

Science and Numeracy: Engaging in the Practices

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Later today I will post this on bit.ly/GACISSCI2019



**Take a minute to think about
this....**

**What do scientists, engineers, and
mathematicians do?**

Let's discuss.

The Vision for Science Education in the GSE

- Students, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.
- The learning experiences provided for students should engage them with fundamental questions about the world and with how scientists have investigated and found answers to those questions.

What Do We Mean By 3-D Science?

Students Actively Engage in the ...

And apply...

To deepen their understanding in the...

Science and Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics, information and computer technology, and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

Core Disciplinary Ideas

- Matter and its interactions
- Motion and stability: Forces and interactions
- Energy
- Waves and their applications in technologies for information transfer
- Structure and processes in living organisms
- Ecosystems: Interactions, energy, and dynamics
- Heredity: Inheritance and variation of traits
- Biological evolution: Unity and diversity
- Earth's place in the universe
- Earth's systems
- Earth and humanity
- Engineering design

What is 3D Standard Construction?

Our science standards include three dimensions meant to be integrated simultaneously in the classroom:

1. Disciplinary Core Ideas: The Content

The standards contain a limited number of disciplinary core ideas

2. Science and Engineering Practices: How Students will Engage with the Content and Show Mastery

All K-12 science use the same eight science practices

3. Crosscutting Concepts: The Big Ideas that Span Science Disciplines

These provide structures to support learning; all courses/grades use the same crosscutting concepts

A Visual - Standard Construction

Each standard in K-12 science begins with the science practice of obtaining, evaluating, and communicating information. Each standard element contains a separate science practice. Here is how they are constructed:

SPS8. Obtain, evaluate, and communicate information to explain the relationships among force, mass, and motion.

b. Construct an explanation based on experimental evidence to support the claims presented in Newton's three laws of motion.

The WHAT (disciplinary core idea)

The HOW (science and engineering practice)

Color-coded standards are available in the SLDS-TRL-Essential Toolkit under “What do I teach”

The Power of the Practices

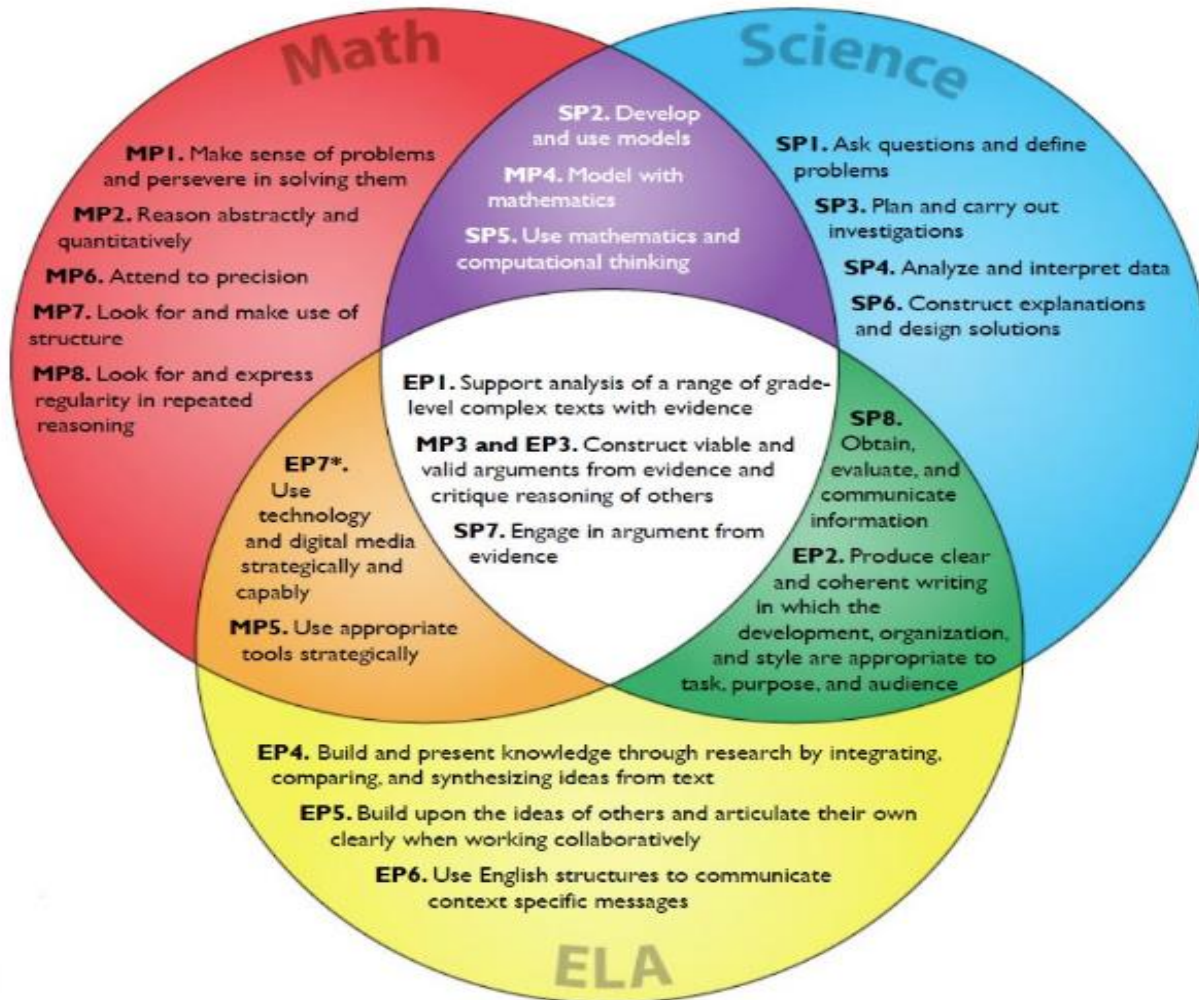
Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in **argument** from evidence
8. Obtaining, evaluating, and communicating information

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable **arguments** and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Commonalities Among the Practices



GSE

- Focus on students doing math/science and student figuring out
- The standards are student performance expectations
- The “practices” are ensuring that students are engaging in the work of scientists, engineers and mathematicians
- Making these connections explicit is our job
- Let’s look into a classroom....

Can We Replace Bees With Robots?



Interdisciplinary investigation for 7th graders

Scenario:

- Pollinator colonies are collapsing around the world.
- Students investigate the feasibility of replacing pollinators with robotic drones.
- Students develop proposals for pollinator replacements.

Standards Correlations

Science

- Interdependence of organisms with one another and their environments
- Use mathematical representations to evaluate explanations of how natural selection leads to changes in specific traits of populations over successive generations.

Social Studies

- Africa, Southwest Asia, Southeast Asia

Mathematics

- Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Solve problems involving scale drawings
- Solve real-world and mathematical problems involving surface area

ELA

- Cite several pieces of textual evidence to support analysis
- Write arguments to support claims with clear reasons and relevant evidence.

Project Outline

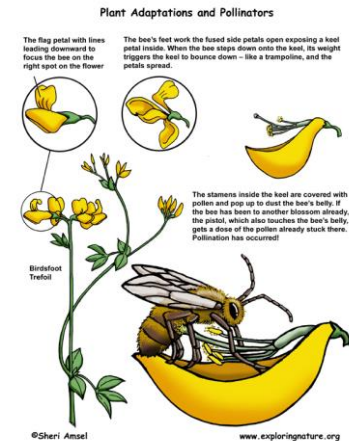
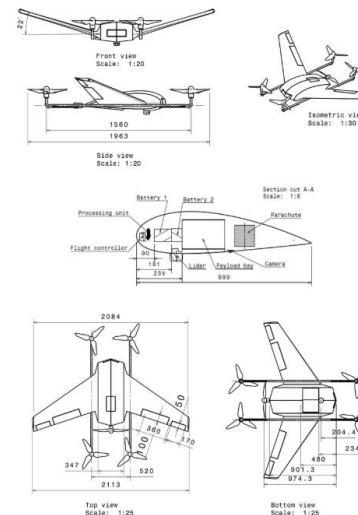
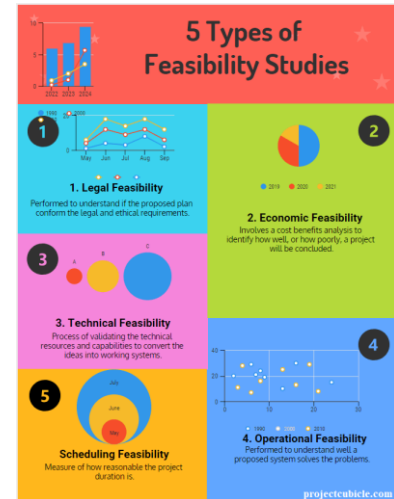


- Students research pollinators in different regions
- Develop pollinator replacement drones for specific plants
 - Coffee in Africa, date palms in Middle East, coffee in Southeast Asia
 - Draft scale models of drones and drone adaptations
- Develop simulated flowers for drone testing
 - Consult with fine arts for developing models
- Conduct feasibility study based on drone testing
 - Calculating numbers of drones required
- Present findings for adoption by local “governments”

Assessment

Proposal & Feasibility Report

- Graded each subject area for content
- Student produces only one report with a team
- Includes sum of project parts
 - Summary of expert consultation
 - UGA Extension Office
 - Summary of research
 - Drone Scale Model Drawing
 - Analysis of drone adaptation
 - Calculation of feasibility





Q&A

Resources: Georgia Standards

Science Georgia Standards of Excellence (GSE)

On June 9, 2016, the State Board of Education approved the K-12 Georgia Standards of Excellence (GSE) for Science. The K-12 Science GSE will be implemented during the 2017-2018 school year following a full year of teacher training.

A great resource library takes time to build. Check back frequently as we fill the shelves.

Standards

K-5

- Kindergarten
- Grade 1
- Grade 2
- Grade 3
- Grade 4
- Grade 5

6-8

- Grade 6
- Grade 7
- Grade 8

9-12

- Biology
- Chemistry
- Earth Systems
- Environmental Science
- Physical Science
- Physics

Curriculum Maps

- Kindergarten
- Grade 1
- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Grade 6
- Grade 7
- Grade 8
- Biology
- Physical Science

GSO is undergoing a great deal of updates and changes. So, all updates for science are currently being loaded in the SLDS-TRL

www.georgiastandards.org

– 10 Modules in 3D Science to be used in Professional Learning Communities (for sessions less than an hour)

Resources: TRL

The screenshot shows the Hall County Schools website interface. At the top left is the logo for Hall County Schools. Below it is a navigation bar with tabs for SLDS, TRL, PD, High School Feedback, and Logout. The TRL tab is selected. Below the navigation bar, there are several filters: 'Consider Best Score' (set to No), 'Admin Group' (Main, Retest), 'Filter Group' (Total), 'Season' (Spring), 'Fiscal Year' (2018, 2017), and 'Filter' (Total). Below the filters is a pagination bar showing '1 of 1' and a 'Find | Next' button. The main content area displays the title 'Historical DISTRICT MilestonesEOG Results for: Hall County' and the date 'Thursday, August 30, 2018'. Below the title is a legend for learner levels: Beginning Learner (red), Developing Learner (orange), Proficient Learner (green), and Distinguished Learner (yellow). An orange arrow points from the 'TRL' tab in the navigation bar to the 'Historical Dashboard' link in the main content area.

Resources: TRL

The screenshot displays the Georgia Virtual School Resources website. At the top right, there are two green buttons: "Essential Toolkit" and "Help & Training". Below these is a search bar with the text "Title/Description Search: enter word then results containing this word will appear below. (Math)" and a "SEARCH" button. To the left of the search bar is a vertical menu with filters for Grade, Subject, Educational Use, Digital Media Type, Program, and Rating. To the right of the search bar are options for "Sort by: Relevance" and "View: 10", along with "List" and "Grid" view toggles. Below the search bar is a "LEARNING STANDARDS" dropdown menu and three icons for folder, document, and refresh. The main content area is titled "Georgia Virtual School Resources" and shows four resource cards for "Advanced Composition" in different genres: "Writing Resumes and Letters", "Informative Writing", "Persuasive Writing", and "Narrative Writing". An orange arrow points from the "Writing Resumes and Letters" card to the "Essential Toolkit" button.

Resources: TRL

Title/Description ▾ Title/Description Search: enter word then results containing this word will appear below. (Math) Q SEARCH




Select a category based on what you want

What do I Teach? How do I Teach? Did they Learn? Need to Know?

Grades ▾
Subject ▾

Found 686 results Sort by: Relevance ▾ View: 10 ▾ List Grid

What do I Teach? X CLEAR

Resources: GaDOE Assessment

- GaDOE EOG/EOC –don't google /go to source
 - <http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-End-of-Grade-Assessment-Guides.aspx>
 - <http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/EOG-Study-Resource-Guides.aspx>
 - <http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-End-of-Course-Assessment-Guides.aspx>
 - <http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/EOC-Study-Resource-Guides.aspx>
- Make sure all teachers review these resources as all teachers are teaching GSE and thus assessing GSE (not just those with a GMAS)

Resources: GaDOE Science

<https://www.gadoe.org/Curriculum-Instruction-and-Assessment/Curriculum-and-Instruction/Pages/Science.aspx>

Science

Science

The Georgia Science standards are designed to provide foundational knowledge and skills for all students to develop proficiency in science. The Project 2061's Benchmarks for Science Literacy and the follow up work, A Framework for K-12 Science Education were used as the core of the standards to determine appropriate content and process skills for students. The standards focus on a limited number of core disciplinary ideas and crosscutting concepts which build from Kindergarten to high school.

The Science Georgia Standards of Excellence drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphasis of instruction. The standards are a required minimum set of expectations that show proficiency in science.

Science Standards and Curriculum Frameworks

Georgia Science Standards and Courses

- Georgia Standards of Excellence for Science
- Frequently Asked Questions - Science GSE
- 2019 -2020 Fourth Science Options
- Finding Resources on the TRL

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- 13 Videos Just Released in September



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