Growing Together

American Teachers Embrace the Japanese Art of Lesson Study

By Jennifer Dubin

When Sue Tabor stood before 20 fourth-graders at Pine Trail Elementary School one morning in April, they quickly forgot about the video camera and the 14 educators in the back of the room. They focused instead on Tabor, who said she was going to work with them on "a special math challenge." Tabor explained that after school the previous week, some teachers had played one of the students' favorite video games: *Guitar Hero*. The game, as the students already knew, entails playing a "guitar" to the notes of a rock song as they appear onscreen. If a player strums enough notes correctly, she "passes" the song and moves on to the next one. If she makes too many mistakes, she loses and the game ends.

Upon hearing that the teachers had played the game, the students' eyes grew wide and they giggled. "Now we know what those teachers do on break!" one student said. Tabor told them that the principal had not watched the teachers play and that she wanted the students to rank them so she could award prizes. Since the teachers had not played the same number of games, the students would have to figure out each teacher's rank. "You think you guys can help us?" Tabor asked. The students smiled and said yes. The teachers in the back of the room smiled, too; the lesson they had written was off to a good start. Tabor knew it by heart, and as soon as she mentioned *Guitar Hero*, she had the students hooked.

For three months, Tabor and other teachers at the school in Volusia County, Florida, had worked on this particular lesson, an introduction to percentages. They reviewed their state's standards and researched ways to teach proportional relationships. They created a blog where they posted comments as the lesson developed. They consulted math education experts. Meeting during school and on in-service days, they carefully chose which words to use in discussing the mathematics they wanted to teach and which numbers to use in creating problems. After Tabor taught the lesson, the teachers discussed it at length and then one of them wrote a summary of their reflections. They took these steps to craft a single lesson, a practice they engage in once a year. This complex process has a simple and meaningful name: lesson study.

Teacher-Led Professional Development

In Japan, *jugyou kenkyuu*—or lesson study—is the most common form of professional development among elementary school and lower–secondary school (grades 7, 8, and 9) teachers. While in the United States it is best known as a means of improving math instruction, in Japan lesson study is practiced in all subjects, from language studies to physical education. Teachers typically begin engaging in lesson study as part of their pre-service training and then continue the practice throughout their careers.

Teachers (sometimes in the same grade, sometimes across grades) meet regularly over several months to plan what is called a research lesson. First, they decide what concept to present to students. Then, they consult books and articles that other teachers have written. Such resources are available because lesson study groups write reports after their lessons, and those reports are often published and sold in local bookstores. Japan's national curriculum makes this exchange of ideas fairly easy; for instance, fifth-graders learn the same material no matter which school they attend.

In developing the lesson, teachers try to agree on every detail, even the exact phrasing the teacher will use in explaining key concepts. They also anticipate students' responses so they can plan how the lesson will unfold and be prepared to address students' mistakes. Just as important, teachers focus on *hatsumon*—posing key questions to stimulate students' thinking. With the

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right questions, teachers can guide students to a better understanding of the problem at hand, and how it relates to previously learned material.

As needed, teachers draw on outside experts, known as "knowledgeable others," to assist in planning and to observe and comment on the research lesson. These experts include college professors who specialize in the relevant content area or in cognitive science, accomplished teachers from schools that work closely with national universities, and instructional supervisors. Knowledgeable others often work with many lesson study groups throughout the school year, enabling them to contribute not only their own content and pedagogical knowledge, but that of multiple lesson study groups. Since these experts observe research lessons frequently, they see examples of excellence and push all their groups to improve.

Early in the planning, teachers set a date for the lesson and choose someone in the group to teach it. While that person is teaching the lesson on the scheduled day, the other teachers in the group observe and take notes on student responses. Often, a video camera records the lesson for the teachers to review.

After the lesson has been taught, teachers often spend 60 to 90 minutes discussing it. The teacher who taught speaks first. She tells the group what parts of the lesson worked as planned and what could improve. Then the other teachers share their observations. It's important to note that the teachers focus their comments on student learning during the lesson, which they all planned, not on the teacher who taught it. Lesson study is not a tool for teacher evaluation. Members of a lesson study group seek to improve their students' understanding of concepts and, in the process, work together to improve their teaching.

Based on their reflections, the teachers revise the lesson, and then another member of the group teaches it to another class. This time, other teachers (those in the school and elsewhere) plus outside experts often are invited to observe the lesson and participate in the postlesson discussion. Again, the teacher who taught the lesson shares her insights first. Usually, a moderator focuses the discussion so observers can share their thoughts on what students learned during the lesson. At the end of the discussion, an outside expert usually makes closing remarks. Finally, members of the group write a report summarizing their work.

The goal of lesson study is not to create lessons, though that is one benefit. The goal is to engage teachers in a research process that will help them improve their teaching. Lesson study provides a framework for Japanese teachers to think deeply about content and student learning. It also gives them an opportunity to learn from each other. This contrasts sharply with the isolation that so often characterizes teaching in America. Here, teachers have little time to exchange ideas for improving instruction and rarely observe each other.

Of course, the process is not perfect. A common criticism of lesson study (especially as it is practiced in the United States) is that if teachers do not have sufficient content knowledge, their efforts may not be productive. One obvious way to improve the lesson study process: draw on experts from the outset, particularly when trying to address a concept that teachers and students alike find challenging.

Teachers in the United States may need to call on "knowledgeable others" even more often than their peers in Japan. As Catherine Lewis, a lesson study researcher at Mills College, has pointed out, U.S. teachers do not have a rich national curriculum, top-notch textbooks and other instructional materials, informative teachers' manuals, or a long history of practicing lesson study. Japanese teachers have all these things, plus even more supports (like highly focused teacher preparation), which better prepare them to undertake lesson study.

Of all the supports that U.S. teachers lack, the absence of a concise, coherent, common curriculum may be the most problematic. Here's how Patsy Wang-Iverson, a lesson study researcher, put it:*

> In Japan, lesson study is perhaps more viable because the curriculum is focused on fewer topics than typical U.S. curricula. For the sake of comparison, consider that a science topic such as pendulums might require 13 to 14 lessons in Japan. . . . During these lessons, students have the opportunity to (1) decide what variables they need to investigate, (2) design and conduct the experiments, and (3) frequently repeat their experiments to test the validity of their findings. . . . In the United States, that same topic may be covered in one class period to make time for other required

*Patsy Wang-Iverson, "What Makes Lesson Study Unique?" in *Building Our Understanding of Lesson Study*, ed. Patsy Wang-Iverson and Makoto Yoshida (Philadelphia: Research for Better Schools, 2005), 19.

For a detailed description of lesson study, see "A Lesson Is Like a Swiftly Flowing River," *American Educator* (Winter 1998), available at **www.aft.org/pubs-reports/american_educator/winter98/Lewis.pdf**.

topics. Under which circumstance do we think students will develop a deeper understanding of pendulums?

Not surprisingly, Wang-Iverson suggests that schools address their overstuffed curricula before undertaking lesson study.

Lesson Study Comes to Volusia County

In the late 1990s, a groundbreaking international video study* of eighth-grade classroom instruction brought to light dramatic differences between the United States and Japan. Researchers found that Japanese teachers often focused their math lessons on developing students' understanding of the relationships between mathematical concepts, while American teachers often focused more on procedures and skills. Although the video study could not determine what caused these differences in instruction, some of the key factors appeared to be Japan's national curriculum, high-quality instructional materials, and commitment to lesson study.

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Since 1995, a handful of math education experts in the United States have worked with teachers to form lesson study groups. The one who brought lesson study to Volusia County is Alice Gill. A former elementary teacher, Gill now develops and coordinates math professional development courses for the American Federation of Teachers.

In January 2003, Gill gave a presentation on lesson study at the Volusia Teachers Organization (VTO)† office. Soon thereafter, a group of eight intermediate-grades teachers from six different schools—including Pine Trail Elementary—began meeting regularly. The group conducted its first research lesson (on the distributive property) in March 2003. After working as a multischool team for three years, and developing enough research lessons to become comfortable with the process, members of the group decided they'd like to develop lesson study groups in each of their schools.

Becky Pittard, a member of the VTO and a fourth- and fifth-grade teacher at Pine Trail, eagerly brought the practice to her school. Now enough Pine Trail teachers express interest to form at least one and sometimes two or three lesson study groups in math, science, and writing each year. Before lesson study, teachers didn't really collaborate on improving instruction. As they passed each other in the halls, they might share ideas, but they didn't have a dedicated block of time to discuss content, student learning, or instructional strategies.

One Friday morning in January 2009,‡ on a teacher professional development day, Pittard and her colleagues did have that time. A lesson study group that focused on writing met in one classroom, while in Pittard's classroom, the lesson study group that focused on math began discussing, in person, its research lesson.

The members of the math group, composed of teachers in kindergarten through fifth grade, had brought books and research articles to Pittard's classroom to help them brainstorm. A few weeks earlier, they had started to share ideas on a blog they had created. Pittard, the math group's facilitator, reminded the teachers that, as they had already discussed on their blog, the upper-grades teachers wanted help teaching percentages, "a very difficult concept for children." Pittard was concerned because the topic too often has been taught not for understanding but solely for doing the operation.

The teachers scanned the piles of papers and books on their desks, including math textbooks from Singapore (which are written in English) and Japanese math textbooks, translated into English. The books are slender and colorful, with a small number of carefully sequenced topics per grade. They hardly resemble American math textbooks—tomes that cover too many topics and overwhelm students and teachers alike. They also flipped through another resource, *Thinking Mathematics*. Created jointly in 1992 by AFT teachers and staff, and cognitive scientists from the University of Pittsburgh, *Thinking Mathematics* is a program that teachers can use with any math curriculum. *Thinking Mathematics* includes research-based articles, instructional strategies, and content knowledge. Nearly all of the school's 46 teachers are trained in it.

As the group searched for a clear way to present the idea of percent, Stephanie Hajdin, a first-grade teacher, read aloud from one of the books from Singapore: "Percent is out of 100 or per 100." The teachers examined the Singaporean books further. They noted how the problems work out evenly so students can focus on understanding concepts and not be distracted by computation. They also admired the books' organization. When Hajdin pointed out that students first learn ratios, then fractions, then percentages, Pittard said it made sense. Students at Pine Trail and across the United States, she said, don't learn those concepts in that

*To learn more about the study, see "Teaching Is a Cultural Activity," *American Educator* 22, no. 4 (Winter 1998), available at www.aft.org/pubs-reports/american_educator/winter98/TeachingWinter98.pdf. The official report of the study is available at http://nces.ed.gov/pubs99/1999074.pdf.

†The VTO is jointly affiliated with two national unions: the American Federation of Teachers and the National Education Association. VTO President Andrew Spar has supported teachers' participation in lesson study, providing funding for some members to attend national lesson study conferences to improve their practice.

‡In December 2008, interested teachers attended an organizational meeting where they split into a math group and a writing group. An initial meeting for lesson study usually takes place in September. But Pine Trail held it a few months later because teachers had to learn a new system for state testing, which cut into their time.

order—but they should. Ultimately, they decided to craft a lesson on ratios.

At the end of the two-and-a-half-hour meeting, Pittard encouraged the teachers to continue sharing ideas on the blog. She said they would start shaping the lesson at their next session. The group met five more times before April 2, the date they had set for teaching the research lesson.

Crafting and Teaching the Lesson

Three months later, the teachers had come a long way from their January meeting. They had settled on introducing a fourth-grade class to the concept of ratio through a story they made up about teachers playing *Guitar Hero*. Pittard and her colleagues had written the lesson to illustrate that if players don't play the same number of games, their scores must be calculated as ratios—comparing the number of songs played with the number of songs passed—to determine the winner. The scores from this popular video game captured the students' attention. Ultimately, the game provided the teachers with a hook to give students a concrete example of ratios.

Sue Tabor, a special education teacher who had participated in lesson study for the last three years but had not taught a research lesson, volunteered to teach. The group also had kept in touch with two "knowledgeable others." In addition to Gill, Tad Watanabe, a professor of mathematics at Kennesaw State University, had offered suggestions during the lesson's development.

Lesson study groups in the United States often do not follow the Japanese model to a tee. Circumstances force them to tweak the practice. For instance, at Pine Trail, after Tabor taught the official research lesson, the group did not have another member of the group teach it. They did revise it, and some teachers plan to use it in the future, but unfortunately they were unable to complete two observations, and postobservation discussions, of the lesson. Another difference was that the teachers at Pine Trail had limited access to outside experts. At times, they struggled with some of the concepts—which is to be expected, since their goal is to improve their teaching and students' learning of challenging content. It would have been helpful to have experts observe their research lesson and participate in the postlesson discussion.

On April 2, minutes before the research lesson began, Tabor walked into the classroom to a round of applause. The members of the group cheered along with the principal, assistant principal, and a teacher from another elementary school who would moderate the postlesson discussion. Tabor admitted she was nervous. Pittard told the group that Tabor had nothing to be nervous about. "Our observations need to be focused on the behavior of the children, not the teacher," she said. Pittard reminded her colleagues to stay focused on student learning during the lesson.

The observers each took a copy of the research lesson, which was divided into three columns: one for what the teacher says in each step of the lesson, one for anticipated student responses, and one for what the teacher says when a student's work is not on target. Each observer received a clipboard for taking notes, and a classroom seating chart. Pittard reminded everyone not to talk during the lesson, but invited them to walk around the room to hear the students' conversations once group work began.

The students entered the room. Their classroom teacher, who had agreed to the students' participation in the lesson, gave them nametags so the observers could match names with faces and comments. Those comments would help them understand the lesson's effectiveness.

As planned, Tabor began the lesson by explaining that the principal had asked the students to rank the teachers. Then she launched into the group's introduction: "Sometimes, when we solve math problems, we have to do a lot of work with adding, multiplying, or dividing numbers. But sometimes, mathematicians look at a problem and just use their common sense." Tabor then posted a question on the board: "How can we make it *easy* to compare scores?" She showed the class the first set of players and scores:

Mrs. Hajdin passed 4 out of 10 songs.
Mrs. Maccio passed 2 out of 10 songs.
Mrs. Wachtel passed 4 out of 7 songs.

Tabor asked everyone to reflect on the scores and tell her what they noticed. Then she asked them to share their strategies for ranking the teachers. It appeared that half the students understood the necessary proportional thinking and were keeping the ratio of wins to games played the same. They correctly ranked Mrs.

Wachtel first, Mrs. Hajdin second, and Mrs. Maccio third. The other half of the students used subtraction: they said Mrs. Wachtel should be ranked first because her score—4 out of 7—is a loss of only 3 games, while Mrs. Hajdin's score—4 out of 10—is a loss of 6 games.

Both approaches led students to the right answer. In planning the lesson, the teachers accurately predicted that some students would use subtraction, which, of course, will not always work. To explain why it does not work every time, the teachers wrote what Tabor should say. "If Rohit played 99 games and won 97, and if Julie had time to play 2 games and won 1, does that make her a better player?" Tabor asked. The students said no. Tabor called on Chase to explain why: Julie had won only half her games. Tabor reminded them to keep each teacher's ratio of wins to total games played the same as they compared scores in order to rank the teachers. Tabor presented two more sets of scores, neither of which resulted in the correct ranking if students used subtraction. Throughout the lesson, Tabor walked around the classroom to answer students' questions. The observers walked around, too. They listened to students' conversations and took notes.

The Postlesson Discussion

After the lesson, Tabor and the observers gathered in the school's media center. Tabor spoke first. She said she was glad she overcame her fear of teaching before her peers and that the students seemed to get the goal.

The teachers congratulated Tabor on teaching the lesson, and themselves for successfully anticipating students' responses, particularly their misunderstandings. For more than an hour, the teachers worked to improve the lesson. They wanted to add different phrases and emphasize certain words to make the lesson more effective in reaching all students the next time it was taught. At Pine Trail, research lessons don't sit untouched on a shelf. Teachers use them in their own classrooms long after they are written.

To improve the lesson further, Pittard e-mailed a summary of reflections to the "knowledgeable others," Watanabe and Gill, and asked what worked and what could improve. In Japan, knowledgeable others usually attend lessons and participate in the postlesson discussions. Ideally, they would do the same in this country. When that is not possible, reflections by e-mail are worth gathering. Gill was pleased that the lesson required the students "to draw on what they already knew to compare the scores, instead of just giving them a formula to use to make the comparison."

As for something to improve, Watanabe suggested that the teachers avoid using the term "rate" and only use the term "ratio." In this lesson, both terms were used interchangeably, something he says happens often because there are no set definitions. He finds the following definitions helpful: "A ratio is a comparison of two (or more) quantities of the same kind, while a rate is a comparison of two different quantities." Having not observed the lesson, he can't say for sure, but it's possible that some students assumed that when pretending a teacher played more games than she did, they had to keep her "pace" of winning the same. Indeed, one student who struggled with the lesson did seem to be thinking along those lines. He commented to another student that one teacher, who had played 3 games and won 1, would win once *every time* she played 3 games.

Overall, Watanabe found the core idea of the lesson quite strong, saying "the essence of putting ratios in the context of making multiplicative comparisons is something that other lesson study teams should think deeply about."

Principal Support

Lesson study at Pine Trail, or at any school, would not happen without the principal. When Pittard first approached Barbara Paranzino, Pine Trail's principal for 16 years, Paranzino was skeptical: "I really thought it was so time consuming and that there would be no way we could pull this off." Gradually, she saw that lesson study was time well spent, that the purpose was not to create the perfect lesson. "We're after the growth," she says. "Teachers communicating with each other about a specific math concept—that conversation is an administrator's dream."

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> **–STEPHANIE HAJDIN,**
> First-grade teacher

To make it a reality, at the beginning of each year she and Pittard ask teachers if they want to participate in lesson study. After the groups form, she and Pittard schedule dates for teaching each of the research lessons. They also work around school vacations and state testing to schedule blocks of time—typically 60 to 90 minutes—for the groups to meet. The days the research lessons are taught, Paranzino helps ensure that teachers not involved in lesson study can cover the classes of those who do participate. Some years, the school uses grant money to pay for substitutes.

In an effort to drum up support for lesson study districtwide, Paranzino has invited other principals to observe research lessons at Pine Trail. But she emphasizes that interest in the practice must come from teachers, not from the top down. "It's a huge commitment." Unfortunately, in Volusia County, teachers engage in lesson study without extra pay and often on their own time.

For Stephanie Hajdin, a first-grade teacher, the practice tops all other kinds of professional development. "I'd rather do this any day of the week than attend a workshop for three hours and have somebody tell me what I should be doing in my classroom," she says. Instead, Hajdin and her colleagues decide what they need to work on. Each year, when she signs up for lesson study, she looks forward to improving her teaching, to sharing in the camaraderie and the sense of accomplishment. "I really enjoy being part of the team." □

Interested in starting lesson study at your school? Unsure how to begin? Contact Alice Gill in the AFT's educational issues department at **agill@aft.org**.