Supporting Future Scientists
An Annotated Bibliography of Elementary Science Resources

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About This Bibliography

The Coalition for Elementary Science at EDC compiled this annotated bibliography of resources on elementary science education for our members and the public. This is not an exhaustive list, but a “starter set” that includes key research reports, practice briefs, policy papers, and a variety of other tools and materials to inform efforts to strengthen elementary science in schools and communities. We encourage readers to seek out new and useful materials and send them to us so we can expand this bibliography.

Reports from the National Academies of Science

The eight landmark reports below present syntheses of research and expert opinion on a variety of topics specific to elementary science education and/or science education in general. They are downloadable at no cost from the National Academies of Science.


- Provides guiding principles to inform school and district leaders’ planning and implementation process
- Offers guidance with regard to supporting changes in curriculum, instruction, professional learning, policies, and assessment that will align with new standards
- Suggests strategies for addressing anticipated challenges

- Provides specific recommendations for supporting teachers’ learning as they adapt their instruction to align with the new science standards
- Offers guidance on developing effective professional development programs for schools and districts
- Considers policy approaches that will support teachers’ ongoing learning and instructional change


- Strengthens educators’ understanding of how students learn science to help them more effectively adapt their instruction
- Provides guidance on developing new approaches to assessing student learning that will support learning and teaching new standards
- Provides examples of new assessment formats and formative assessment strategies, and offers suggestions for making use of assessment information to shape instruction

- Presents what is known about English learners and learning, teaching, and assessing STEM subjects.
- Pays particular attention to the complexities of language in mathematics and science, as well as the diversity of English learners’ capacities and needs
- Offers strategies for strengthening learning outcomes for English learners


- Describes existing approaches to integrating learning and teaching across STEM disciplines
- Presents evidence of the impact of integrating STEM disciplines on a variety of student outcomes
- Offers recommendations for designing and documenting effective integrated STEM learning and teaching efforts
- Offers a common structure and vocabulary to use to consider and discuss integration of STEM disciplines in general and in relation to specific strategies and initiatives

- Outlines a broad set of expectations for students in science and engineering in grades K–12
- Informs the development of new standards for K–12 science education and, subsequently, revisions to curriculum, instruction, assessment, and professional development for educators
- Identifies three dimensions that convey the core ideas and practices around which K–12 science and engineering education should be built: crosscutting concepts, science and engineering practices, and disciplinary core ideas


- Presents a vast body of cutting-edge research and syntheses of research on the teaching and learning of science in Kindergarten through eighth grade
- Provides real, classroom-based case studies of instruction that embody the findings and help educators implement successful practices and approaches
- Offers examples of how teachers choose and/or create effective and motivating instructional experiences, manage classrooms, facilitate productive discussions among diverse learners, and help learners share their thinking in a variety of ways, using several different tools
https://go.edc.org/NRC2007

- Draws on a comprehensive evidence base to present what is known about learning and teaching science from Kindergarten through eighth grade
- Provides a research-based foundation on which educators can build programs for supporting the learning and teaching of science
- Brings existing research to consideration of specific questions that inform instructional approaches such as, “How can science education capitalize on children’s natural curiosity?” and “What are the best tasks for books, lectures, and hands-on learning?”

**Other Research of Interest**

https://go.edc.org/Rolf2013

- Spotlights the important role of elementary science
- Presents and discusses national trend data showing decline in instructional time for science
- Describes associations between time for science and science achievement scores

- Presents and discusses data showing associations between career expectations and interest of eighth grade students and their subsequent career path
- Spotlights the important role that encouraging and supporting youth’s interest in science in the middle grades—and even earlier in school—plays in their pursuit of science careers


- Synthesizes NSF-funded research and development work that builds understanding of STEM learning for young children and professional learning for STEM educators
- Summarizes the many benefits of STEM learning for young children and describes necessary supports for early educators
Position Papers from the National Science Teaching Association


- Offers four key principles to guide effective science learning in the elementary grades
- Recommends supports for elementary science educators, including professional development
- Includes recommendations for policy makers, administrators, and curriculum specialists

Safety in Elementary Science, n.d. [https://go.edc.org/SES-ND](https://go.edc.org/SES-ND)

- Makes the case for inquiry science as a key component of core elementary curriculum
- Provides guidance to ensure safety of elementary school science learning experiences
- Covers topics such as working safely with chemicals, physical science materials, and biological materials
Supports for Teachers and Administrators

Instructional Leadership for Science Practices, 2015 [https://go.edc.org/ILSP](https://go.edc.org/ILSP)

- Provides a wide range of tools designed to help leaders support teachers in enhancing science teaching and learning
- Includes supervision tools, instruction tools, and professional development tools
- Offers detailed information on instructional leadership and science practices and features sample lessons

Practice Briefs from the STEM Teaching Tools Initiative, 2015 [https://go.edc.org/STEM2015](https://go.edc.org/STEM2015)

- The STEM Teaching Tools Initiative creates and provides tools to support STEM teaching
- Tools are developed to meet teachers’ needs/interests
- Tools are authored and reviewed by teachers and researchers to inform how best to teach STEM subjects
https://go.edc.org/Brief62

- Explores how science leverages students’ natural curiosity
- Describes how science learning helps students build a strong knowledge base in other content areas
- Provides questions, points to consider, and actions that educators and leaders can take

Cafarella, J., McCulloch, A., & Bell, P. 2017. *Why do we need to teach science in elementary school?*  
https://go.edc.org/Brief43

- Discusses specific reasons why science should be a core part of elementary school learning including the need to foster scientific literacy
- Provides reflection questions and key considerations in ensuring equity in science education
- Spotlights the importance of “3D science investigations,” starting in preschool and continuing onward
Bell, P. 2015. *What school building administrators should know about the new vision for K-12 science education.* [https://go.edc.org/Brief21](https://go.edc.org/Brief21)

- Discusses ways that school building leaders can play unique roles in resourcing and supporting teachers as they strive to realize the new standards’ vision for science learning
- Shares actions leaders can take related to messaging, building-level coherence, resourcing, and observations to support teachers in providing “3D science investigations”
- Provides useful reflection questions for leaders

**Policy Papers**


- Informed by experts in early education and STEM fields
- Identifies policies and actions states can adopt to bring STEM opportunities to Pre-K through third grade
- Provides extensive recommendations focused on equity, state and regional coordination, educator preparation and professional learning, curriculum, instruction, and assessment
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- Provides a detailed historical summary of the decline of elementary science, with explanations of the causes
- Underscores the role states can play in adopting policies to encourage more robust elementary science teaching
- Offers examples from two states that have elevated elementary science

STEM4: The power of collaboration for change, 2018. [https://go.edc.org/STEM4-2018]

- Authored by the nation’s STEM education leadership groups: Advance CTE, the Association of State Supervisors of Mathematics, the Council of State Science Supervisors, and the International Technology and Engineering Educators Association
- Offers a strategy for improving and advancing learning across all STEM disciplines for all students