



LESSON STUDY: TEACHERS LEARN BY TEACHING AND OBSERVING

Lesson study focuses on the processes of teaching and learning. It is a success when the teacher learns.

The practice of lesson study as a teacher professional development tool is relatively new in the United States. It is sometimes referred to by other names, including *collaborative lesson research*; *research study*; *learning study*; and even the Japanese term *jugyou kenkyuu*, as it is known in its birthplace of Japan. Lesson study is also described in different

ways, such as:

- A collaborative process for planning, analyzing, and constantly improving instructional practices
- A structured process for teachers to work together to discover solutions to common teaching-learning challenges¹
- An inquiry cycle that supports teachers to experiment, observe, and improve²



Lesson study is
“a teaching improvement
activity in which instructors
jointly develop, teach,
observe, analyze,
and revise lessons for their
courses.”³

Lesson Study Project

Center for Advancing Teaching and Learning
University of Wisconsin-La Crosse



The lesson study process is aimed at helping teachers learn how to improve their instructional practices based on the careful observation of student learning. As described by J. W. Stigler and J. Hiebert,⁴ lesson study focuses on *teaching* rather than *teachers* and on children *working* rather than the children's *work*.

What is the history of lesson study, and how is it being used today? The term *lesson study* is a rough translation of *jugyou kenkyuu*, the name given to the teacher professional development approach used in Japan for mathematics instruction for more than 100 years.⁵ Its success in math led Japanese educators to expand its use to other subjects, including the sciences. More recently, lesson study has spread to other countries, including the United States, where an increasing number of schools are exploring it as an approach to their teacher professional development programs.^{6, 7, 8}

THE LESSON STUDY CYCLE

A lesson study cycle is organized around four basic steps and their essential elements:²

1. Study

- Form a team of teachers.
- Define a clear lesson focus and goals.
- Conduct in-depth research on the lesson focus, student learning, and the applicable standards and curriculum.

2. Plan

- Write a lesson proposal.

3. Teach

- One of the teachers from the team teaches the lesson to a live audience that includes the rest of the team and other knowledgeable people.
- The other team members and observers note and record the students' learning and responses to the lesson.

4. Reflect

- The teachers and observers discuss the observations made during the lesson and how the lesson might be adjusted to improve student reception and learning.
- The team communicates its lesson study and findings to others within and potentially outside of its school.

Each of these elements is worthy of in-depth consideration, and a growing number of organizations and schools provide open-source, detailed guidance for the steps of the lesson study cycle. A few of these excellent sources of assistance are the [Lesson Study Alliance](#),¹ the [Lesson Study Group](#) at Mills College,² and the [Lesson Study Project](#) at the University of Wisconsin-La Crosse.³

One group that has embraced lesson study is the Onondaga, Cortland, and Madison counties region of the New York State Board of Cooperative Educational Services ([OCM BOCES](#)). The OCM BOCES in central New York State uses lesson study to help teachers in its 23 school districts build good science instructional practices, incorporate new state science standards that are being rolled out over the next few years, and implement new grades K–6 science curricula.





IT'S GO TIME IN NEW YORK STATE

OCM BOCES has been incorporating lesson study into its teacher professional development program since 2016. Its annual [“It’s Go Time: Science for All”](#) conference⁶ demonstrates the power of lesson study to inspire teachers and improve instructional practices and student learning.



Jessica Whisher-Hehl

Jessica Whisher-Hehl is the coordinator of Innovative Teaching and Learning at the OCM BOCES Center for Innovative Science Education. She collaborates with Dr. Sharon Dotger, lesson study expert and advocate at the Syracuse University School of Education, to plan the “It’s Go Time” conference and support the teacher teams as they develop the research lessons they will teach during the conference. Whisher-Hehl and Dotger recognize the importance of linking science content with effective classroom instructional practices and find lesson study to be a great way to blend the two for the benefit of students and teachers alike. “We need to be able to link teaching to learning outcomes, which traditional assessments do not do,” Dotger explains. “The lesson study approach shows teachers how to identify the teaching-learning outcome linkage.”

Whisher-Hehl and Dotger remind teachers that lesson study is a success when the teacher learns, not when the lesson itself is deemed perfect. Teacher feedback indicates that keeping this metric in mind helps remove the fear of failure, enabling teachers to begin to build a habit of research-minded thinking so they are continuously improving their instructional practices to meet students’ needs.

Lesson study encourages teachers to take a scientific approach to teaching where they plan, execute, evaluate, and adjust—just what they are teaching students to do in science class.



Smithsonian
Science Education Center

The “It’s Go Time” conferences have been great successes for teachers and students. “It is clear at the workshops that the observers are really listening to the students and evaluating student progression and learning, which is a paradigm shift for many teachers,” Whisher-Hehl says. She explains that one superintendent reported seeing a total transformation in the instructional practices of her teaching team after the conference, the students being taught the research lesson find it fascinating that the teachers are there to learn from them, and the teachers see how valuable the insights gained from the lesson will ultimately be for their students. Whisher-Hehl reports that participation in the science curriculum materials program has increased by 50% since the first conference, resulting in a significant increase in student science studies and learning.

Whisher-Hehl and Dotger point out that the purpose of lesson study is not to create new content or curriculum but rather to gain information that will help teachers refine their presentation of the curriculum to better reach their students. They also recognize that teachers often consider making a change to the curriculum content for various reasons. Whisher-Hehl is hoping the OCM BOCES teachers will begin to use the lesson study approach to evaluate proposed edits to determine the impact they will have on the efficacy of their instruction and student learning within the overall curriculum.

The lesson study proposals and findings are available on the [OCM BOCES website](#)⁶ so teachers in all BOCES regions can review and learn from them. This collaborative sharing is key to reducing the incidence of repeated failures by helping teachers understand what has already been tried and what the outcomes have been. Whisher-Hehl also sees the need for a larger-scale communication network that extends beyond district and state lines as the practice of lesson study grows and the wealth of “lessons learned” increases.



THE CONFERENCE EXPERIENCE

Preparations for the “It’s Go Time: Science for All” conference begin long before the conference takes place. Each year, the conference includes several research lessons on elementary, middle, and high school STEM topics. Thus, the live lessons are community research events that reveal students’ ideas and learning processes.

Each of the four teams of teachers selects its lesson focus, develops the lesson goals, researches the topic and instructional approaches, and prepares its lesson proposal. To date, research lessons presented have included the following:

- Grade 2 students designing and testing a solution to slow or prevent erosion
- Grade 4 students matching 3D models of landforms with topographic maps and profiles
- Grade 8 students constructing and testing models to explain energy concepts

The teams teach their lessons to students as conference attendees observe the teaching practices and, more importantly, student responses. The teachers taking part in the lesson and those observing it see firsthand what works for the students, what doesn’t work, and what could be adjusted to make the lesson more successful for students. In essence, they evaluate the lesson through the eyes of the students.



LESSON STUDY AND THE STANDARDS

The use of lesson study in teacher professional development is also helping the OCM BOCES teachers adjust to the revised New York State Science Learning Standards. OCM BOCES is in the process of implementing the new state standards, which are largely based on the Next Generation Science Standards* (NGSS) and align with the principles of its framework. Whisher-Hehl says the phenomenon-driven approach of lesson study parallels that of the standards, leading to mutual reinforcement between the two.

Many teachers, however, are unclear on what the standards entail and how they are to be implemented. “Teachers need to realize the instructional shift needed to teach the new standards and be confident they can make

that shift,” Whisher-Hehl explains. “The lesson study workshops during the conference help teachers realize it is possible to make that shift and demonstrate how it can be done, which inspires the teachers and builds their confidence regarding teaching the new standards.” In other words, the phenomenon-driven lesson study approach naturally segues the teacher into the phenomenon-driven standards.

Holly Baldwin, elementary science specialist for OCM BOCES, observes and interacts with the teachers at the research lesson presentations. “The teachers learn from it in different ways,” she explains. “But one thing nearly all of the teachers take away from the conference is a profound realization of how to best implement the standards in their lessons.”



CHOOSING THE RIGHT CURRICULUM

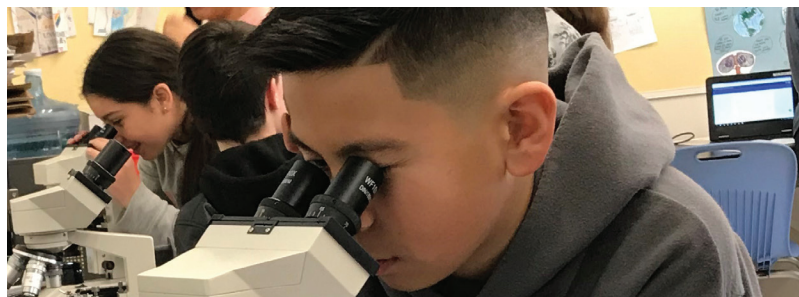
After lesson study conferences, teachers have new insights and ideas they are excited to use in their classrooms. Now they need a curriculum that parallels lesson study's phenomenon-based approach—a sound curriculum based on the NGSS and focused on the three dimensions of learning (science and engineering practices, disciplinary core ideas, and crosscutting concepts) to successfully implement their lesson study insights.

The OCM BOCES region uses the [Smithsonian Science Education Center STCMS™](#) and [Smithsonian Science for the Classroom](#) curricula to provide its teachers and students with standards-based, phenomenon-driven learning.⁹ STCMS™ and Smithsonian Science for the Classroom are built around 3D learning and incorporate student notebooking and discourse, which help to reveal student thinking, a key goal of the lesson study approach. As Baldwin describes, “At our lesson study conference, teachers watch the students complete the STCMS and Smithsonian Science lessons and learn how they incorporate the standards and promote 3D learning, and then see how the students react to the lessons.”

Baldwin, Whisher-Hehl, and Dotger find the Smithsonian Science for the Classroom curriculum and units to be “intentional and complete.” Some of its key aspects that help their teachers successfully integrate lesson study and the standards into their teaching include:

- The modules and rubrics are clearly broken down into the three dimensions of learning.
 - The standards are clear within the modules so teachers learn and become comfortable with them.
 - Common student misconceptions are highlighted in the teacher guide to help teachers recognize them and guide students.
 - Every module is well-organized around a central question, and lessons within a module follow a trajectory and have a relationship with each other.
- The different modules shed light on each other so they are mutually reinforcing.
 - There is a nice progression through the grades, aided by STEM—science, technology, engineering, and math—notebooking that also builds throughout the grade levels.

“Teachers need to understand where the students will begin, where they will end, and what is in-between,” Whisher-Hehl explains, “and Smithsonian Science consistently provides teachers with that information.”



THE SMITHSONIAN PROCESS

The Smithsonian Science Education Center's development process demonstrates the effort and rigor needed to create a curriculum that supports and reinforces lesson study.

- Teachers, standards developers, instructional designers, and other science and education professionals collaborate throughout the development.
- Research is conducted on successful curricula, teacher feedback, and the current literature on science learning and equity learning.
- The draft lesson is revised based on feedback from a Teacher Advisory Board.
- The revised lesson undergoes a broad field test followed by revision based on teacher and student feedback.
- The lesson is published, and feedback is continuously gathered from students and teachers to guide adjustments.



Dr. Brian Mandell, division director of Curriculum and Communication for the Smithsonian Science Education Center, directs development of the Smithsonian Science for the Classroom curriculum. He has learned from the process, as well as from teacher and student feedback, some of the most effective and appreciated aspects of this curriculum.

- The focus on standards that are called out at point-of-use builds teacher confidence in their ability to understand the standards and deliver them to students.
- Standards-aligned formative and summative assessments are used throughout each lesson—not just at the end of the lesson or unit.
- Common student misconceptions are at point-of-use in the teacher's guide (with citations for further study if desired), which is invaluable for the teacher's lesson study efforts.
- Teachers and districts appreciate the support they receive during curriculum implementation and as they integrate the standards into their teaching.

These and other intentional aspects of the Smithsonian curriculum make it easy for teachers to use their lesson study insights to better reach and engage their students. Without a comprehensive curriculum such as this, teachers can easily get caught up in trying to build their own modules and lose their lesson study momentum.

The Smithsonian curriculum provides teachers with the standards-based lessons, teacher guides, and materials they need so they can focus on improving their instructional practices.

On an even wider scale, districts that provide teachers with comprehensive standards-based curricula, such as Smithsonian Science for the Classroom, are also providing continuity for students as they progress through their school years, Whisher-Hehl says. The successes realized by the OCM BOCES districts, teachers, and students are a testament to the benefits of lesson study and the Smithsonian curriculum.





ABOUT

SMITHSONIAN SCIENCE EDUCATION CENTER

The mission of the [Smithsonian Science Education Center](#) is to transform and improve the teaching and learning of science for PreK–grade 12 students in the United States and throughout the world. Established in 1985 as the National Science Resources Center under the sponsorship of two prestigious institutions—the Smithsonian Institution and the National Academy of Sciences—the Center is dedicated to the establishment of effective science programs for all students.

CAROLINA BIOLOGICAL SUPPLY COMPANY

From its beginnings in 1927, [Carolina Biological Supply Company](#) has grown to become a leading supplier of science teaching materials. Headquartered in Burlington, North Carolina, it serves customers worldwide, including teachers, professors, homeschool educators, and professionals in health- and science-related fields.

OCM BOCES

The [Onondaga-Cortland-Madison Board of Cooperative Services](#) (OCM BOCES) is a public educational service agency in New York State created in 1948 to help school districts pool resources and share costs. With the help of OCM BOCES and 36 other BOCES across the state, districts provide a rich variety of experiences for students and staff.

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