Expanding Opportunities for STEM Teacher Leadership

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DISCOVERY RESEARCH K-12

DR K–12 PI Meeting
June 1–3, 2016

Washington Marriott Wardman Park
Washington, D.C.

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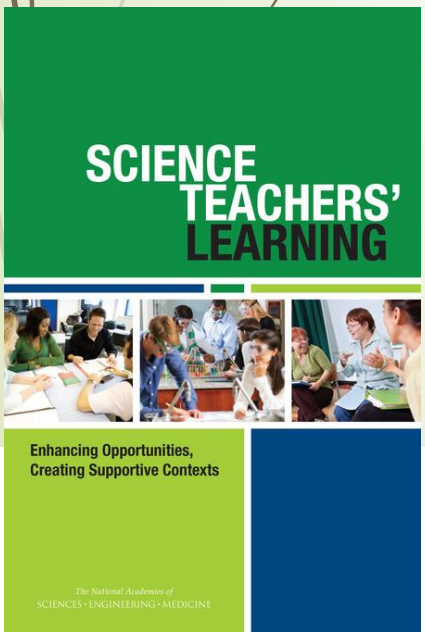
Science Teachers Learning: Enhancing Opportunities, Creating Supportive Contexts



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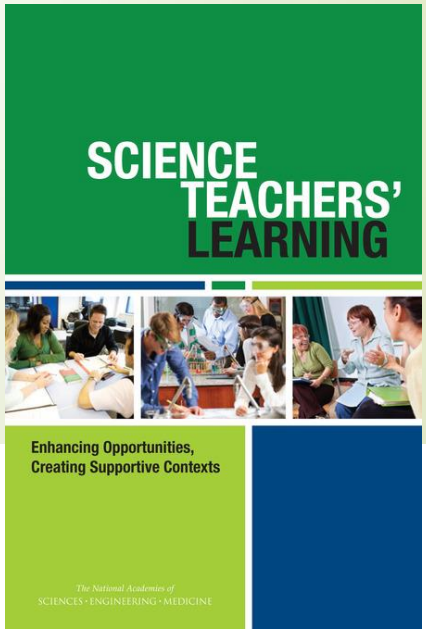

Study Charge

- Identify learning needs for teachers throughout careers including how these needs might differ depending on school level and across the span of one's career.
- Characterize current state of learning opportunities and support that exist for teachers and identify characteristics of effective learning opportunities.
- Consider how schools and districts shape teachers' learning opportunities and limit or promote teachers' efforts to implement new classroom practices.
- Develop guidance for schools and districts for how to best support teachers' learning and implementation of successful professional development programs.

- A Set of Commitments

- Teacher quality is not simply about individual teachers but also the context in which a teacher learns and works, including:
  - Leadership
  - Learning community
  - Resources(material, financial, etc.)
  - Policies (teacher evaluation, testing, hiring, etc.)
- That professional learning takes place across a wide array of settings including, perhaps most importantly, in a teacher's classroom
- To produce something useful

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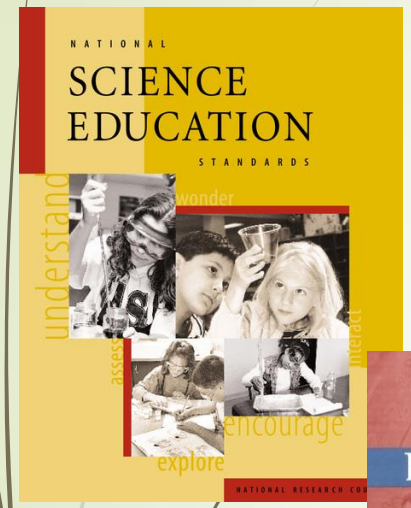

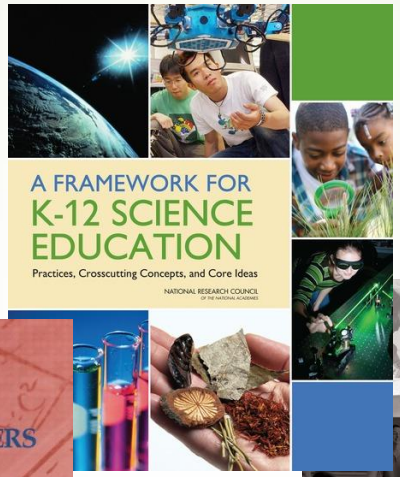

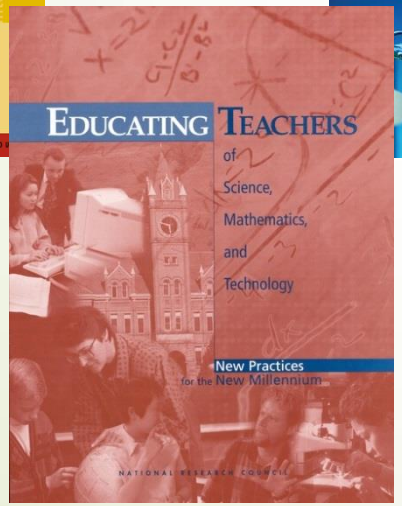

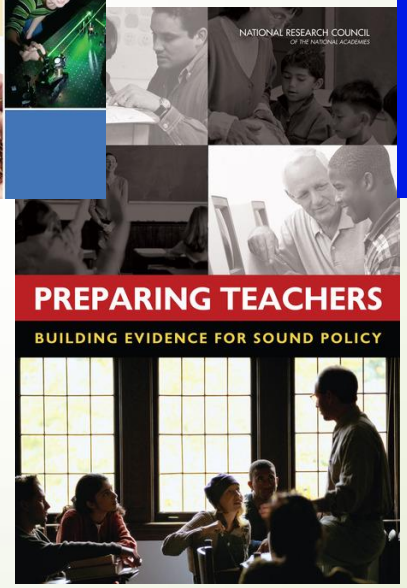

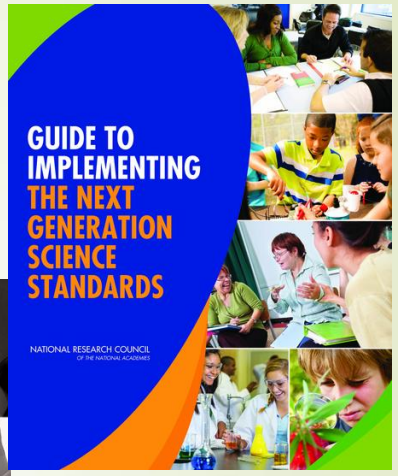

Major Topics

- A New Vision of Science Teaching and Learning
- The Current Status of Science Instruction
- The K-12 Science Teaching Workforce
- Science Teachers' Learning Needs
- Professional Development Programs
- Teacher Learning in Schools and Classrooms
- Creating A Supportive Context for Teacher Learning

Among the Conclusions

CONCLUSION 3—Typically, the selection of and participation in professional learning opportunities is up to individual teachers. There is often little attention to developing collective capacity for science teaching at the building and district levels or to offering teachers learning opportunities tailored to their specific needs and offered in ways that support cumulative learning over time.

CONCLUSION 5—The best available evidence based on science professional development programs suggests that the following features of such programs are most effective:

- active participation of teachers who engage in the analysis of examples of effective instruction and the analysis of student work,
- a content focus,
- alignment with district policies and practices, and
- sufficient duration to allow repeated practice and/or reflection on classroom experiences.

Among the Conclusions

CONCLUSION 6—Professional learning in online environments and through social networking holds promise, although evidence on these modes from both research and practice is limited.

CONCLUSION 7—Science teachers' professional learning occurs in a range of settings both within and outside of schools through a variety of structures (professional development programs, professional learning communities, coaching, and the like). There is limited evidence about the relative effectiveness of this broad array of learning opportunities and how they are best designed to support teacher learning.

Among the Conclusions

CONCLUSION 9—Science teachers' development is best understood as long term and contextualized. The schools and classrooms in which teachers work shape what and how they learn. These context include, but are not limited to school, district, and state policies and practices concerning professional capacity (e.g., professional networks, coaching, partnerships), coherent instructional guidance (e.g., state and district curriculum and assessment/accountability policies), and leadership (e.g., principals and teacher leaders).

Among the Conclusions

CONCLUSION 11—Teacher leaders may be an important resource for building a system that can support ambitious science instruction. There is increasing attention to creating opportunities for teachers to take on leadership roles to both improve science instruction and strengthen the science teacher workforce. These include roles as instructional coaches, mentors, and teacher leaders.

CONCLUSION 12—Closing the gap between the new way of teaching science and current instruction in many schools will require attending to individual teachers' learning needs, as well as to the larger system of practices and policies (such as allocation of resources, use of time, and provision of opportunities for collaboration) that shape how science is taught.

Conclusions

CONCLUSION 13—The U.S. educational system lacks a coherent and well-articulated system of learning opportunities for teachers to continue developing expertise while in the classroom. Opportunities are unevenly distributed across schools, districts, and regions, with little attention to sequencing or how to support science teachers' learning systematically. Moreover, schools and districts often lack systems that can provide a comprehensive view of teacher learning; identify specific teacher needs; or track investments—in time, money, and resources—in science teachers' professional learning.

Expanding Opportunities for STEM Teacher Leadership:

Listening to Teachers and Their Wisdom of Practice

Discovery Research K-12 PI Meeting
June 2, 2016
Washington, DC

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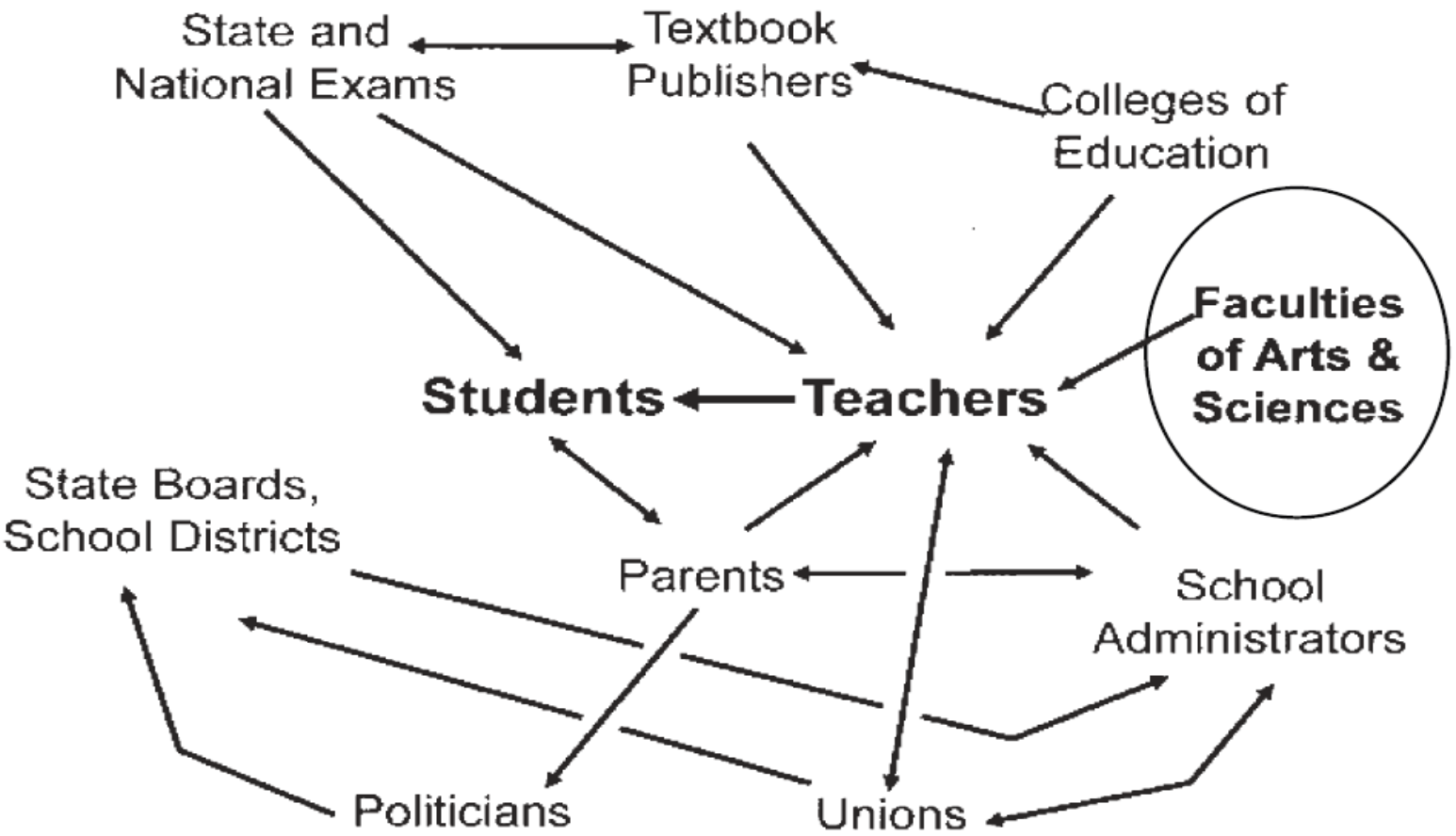
The Big Take Away…

Teachers are at the center of synergistic changes



Courtesy of Bruce Alberts

But one critical set of voices has largely been missing….

- **That of classroom teachers themselves**!

- A number of studies have shown that when teachers are effectively engaged in policy and decision making…
  - teacher morale improves,
  - teacher retention can increase,
  - the school and surrounding communities benefit.

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Recent Events

Convocation

Professional Empowerment of STEM Teachers through Education Policy and Decision Making

June 5-6, 2014

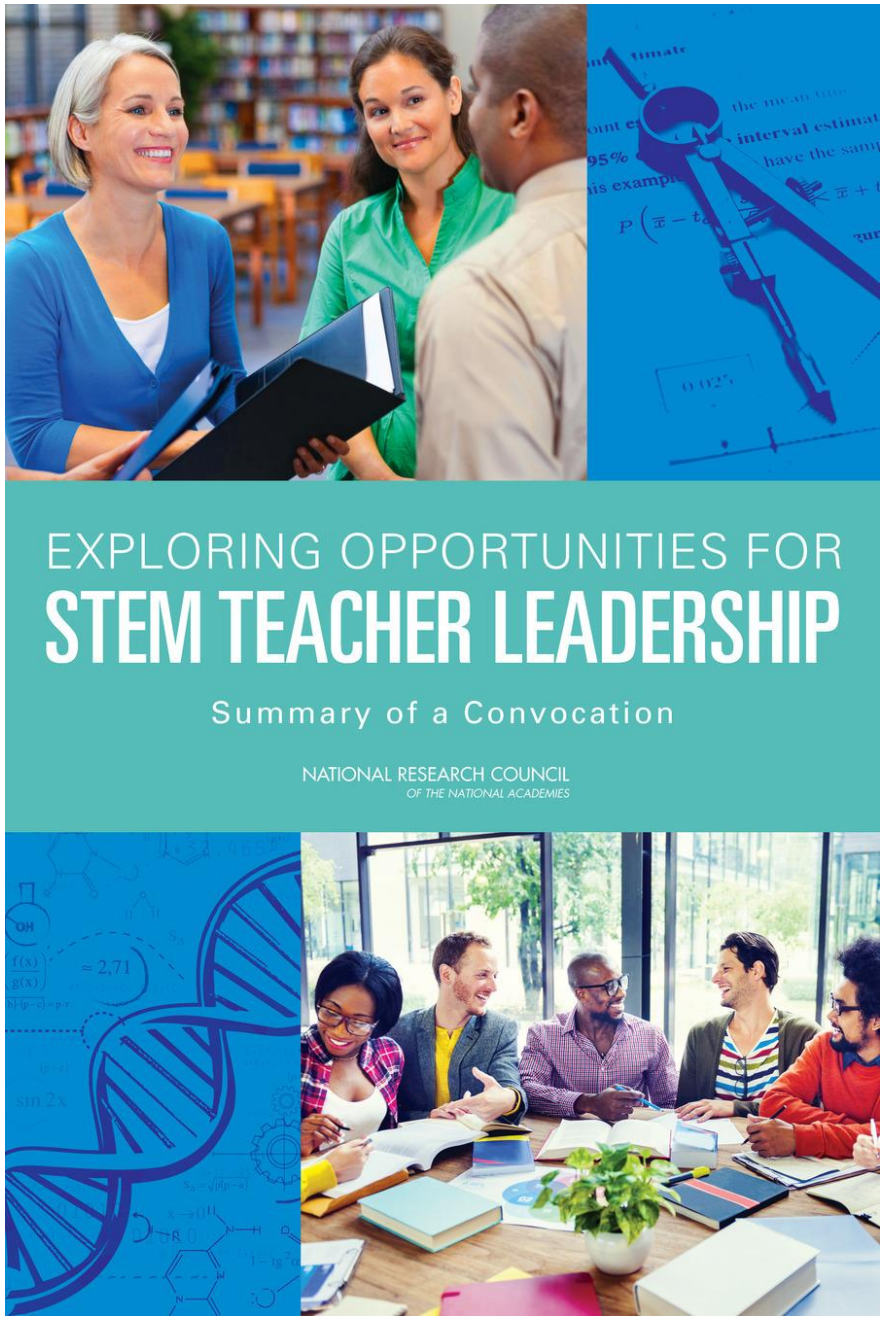
Recent Reports

New Report:

Exploring Opportunities for STEM Teacher Leadership

This report explores the potential for STEM teacher leaders to improve student learning through involvement

http://nas.edu/tac



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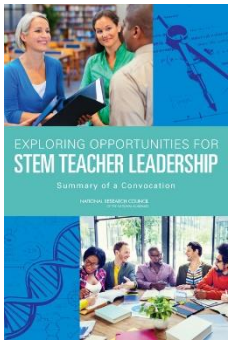


STEM Teacher Leadership

- Guiding Question:
  - How can teachers become leaders, spokespersons, and individuals who know how to speak about policy and the impact of various evidence-based practices the education system is seeking to put into place?

Questions Explored

- What is the **evidence base** (both from the United States and from other countries) that addresses whether involving teachers of STEM in education policy and decision making can lead to improvements in policies that affect teachers and teaching in these subject areas?

- What **models for engaging teachers** in policy and decision making at the national, state, and local levels currently exist, especially as they pertain to STEM education?

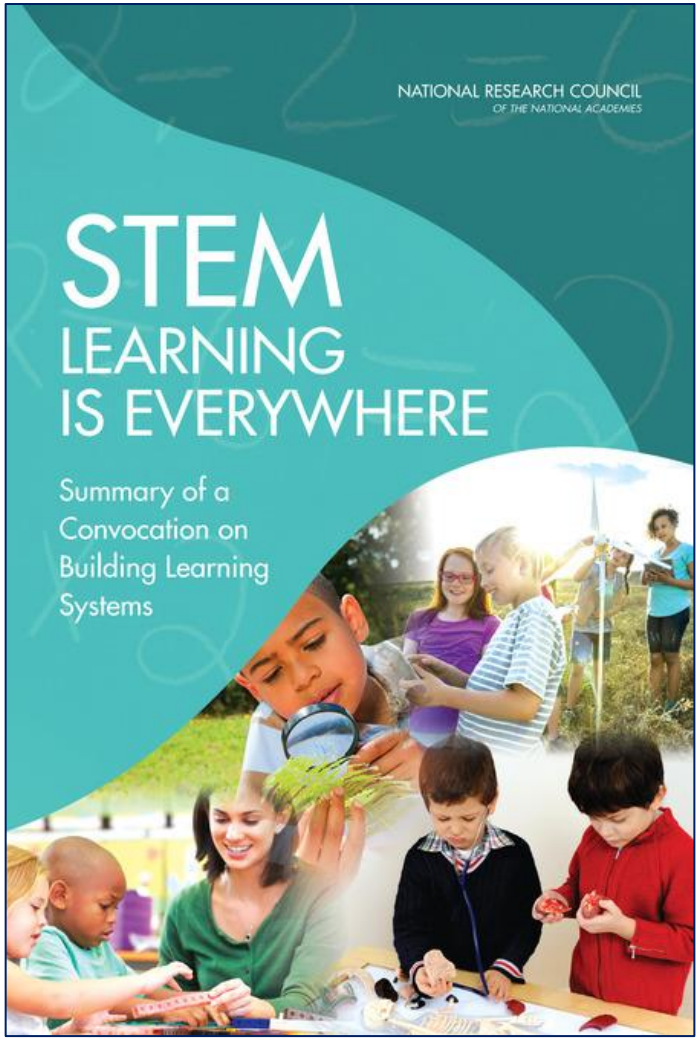
- What kinds of **communication efforts, resources and other activities** are needed to help education officials and policy makers understand the roles, contributions and potential impact of teachers of STEM in these processes?

Programs that Rely on Teachers' "Wisdom of Practice"

- Albert Einstein Distinguished Educator Fellowships (Dept. of Energy)
- Knowles Science Teaching Foundation Fellowships
- Math for America (Simons Foundation)
- Presidential Awards for Excellence in Mathematics and Science Teaching (NSF)
- National Academies Teacher Advisory Council
- Fulbright Distinguished Awards in Teaching Program (Dept. of State)

NRC Convocation on STEM Learning is Everywhere

February 8-9, 2014 – Irvine, CA



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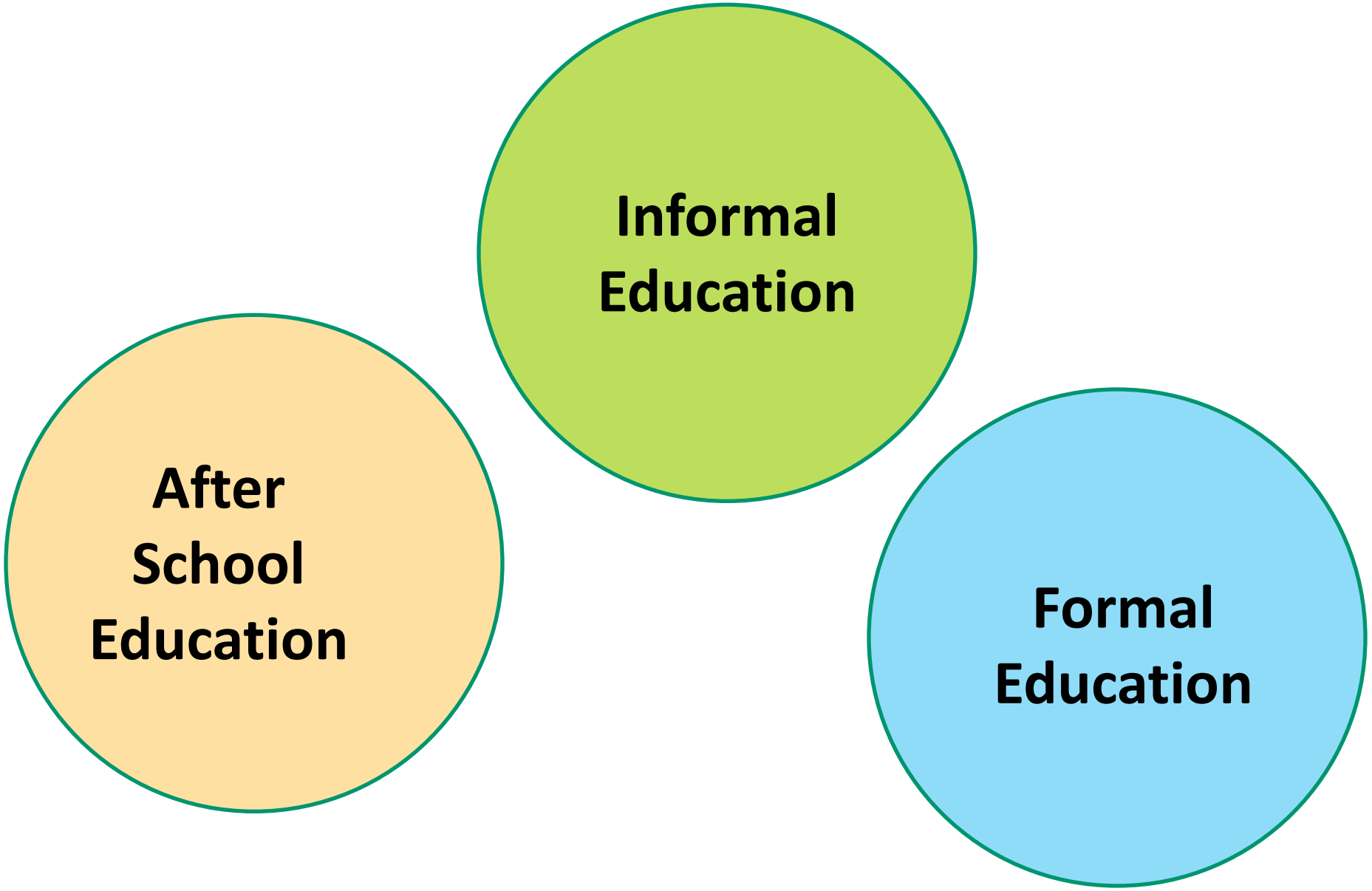
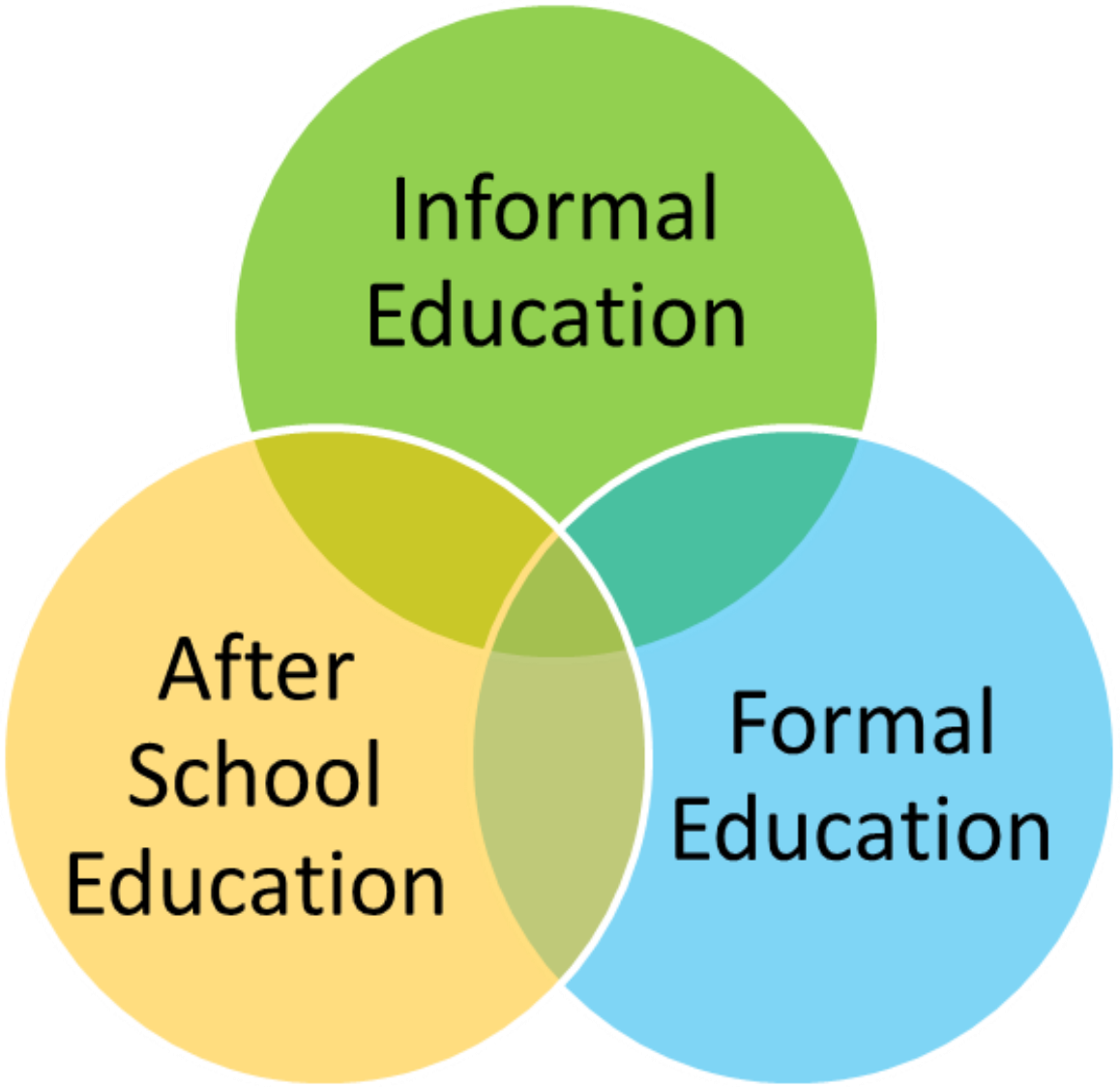


What opportunities await students and teachers if the sectors represented by the 3 circles…



…could be strategically integrated into a Venn Diagram?

Science magazine, January 15, 2016

EDITORIAL

Empowering great teachers

Long ago, U.S. business learned the benefits of constantly soliciting advice from workers on the shop floor by studying the startling success of the Japanese automobile industry. But the vast majority of U.S. school districts have remained hierarchical operations that ignore the wisdom available from their best classroom teachers. After decades of failed top-down solutions, now is the time to create a massive national movement that empowers and deeply respects our teachers. Scientists and science teachers can lead the way.

Producing an effective system of education is an extremely complex endeavor. Yet despite this complexity, U.S. policy-makers have been employing one simplistic top-down solution after another in attempts to improve schools. The most recent fiasco has been the high-stakes test-based accountability introduced by the federal government's No Child Left Behind Act of 2001. Against the advice of experts, the nation has even been mistreating teachers by grading them according to the annual test gains of their

"...now is the time to create a..national movement that empowers...our teachers."

logic, while sorting, analyzing, and critiquing information. A skilled, experienced teacher creates appropriate challenges for each student, constantly suggesting ideas and connections to follow. A wise friend, with decades of leadership experience in my local public school system, is convinced that "experienced, effective teachers are a vastly underutilized resource in education systems...perhaps the only resource that can truly create the change and improvements that students and teachers deserve." But such teachers are rarely used appropriately, and they can even be resented by school system bureaucracies.

Launching an effective national movement to empower teachers will require casting a wide net to select specific strategies. Such an effort should begin by seeking advice from the best teachers. This can be done immediately for science, where an appropriate set of networks already exists. The organizations that oversee these networks would then form a consortium to select, and strongly advocate for, a small set of specific policies. Collaborations will need to

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Enhancing Teachers' Voices in Policy Making on Implementation of K-12 Engineering Education

September 30/October 1, 2016
National Academy of Sciences
Washington, DC

And for Discussion:

"We see this convocation not as a culminating experience but as the beginning of a process to think about how educators, whether formal, informal, or afterschool, can have their voices heard."

Jay Labov

National Research Council

Exploring Opportunities for STEM Teacher Leadership

Questions for Discussion

- How can we build systems of support specifically designed for teacher leader development, and collect evidence of the programs' impact?

- How can we strategically develop partnerships that blur the boundaries of the informal and formal education worlds, that enhance both the capacity of teacher leaders and K-12 STEM educators?