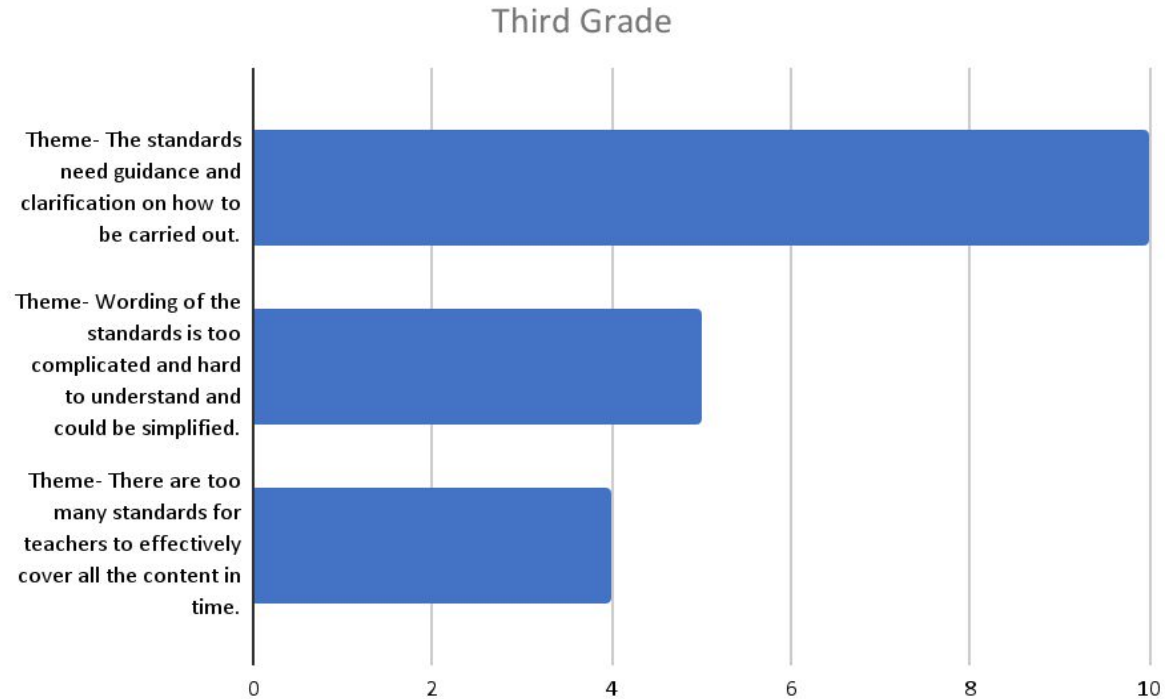
- Followed same process used to developed Drafts 1 and 2
  - Feedback was collected through a single All Stakeholder Survey released from February 23, 2023 through March 26, 2023
    - Per the NCSCOS Manual the Draft 2 survey focused on 10 questions examining the draft standards and objectives as a whole with an opportunity for comments
  - Quantitative and qualitative feedback was reviewed by the Office of Learning Recovery
  - DRC met (virtually) in early April to complete a report with recommendations and conclusions
  - SWT met (virtually) in late April/early May review the DRC Report and to start work on Draft 3

# DRC Draft 2 Report & Analysis

Percentage with levels of agreement



Qualitative Analysis identifying themes specific to comments still seeking improvements/revisions



# Data Trends/Themes from DRC Report(s)

Quantitative and Qualitative Analysis identified initial trends across interviews, focus groups, surveys...

- Keep but streamline content from 2009 standards
  - Focus on the vertical alignment of the standards
  - Refinements to the placement of content within grades, grade bands, or courses
- Embed the Scientific and Engineering Practices to support real world applications
- Consistent use of language across strands and grade levels

# Data Trends/Themes from DRC Report(s)

Feedback trends specifically from Drafts 1 and 2

1. Continued refinement in the wording and language within the standards and objectives to clarify the rigor and expectations.
2. Suggestions and requests for supporting documents and resources to support implementation of the new standards and objectives.
  - Boundary Statements, assessment examples, critical vocabulary (academic language) and descriptions of the Science and Engineering Practices,
3. Professional Learning
  - Training on Science and Engineering Practices
  - Training on Support Materials
  - Support for PSU learning communities (teachers and instructional leaders)

# K-12 Science Standards Writing Team

## Standards Writing Team:

- Began working in early October and met immediately after the DRC completed their reports.
- Worked in teams by grade band or course to address conclusions and recommendations from the DRC Report to create each draft.
- Engaged in vertical conversations prior to each draft being released.
- Worked alongside the Extended Content Standards writing team.

## Draft 3 Revisions/Improvements

- Clarified wording of certain standards and objectives to improve readability
- Examined vertical alignment
- Provided additional suggestions and notes to NCDPI staff for future support materials and professional development.

# Draft 3 of the Proposed K-12 Science Standards

## DRAFT CHEMISTRY CROSSWALK

	2009 Standards		DRAFT 3 2023 Standards	
	Standards	Objectives	Standards	Objectives
Kindergarten	4	14	5	11
1st	5	12	5	10
2nd	5	13	5	13
3rd	7	18	8	19
4th	7	18	8	20
5th	7	19	6	16
6th	7	21	8	26
7th	5	21	6	23
8th	8	22	8	23
Biology	11	31	10	27
Chemistry	7	31	7	20
Earth/ Environmental	9	30	6	28
Physical Science	8	30	8	34
Physics	8	29	7	19
TOTAL	99	309	101	289

Matter and Its Interactions	2009 Essential Standards/Clarifying Objectives	Notes
<b>2023 Standards/Objectives</b>		
<b><i>PS.Chm.1 Analyze the structure of atoms and isotopes.</i></b>	<i>Chm.1.1 Analyze the structure of atoms and ions.</i>	
PS.Chm.1.1 Use models to explain how the scientific understanding of atomic structure has evolved.	Chm.1.1.1 Analyze the structure of atoms, isotopes, and ions.	
PS.Chm.1.2 Use models to compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission.	Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life.	
PS.Chm.1.3 Use models to explain how electrons are distributed in atoms.	Chm.1.1.2 Analyze an atom in terms of the location of electrons.	
	Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model.	
<b><i>PS.Chm.2 Understand the physical and chemical properties of atoms based on their position in the Periodic Table.</i></b>	<i>Chm.1.3 Understand the physical and chemical properties of atoms based on their position in the Periodic Table.</i>	

# Standards that Engage and Build Durable Skills

Scientific & Engineering Practice	How students are engaging with science?
Ask Questions and Define Problems	Asking and refining questions to clarify what is needed to test ideas about the natural world or find solutions to solve engineering problems.
Develop and Use Models	Using or constructing models to represent ideas, develop new questions and revise scientific explanations or proposed engineering systems.
Plan and Carry Out Investigations	Planning and carrying out data driven investigations through labs and field experiences in/out of the classroom working collaboratively as well as individually.
Analyze and Interpret Data	Analyzing data using tools, technologies, and/or models in order to recognize patterns and make valid and reliable scientific claims
Use Mathematics & Computational Thinking	Using mathematics to recognize, express, and apply quantitative relationships.
Construct Explanations	Apply scientific ideas, principles, and/or evidence to explain phenomena and solve design problems.
Engage in Argument from Evidence	Listening to, comparing, and evaluating ideas and methods based on evidence.
Obtain, Evaluate, and Communicate Information	Using multiple sources of information to obtain, critique and communicate ideas visually, verbally, or in writing, both individually and in groups.



# Standards that Engage and Build Durable Skills



# Science

# Extended Content Standards

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Office of Exceptional Children

Dreama McCoy, Section Chief

Supporting Teaching and Related Services

Matthew Martinez, Consultant for Significant Disabilities



# Every Student Succeeds Act

- A state's academic achievement standards describe how much students are expected to learn in order to be proficient on a state's general assessment. Alternate academic achievement standards set an expectation of performance that can differ in complexity from a grade-level achievement standard.
- ESSA determined the cap for students instructed towards alternate academic achievement standards at 1.0 percent of total assessed population to be considered students with significant cognitive disabilities

# Students with Significant Cognitive Disabilities

Meet these 3 criteria established by North Carolina

<p>The student's disability significantly impacts cognitive and adaptive behaviors, defined as those skills which are essential for someone to live and function independently</p>	<p>The student requires extensive and repeated individualized instruction and support to make meaningful gains.</p>	<p>The student uses substantially adapted materials and individualized methods of accessing information in alternative ways.</p>
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- ❖ Graduate high school with a certificate of completion, not a high school diploma

# Course of Study Comparison

99%

Standard Course of Study

Majority of students, including students with disabilities

- Access instruction in general ed. classes
- Participate in Standard Course of Study Assessments

1%

Extended Content Standards

Students with significant cognitive disabilities:

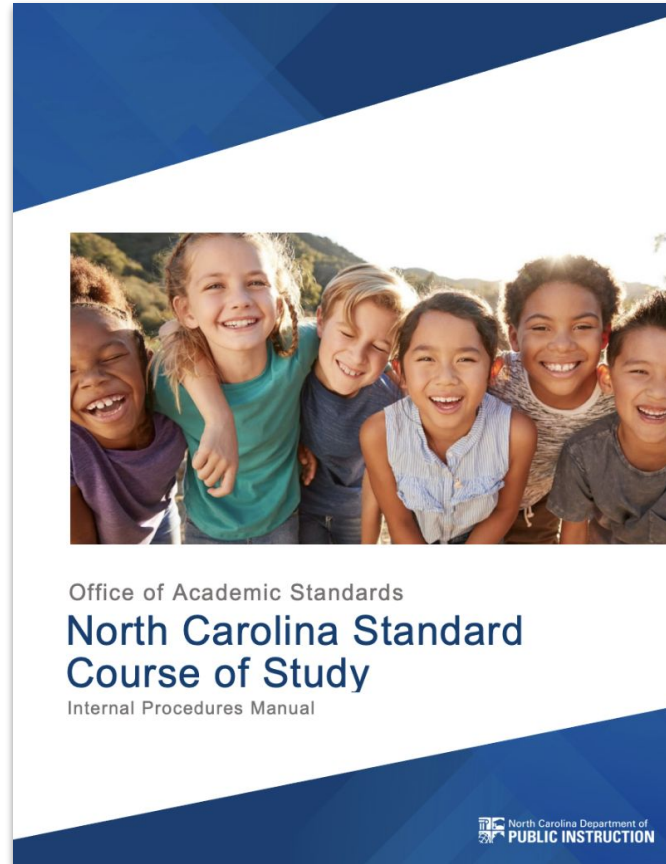
- Placement decision made by the IEP team
- Access instruction within special education classes

# Our students instructed towards the ECS



- Are able to learn
- Need more time
- Need more practice
- Need opportunities
- Need teachers who are experts in standard based learning
- Need a mode of communication

# Internal Procedures Manual



# Writing Stakeholder Groups

Grades K - 2	Grades 3 - 5	Middle School	High School Biology	High School Earth / Environmental Science
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# Draft 3 of Proposed K-12 Science Extended Content Standards

- Followed similar process as Standard Course of Study
  - Feedback was collected through a single All Stakeholder Survey released from February 23, 2023 through March 26, 2023
    - Survey focused on 10 questions examining the draft standards and objectives as a whole with an opportunity for comments
  - Quantitative and qualitative feedback was reviewed by the Office of Exceptional Children
  - SWT met (virtually) in late April/early May review the results and to start work on Draft 3
  - OEC final changes based upon Internal and External Feedback

# Proposed change to High School

## Current High School Courses

Biology A

Biology B

*Life Science*

## Proposed High School Courses

Biology A

Biology B

*Earth and Environmental Science*

# The Positives

- ❑ Collaboration provided the ECS Writing Teams the Science instructional knowledge for rigorous, yet attainable standards and objectives for all learners
- ❑ Provides a model for how districts can include all teachers in professional learning and instruction resources sharing
- ❑ Instructional resources can be purchased for all classrooms

# OEC Process

## Words from the Field



# Testing Timeline: Development

- Train teachers and content experts to write items aligned to the new science content standards in summer 2023
- Contract with teachers and content experts to write test items for embedded field testing in the 2023-24 science tests (after SBE adopts science content standards)
- Engage teachers and content experts to recommend test specifications in Fall 2023

# Testing Timeline: Implementation

- Build and administer new operational assessments for the 2024-25 school year
- Engage teachers and content experts in standard setting workshops to recommend academic achievement levels in July 2025
- Recommend academic achievement levels to SBE for adoption in August 2025

# Questions?

