K-12 science teachers in dire need of PD

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Sustained professional learning opportunities are needed to help science teachers teach new science standards, according to a new report

K-12 science teachers are often left to deal with a lack of coherent and sustained professional learning opportunities that researchers say are needed to support science teachers inside and outside of the classroom, particularly as they strive to teach new science standards.

As researchers' and teachers' understanding of how best to learn and teach science evolves and curricula are redesigned, many teachers are left without the experience needed to enhance the science and engineering courses they teach, according to a Jan. 20 report [1] from the National Academies of Sciences, Engineering, and Medicine.

This issue is particularly pronounced in elementary schools and in schools that serve a high percentage of low-income students.

Science teachers' professional learning occurs in a range of settings, both in and outside of schools, including teacher-organized and teacher-led study groups, coaching from more experienced teachers, and professional development programs that are often at summer institutes. Professional learning in online environments and through social networking holds promise, although evidence from research and practice on the outcomes and value of these modes is limited.

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Elementary, middle, and high school science teachers are required to participate regularly in professional development, but these activities are often generic and unevenly distributed across schools, districts, and regions.

The study also reveals that little attention has been devoted to how to systematically structure science teachers' learning in ways that support cumulative learning over time. While high school teachers have more access to relevant professional development opportunities, middle and elementary school teachers have less. The situation is especially difficult for teachers in schools that serve high percentages of low-income students, where teacher turnover is higher, and the workforce is relatively inexperienced. Since teachers spend the majority of their professional time in classrooms and schools, more learning opportunities should be built into the work day.

As part of ongoing efforts to improve the quality of science education in the U.S., many states are adopting the Next Generation Science Standards, which are largely based on the 2011 Academies report A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas [2]. The standards outline key scientific ideas and practices that all students should learn by the time they graduate from high school, and they entail shifting away from memorization of facts and information presented by teachers to student-led investigations and in-depth examination of core ideas.

"The Next Generation Science Standards are a motivating factor for us to think differently about learning opportunities for both students and teachers," said Suzanne Wilson, committee chair and Neag Endowed Professor of Teacher Education at the University of Connecticut. "Many science teachers will need to alter the way they teach to achieve this new vision of the science education of K-12 students. Closing the gap between the vision of teaching science exemplified in the NGSS and current instruction in many schools will require creating a system of policies and practices that support individual and collective teachers' needs, allowing them to deepen their own expertise, while challenging their students to learn, enjoy, and appreciate science."

The report committee issued a number of recommendations to help implement policies and practices at the school and district levels, which are crucial locations for investments in the science teacher workforce, including:

Districts and schools should design a portfolio of coherent learning experiences for science teachers that reflect their individual and context-specific needs.
In collaboration with teachers and parents, district personnel and school principals should identify specific learning needs of science teachers in their schools and develop a multiyear plan for their development that is linked to the school and district strategy for students' science learning.
Consider both specialized professional learning programs outside of school and opportunities for science teachers' learning embedded in the workday.
Design and select learning opportunities for science teachers that are informed by the best available research.
The committee found that more research is needed to understand the path from professional learning opportunities to changes in teacher knowledge and practice to student learning and engagement. It identified several areas of research to inform the work of school leaders in supporting ongoing teacher learning, including:

Focus research on linking professional learning to changes in instructional practice and student learning
Invest in improving measures of science instruction and science learning
Design and implement research that examines a variety of approaches to supporting science teachers' learning
The study was sponsored by the Merck Foundation. The National Academies of Sciences,

Engineering, and Medicine are private, nonprofit institutions that provide independent, objective analysis and advice to the nation to solve complex problems and inform public policy decisions related to science, technology, and medicine. They operate under an 1863 congressional charter to the National Academy of Sciences, signed by President Lincoln. For more information, visit http://national-academies.org [3].

Material from a press release was used in this report.
