Elementary Science
Equipping Students Through Inquiry and Integration

Stephen Pruitt, President
Samantha Durrance, Policy Analyst
In the *Elementary Science* report, SREB examines how science instruction, typically taught separately from reading and math, may not be getting enough attention in elementary classrooms. The report looks at how waiting until the middle grades to give science an equal place among the academic subjects can hinder students in developing important thinking skills that will benefit them in all subjects areas and for later career success.
Summary

• Scientific thinking and processes are valuable across all areas of learning.
• Science often receives inadequate attention in elementary school.
• Scientific learning in elementary school should be 3D and integrated with other subjects.
• Elementary teachers need adequate preparation to teach science well.
The Value of Science

S

E

T

M
Many Fields Rely on STEM

Health Care
- Doctors
- Nurses
- Lab Techs
- Med Assts

Skilled Trades
- Plumbers
- Electricians
- Carpenters
- Mechanics

White Collar Professionals
- Scientists
- Architects
- Engineers
- Psychologists
K-3 teachers who report teaching each subject all or most days each week:

**Math**: 99%

**Science**: 17%

*Source: SREB, based on data from the 2018 National Survey of Science and Mathematics Education*
# Kindergarten

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00-10:00</td>
<td>8:00-10:00</td>
<td>8:00-10:00</td>
<td>8:00-10:00</td>
<td>8:00-10:00</td>
</tr>
<tr>
<td>Reader’s Workshop</td>
<td>Reader’s Workshop</td>
<td>Reader’s Workshop</td>
<td>Reader’s Workshop</td>
<td>Reader’s Workshop</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td>10:00-10:30</td>
<td>10:00-10:30</td>
<td>10:00-10:30</td>
<td>10:00-10:30</td>
</tr>
<tr>
<td>Writing</td>
<td>Writing</td>
<td>Writing</td>
<td>Writing</td>
<td>Writing</td>
</tr>
<tr>
<td>Lunch</td>
<td>Lunch</td>
<td>Lunch</td>
<td>Lunch</td>
<td>Lunch</td>
</tr>
<tr>
<td>Recess</td>
<td>Recess</td>
<td>Recess</td>
<td>Recess</td>
<td>Math Workshop</td>
</tr>
<tr>
<td>Science</td>
<td>Science</td>
<td>Science</td>
<td>Science</td>
<td>12:10-2:25</td>
</tr>
<tr>
<td>11:50-1:00</td>
<td>11:50-1:00</td>
<td>11:50-1:00</td>
<td>11:50-1:00</td>
<td>12:10-2:25</td>
</tr>
<tr>
<td>Math Workshop</td>
<td>Math Workshop</td>
<td>Math Workshop</td>
<td>Math Workshop</td>
<td>Music (M/W)</td>
</tr>
<tr>
<td>1:00-1:45</td>
<td>1:00-1:45</td>
<td>1:00-1:45</td>
<td>1:00-1:45</td>
<td>12:45-1:15</td>
</tr>
<tr>
<td>Reading and</td>
<td>Reading and</td>
<td>Reading and</td>
<td>Reading and</td>
<td>Art</td>
</tr>
<tr>
<td>Math Rime</td>
<td>Math Rime</td>
<td>Math Rime</td>
<td>Math Rime</td>
<td>1:20-1:50</td>
</tr>
<tr>
<td>1:45-2:05</td>
<td>1:45-2:05</td>
<td>1:45-2:05</td>
<td>1:45-2:05</td>
<td>Media</td>
</tr>
<tr>
<td>Social Studies</td>
<td>Social Studies</td>
<td>Social Studies</td>
<td>Social Studies</td>
<td>Music (T/TH)</td>
</tr>
<tr>
<td>KEA Centers</td>
<td>KEA Centers</td>
<td>KEA Centers</td>
<td>KEA Centers</td>
<td>1:55-2:25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# First Grade

- **8:30-8:55** Arrival/ Morning Work
- **8:55-9:15** Calendar
- **9:15-9:30** Social Studies
- **9:30-10:00** Reading Tier
- **10:00-11:00** Reading
- **11:00-11:20** Lunch
- **11:30-11:45** Recess
- **11:45-12:30** Math
- **12:30-1:00** P.E. (M/W) Music (T/TH)
- **1:00-1:30** Library (M/W) Science (T/TH)
  - Alternate specials on Fridays
- **1:35-2:05** Math Tier
- **2:00-2:25** Encore
- **2:35-3:35** Literacy Centers
- **3:35-3:45** Stack up, pack up
- **3:45-3:54** Read Aloud/ Class Meeting
- **3:54-4:01** Head home
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:50-8:20</td>
<td>CALENDAR</td>
</tr>
<tr>
<td>8:20-9:05</td>
<td>READING</td>
</tr>
<tr>
<td>9:05-9:55</td>
<td>PHONICS</td>
</tr>
<tr>
<td>9:55-10:20</td>
<td>MATH SPARK</td>
</tr>
<tr>
<td>10:20-10:45</td>
<td>ELAR SPARK</td>
</tr>
<tr>
<td>10:45-11:05</td>
<td>RECESS</td>
</tr>
<tr>
<td>11:10-11:40</td>
<td>LUNCH</td>
</tr>
<tr>
<td>11:45-12:25</td>
<td>WRITER’S WORKSHOP</td>
</tr>
<tr>
<td>12:25-1:10</td>
<td>ROTATION</td>
</tr>
<tr>
<td>1:20-2:05</td>
<td>MATH</td>
</tr>
<tr>
<td>2:05-2:50</td>
<td>SCIENCE/SOCIAL STUDIES</td>
</tr>
<tr>
<td>2:55-3:00</td>
<td>DISMISSAL</td>
</tr>
<tr>
<td>3:00-3:30</td>
<td>Clean up and lockers</td>
</tr>
<tr>
<td>3:30-3:50</td>
<td>Math</td>
</tr>
<tr>
<td>3:50-4:20</td>
<td>Science</td>
</tr>
<tr>
<td>4:20-4:40</td>
<td>Math</td>
</tr>
<tr>
<td>4:40-5:00</td>
<td>Math</td>
</tr>
<tr>
<td>5:00-5:20</td>
<td>Math</td>
</tr>
</tbody>
</table>

**Daily Schedule**

5th Grade

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:35 – 8:50</td>
<td>Arrive at school and prepare for the day (Breakfast, visit locker, sharpen pencils, etc)</td>
</tr>
<tr>
<td>8:50</td>
<td>Morning announcements</td>
</tr>
<tr>
<td>8:55 – 10:30</td>
<td>Reading/Language Arts</td>
</tr>
<tr>
<td>10:30 – 11:05</td>
<td>Social Studies</td>
</tr>
<tr>
<td>11:05 – 11:50</td>
<td>Specials</td>
</tr>
<tr>
<td>11:50 – 12:05</td>
<td>Silent Reading/Activity time</td>
</tr>
<tr>
<td>12:05 – 12:50</td>
<td>Lunch/Recess</td>
</tr>
<tr>
<td>12:55 – 1:30</td>
<td>Science</td>
</tr>
<tr>
<td>1:35 – 3:15</td>
<td>Math</td>
</tr>
<tr>
<td>3:15 – 3:20</td>
<td>Clean up and lockers</td>
</tr>
<tr>
<td>3:20 – 3:25</td>
<td>Dismissal</td>
</tr>
</tbody>
</table>
Average number of minutes per day spent teaching each subject:

- Social Studies: 16 (Grades K-3), 21 (Grades 4-6)
- Science: 18 (Grades K-3), 27 (Grades 4-6)
- Mathematics: 57 (Grades K-3), 63 (Grades 4-6)
- Reading/ELA: 89 (Grades K-3), 82 (Grades 4-6)

Source: SREB, based on data from the 2018 National Survey of Science and Mathematics Education
Integrating Science in Elementary: Reading

- Background Knowledge
- Vocabulary
“Reading, interpreting, and producing text are fundamental practices of science in particular, and they constitute at least half of engineers’ and scientists’ total working time.”

- National Research Council
Integrating Science in Elementary: Math

Analyze and interpret data

Find patterns in data

Develop models; make predictions
3-Dimensional Science

Scientific and Engineering Practices

Cross-Cutting Concepts

Disciplinary Core Ideas in the Sciences
3D Science: Scientific and Engineering Practices

- **Gather**
  - Obtain Information
  - Ask Questions/Define Problems
  - Plan & Carry Out Investigations
  - Use Mathematics & Computational Thinking
  - Use Models to Organize Data and/or Information

- **Reason**
  - Evaluate Information
  - Analyze Data
  - Use Mathematics and Computational Thinking
  - Construct Explanations/Solve Problems
  - Develop Arguments for why or how Evidence Supports Explanations or Claims
  - Use Models to Predict & Develop Evidence

- **Communicate Reasoning**
  - Communicate Information
  - Communicate Arguments (written/oral) for how the Evidence Supports an Explanation
  - Use Models to Communicate Reasoning

Source: *Going 3D with GRC*
3D Science: Cross-Cutting Concepts

Source: San Diego County Office of Education Science Resource Center
3D Science: Disciplinary Core Ideas

- Life Sciences
- Engineering & Technology
- Earth & Space Sciences
- Physical Sciences

Source: The Concord Consortium
Elementary teachers who felt very well-prepared to teach a subject:

- **Reading/Language Arts**: 77%
- **Math**: 73%
- **Science**: 31%

*Source: SREB, based on data from the 2018 National Survey of Science and Mathematics Education*
Elementary Teachers Need:

- Understanding of 3D science and what 3D performance looks like
  - Focus on student sense-making and higher-level, systems thinking
  - Students conduct investigations, engage in discussions about open-ended questions, and solve problems
- Know how to create “a need to learn” and make thinking visible
Elementary Teachers Need:

- Science content courses with a teaching-specific focus
  - Know how to use an “activity before content” approach
- Instruction in interdisciplinary teaching

Adapted from Pearson, P.D., Moje, E., & Greenleaf, C. (2010). Copyright by the Regents of the University of California. Used with permission.
Recommendations

• Ensure that science receives adequate time in the classroom.
• Encourage interdisciplinary instruction.
• Equip elementary teachers to use inquiry-based, three-dimensional learning.
SREB’s Powerful Science Instructional Practices

1. Making sense of natural and human-designed phenomena
2. Developing questions to plan and carry out investigations, design solutions and/or obtain information
3. Gathering data and information to use in developing evidence
4. Reasoning how the evidence supports an explanation for the causes of phenomena
5. Engaging in academic discourse
6. Presenting evidence of learning
7. Communicating reasoning through an individual three-dimensional performance
8. Applying science learning beyond the classroom

SREB’s Powerful Science Instructional Practices
Thank you for attending!

Please email Samantha Durrance at Samantha.Durrance@SREB.org with questions or comments.