Designing Lesson Sequences to Increase Student Engagement in Science Practices

Knowles TEACHER INITIATIVE

Transforming Mathematics & Science Education

Through this Knowles Academy course, science teachers will work in small collaborative groups as they learn to increase student engagement in science practices. Teachers will learn how to sequence lessons and revise their current curriculum to provide opportunities for students to build disciplinary knowledge that is the target of instruction.

This sustained professional development is for teachers who seek to shift their science instruction from a place where students are just learning about scientific facts to one where students are making sense of phenomena to build and reason with ideas that provide explanations for how the natural world works. Teachers will investigate phenomena using scientific practices to construct, evaluate, and revise ideas; reason together and persist through challenging tasks; and go public with their ideas in ways that mirror the important aspects of how science is actually practiced. Teachers will build dynamic frameworks to evaluate current curricular materials and redesign lesson sequences that provide increased opportunities for students to build, revise and communicate scientific ideas that are the target of instruction. Drawing from these inquiry experiences, teachers will analyze classroom data to develop indicators of student engagement in the science practices as described in the Next Generation Science Standards. This course will help science teachers to redefine what it means to do science in their classroom.

Course Objectives:

- Engage in an inquiry experience as a learner to develop and articulate an understanding of the practices scientists use and how engagement in scientific practices supports the development of scientific knowledge
- Analyze data from classroom observation video and classroom vignettes to reflect on opportunities for students to engage in the NGSS science practices
- Identify indicators of student engagement in the practices of science and consider how these scientific practices influence students' opportunities to build the core ideas of science that are the target of instruction
- Develop a framework to evaluate current curricular materials and to design future lesson sequences that provide increased opportunities for students to engage in the practices of science
- Apply frameworks to analyze data from lessons, including other participants' lessons and their own, to reflect on students' opportunities to engage in the practices of science
- Redefine what it means to do science in your classroom

Date: August 13–15, 2019; Fall 2019*
Time: 8:30 a.m.–4:00 p.m.
Location: Moorestown, NJ
Price: $50 ($800 value)

"My students are engaging in the practices of science when they are actively building or applying scientific knowledge. In all cases, there is some concrete "artifact"—like a model, dataset or question—with which they are interacting. And in all cases, they are doing more cognitive work than me during the lesson."

Brittany Franckowiak, Biology Teacher
Wilde Lake High School
Columbia, Maryland

For Teachers, By Teachers

The Knowles Academy offers professional development services that are designed and facilitated by experienced teachers.

01 **Teachers supporting teachers:** Teachers learn best from other teachers. All professional development that we provide includes experienced teachers as instructors and coaches.

02 **Professional community development:** Teaching can be isolating. All of our professional development services are designed to build teacher community so that participants can continue to support each other's learning and professional growth long after the professional development experience ends.

03 **Long-term support for sustainable change:** Effective teacher professional development must be sustained and tied to classroom practice. All Knowles Academy programs include long term support from coaches, opportunities for teachers to ground their learning in current practice, and engage with other Knowles Academy participants over an extended period.

04 **Professional expertise and leadership:** Designing and implementing effective professional development requires a diverse range of expertise and experience. All of our professional development services draw and build on the expertise developed within the Knowles community over the last 17 years.

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Agenda:

Teachers will receive ongoing coaching that is initiated by a three-day, in-person workshop, and concluded by a one-day, in-person workshop.

Day 1: Scientific Practices: Engaging in Scientific Inquiry

- Explore and articulate your current understanding of what it means to be a doer of your discipline—how scientists develop scientific knowledge
- Investigate a sequence of phenomena comprising multiple science disciplines
- Explore the Phenomena-Question-Model framework to identify and define the science practices you used to build explanatory knowledge of phenomena
- Design summary tables to document your process of making sense of scientific phenomena

Day 2: Scientific Practices: Building Frameworks for Designing Lesson Sequences

- Revisit what it means to be a doer of science in your discipline
- Analyze case studies of student engagement in scientific practices
- Explore multiple frameworks as a guide to develop indicators of student engagement in scientific practices

Day 3: Scientific Practices in Lesson Sequences: Supporting Our Students' Opportunities

- Review and evaluate curricular materials from your context
- Design lesson sequences using your framework
- Develop a data plan for future analysis of opportunities for students to engage in the practices of science

Between Workshops

- Teach lesson sequence planned on Day 3

Day 4: Analysis of Lesson Sequences

- Analyze data and reflect on the lesson sequence with other participants
- Reflect on how students engaged in the science practices in your own classroom
- Develop a framework for assessing student engagement in science practices

* Dates are subject to change; course is subject to cancellation if minimum enrollment is not met

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The Knowles Teacher Initiative supports the efforts of high school mathematics and science teachers to improve education in their classrooms and beyond. We are committed to supporting a national network of mathematics and science teachers in developing as leaders and collaborators, facilitating exploration and innovation and ultimately improving mathematics and science education in the U.S. Visit www.knowlesteachers.org to learn more.

All Knowles Academy courses can be customized to meet the specific needs of schools and districts.

To register for this course or to learn more, visit www.knowlesteachers.org/knowles-academy.