

FRANKLIN SCIENCE & ARCHIMEDES MATH STANDARDS

Restoring Common Sense Education



INTRODUCTIONS

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A BRIEF HISTORY OF K-12 STANDARDS

- LATE 1980S: CONCERNS ABOUT PUBLIC EDUCATION QUALITY EMERGE.
- 1983: A NATION AT RISK REPORT CALLS FOR RIGOROUS, MEASURABLE STANDARDS.
- LATE 1980S-EARLY 1990S: STATES LIKE CALIFORNIA AND MASSACHUSETTS DEVELOP THEIR OWN ROBUST STANDARDS, DRIVEN BY A BELIEF IN HIGH EXPECTATIONS AND LOCAL CONTROL.
- MID-1990S: NEARLY EVERY STATE ADOPTS STANDARDS FOR CORE SUBJECTS.
- PURPOSE: TO ENSURE CONSISTENT, HIGH-QUALITY EDUCATION, ADDRESS DISPARITIES, AND COUNTER ACADEMIC DECLINE.
- IMPACT: STANDARDS DRIVE INSTRUCTION, CURRICULUM, TEACHER TRAINING, AND ASSESSMENTS.



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THE ROLE OF EDUCATIONAL STANDARDS

- **GUIDELINES**: THEY OUTLINE WHAT STUDENTS SHOULD KNOW AND BE ABLE TO DO AT EACH GRADE LEVEL.

ESSENTIAL PURPOSES:

- **CONSISTENCY**: UNIFORM QUALITY OF EDUCATION FOR ALL.
- **ACCOUNTABILITY**: A WAY TO MEASURE PROGRESS FOR SCHOOLS, TEACHERS, AND STUDENTS.
- **EQUAL ACCESS**: ESTABLISH HIGH EXPECTATIONS FOR EVERY STUDENT, REGARDLESS OF BACKGROUND.
- **CRUCIAL IN SCIENCE**: PREPARES STUDENTS FOR A WORLD DRIVEN BY SCIENTIFIC AND TECHNOLOGICAL ADVANCEMENTS.



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ISSUES WITH THE NGSS SCIENCE STANDARDS:

- **LOW IN CONTENT** - Receives a 'C' grade from the Fordham Institute due to lack of quality content.
- **FOCUSED ON SKILLS** at the expense of content.
- Shifts focus from what students learn to how they learn, leaving **TEACHERS UNCLEAR WHAT TO TEACH.**
- **OMITS SUPPOSITIONS AND LIMITATIONS** of science and clear definitions of scientific reasoning and methods.
- **HIGHLY POLITICIZED.**
- Includes 'Equity Guidance' for providing equitable learning for diverse genders, but **OMITS TEACHING THE SCIENTIFIC METHOD.**



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ISSUES WITH THE NGSS SCIENCE STANDARDS:

Students who demonstrate understanding can:

- 1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*** [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use materials to design a device that solves a specific problem or a solution to a specific problem.

Disciplinary Core Ideas

LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.

LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering and Technology on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

Connections to other DCIs in first grade: N/A

Articulation of DCIs across grade-levels:

K.ETS1.A ; 4.LS1.A ; 4.LS1.D ; 4.ETS1.A

Common Core State Standards Connections:

ELA/Literacy -

W.1.7

Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions). (1-LS1-1)

FRANKLIN SCIENCE STANDARD ALTERNATIVE

Life Sciences

3. All living things use various adaptations to sustain their lives.
 - 3.1 The environment influences the form and function of organisms (light, gravity, moisture, and temperature). Different environments may require specific adaptations for survival and thriving (thick fur in cold weather, long legs, gills in water, lungs in air).



BENEFITS OF ARCHIMEDES MATH STANDARDS

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- Rigorous **CONTENT-RICH standards** from Pre-K–12 with an emphasis on building fundamentals and number fluency.
- Offers **LUCIDITY** with brief, clear, coherent standards that teachers, students, and parents can understand, implement, and assess.
- Provides **PRACTICALITY** through simple style, key terms, symbols, age-appropriate vocabulary and glossary.
- Built on **RESEARCH-BASED PRACTICES** from national and international sources.
- Promotes **DEMOCRATIC ACCESSIBILITY** ensuring equal educational opportunities for ALL STUDENTS.
- Allows for teacher **FLEXIBILITY** in pedagogy.
- **APPLICABILITY** to state public schools, individual districts, private schools, and homeschooling.
- **INSPIRES CURIOSITY** and the WONDER OF MATH by exploring its rich history and the human stories behind key discoveries.
- Provides students with a **SOLID FOUNDATION** to engage with math as a way to make.

ISSUES WITH COMMON CORE MATH STANDARDS:

7. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

ARCHIMEDES MATH STANDARDS ALTERNATIVE

- 3.1 Add three-digit whole numbers to 1,000 with regrouping using the standard algorithm.
- 3.2 Subtract three-digit whole numbers within 1,000 with regrouping using the standard algorithm.

CRITIQUE OF CURRENT EDUCATIONAL PRACTICES

- Many popular methods are well-intentioned but can be ineffective.
- INQUIRY-BASED LEARNING: Can be problematic without proper guidance and lead to misconceptions.
- PROJECT BASED LEARNING (PBL): Often prioritizes the project over content depth. Students learn less content, teachers are stressed, and learning is limited.
- RISK: These methods can leave students with significant knowledge gaps.



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WHAT EFFECTIVE SCIENCE INSTRUCTION LOOKS LIKE

- A combination of direct teaching and structured application.

KEY ELEMENTS:

- **Direct Instruction:** Clear explanations of principles and facts.
- **Structured Hands-On Activities:** Labs to reinforce learning.
- **Critical Thinking & Inquiry:** Asking questions and analyzing data within a structured framework.
- **Historical & Technological Context:** Understanding the "why" and "how."
- **Mathematical Foundations:** Rigorous math preparation.



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THE IMPORTANCE OF TEACHING THE SCIENTIFIC METHOD

- It is the **cornerstone of scientific literacy** and **critical thinking**.
- Framework: Observe, question, hypothesize, experiment, analyze, conclude.

WHY IT'S CRUCIAL:

- Provides a systematic process to understand how knowledge is developed.
- Builds critical thinking skills to evaluate claims.
- It is a structured and effective approach for novice learners.
- Is it “outdated”?
- **The Franklin Science Standards explicitly incorporate the scientific method.**



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FRANKLIN SCIENCE STANDARDS OBJECTIVES:

- IMPROVE K-12 SCIENCE EDUCATION.
- INCREASE RIGOR.
- REMOVE POLITICIZATION.
- EDUCATE CITIZENS ON WHAT SCIENCE IS AND WHAT IT IS NOT.
- ENSURE THAT THE SUPPOSITIONS AND LIMITATIONS OF SCIENCE ARE TAUGHT.
- FOCUS ON TEACHING CONTENT OVER SKILLS.
- PROVIDE FLEXIBILITY FOR STATES TO AUGMENT OR NARROW STANDARDS.
- INTRODUCE K-12 FRANKLIN STANDARDS FOR NATIONWIDE ADOPTION.



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BENEFITS OF FRANKLIN SCIENCE STANDARDS:

- Rigorous, **CONTENT-RICH** standards.
- Teaches **SUPPOSITIONS** and **LIMITATIONS** of science.
- Teaches clear definitions and methods of **SCIENTIFIC REASONING**.
- Allows for teacher **FLEXIBILITY** in pedagogy.
- Appropriate scaffolding that cultivates scientific **CURIOSITY** beginning in kindergarten.
- **DEPOLITICIZES** content.
- Provides students with a **SOLID FOUNDATION** to engage with science as discerning citizens or pursue a science career.



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BENEFITS OF FRANKLIN SCIENCE STANDARDS:

- Addition of **NEW STANDARDS**: Scientific Inquiry, History of Science, and Engineering.
- Teaches and utilizes the **SCIENTIFIC METHOD** as a necessary tool for scientific discovery.
- **APPLICABILITY** to state public schools, individual districts, private schools, and homeschooling.



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THE NEED FOR THE FRANKLIN SCIENCE STANDARDS

CHALLENGES IN AMERICA'S SCIENCE EDUCATION

- The US spends the most on education, yet ranks **12th to 18th in science performance globally.**
- China is posting better science performance at the top end.
- Professors indicate that **US students are unprepared** for science in college or career.
- The majority of graduate science students in many disciplines are foreign-born and **not US K-12 educated.**
- K-12 students who do not pursue science are not being taught what science is and is not, nor how to use science as citizens.
- Most (**over 90%**) of **US states** are based on or heavily influenced by a single low content model standard called NGSS.



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TEACHERS' PERSPECTIVE

The clarity of the Franklin Standards will lead to clarity in teacher training and professional development. They will become confident content experts capable of confidently transferring knowledge to their students.

The objective for an activity is critical. The Franklin Standards solves that problem by focusing on the content that students should acquire upon completing a lesson or unit. As a result, assessing a student's understanding of the content is much more feasible and measurable.



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At Freedom in Education (FIE), we understand the power of collaboration and the strength that comes from leveraging the expertise of others. Our organization was founded with **a clear mission:** to create solutions that drive positive change in education.