

Rosalyn Yalow Charter School is located in one of the most underperforming school districts in New York City. However, four years after opening the school, we ranked in the top 13 % of New State public and charter schools on the State Math exams.

Our lesson study is actual research in classrooms with the school-wide community in an urban area led by a Japanese leader who has experience working in a lesson study research school in Japan. The presenters share three lessons to improve students' solving word-problem skills using the school's Singapore Math curriculum, including math lesson videos.

The school's academic success has two main points. One is our school's math program using the Singapore math curriculum. This has four essential parts: spiral curriculum, concrete-pictorial-abstract approach, number sense development, and teaching using a problem-solving approach. The second main point is teacher professional development using three key factors: teacher-led professional development lesson study, a collaborative schoolwide learning community, and long-time learner development of teaching skills.

Recent New York State Mathematics Exam scores demonstrate that the Singapore mathematics curriculum, with the support of outside resources, including lesson study research, has proven effective for both educators and students. The curriculum uses a concrete, pictorial, and abstract approach (C-P-A approach), where students develop positive attitudes toward math by acquiring and applying mathematical concepts and skills. Students engage in hands-on learning experiences using concrete objects such as math manipulatives. Students make meaningful connections and see applications to real-life experiences.

Presenters share how this C-P-A approach is built into the problem-solving process and can be effectively differentiated. Using research, we implemented note-taking, bansho (board organization), and discussion. Students improve their ability to independently understand what a question is asking and pull out the correct information needed to solve a problem.

Students learn how to successfully solve math problems by applying a problem-solving approach using four phases: Engage, Problem, Discussion, and Key Point.

Engage is the bridge between previous and present lessons. Teachers begin the lesson with a few questions connected to the previous lesson to recall the necessary knowledge to learn the new math content. Then, students encounter a new problem that contains new math concepts related to the learning objectives for this lesson. During **Problem**, students solve the new problem independently by using the previous knowledge they recalled in the Engage part.

Discussion is a student-led discussion. Representative students present different strategies tried. Students explain, ask questions, and clarify their thinking with each other. Teachers' support for students' understanding can be deeper with mathematical reasoning. At the end of the discussion, they select effective strategies with mathematical reasoning and summarize critical points through discussion.

Key Point is a student-led discussion summarizing essential points of their learning. Teachers connect these key points to big mathematical ideas and will articulate these for the class.

This approach allows students to work independently to solve a problem and then present the solution to the class for discussion. This curriculum establishes a rich connection between the content, the learners, the processes, and the social context to develop the learners not only as effective users but creators of mathematics.

The school has established a school-wide teacher-led collaborative learning community for the effective teaching of math lessons through lesson study. Lesson study, the research methodology used to analyze lessons, originated in Japan. The lesson study steering committee started in 2018 with a Japanese leader.

Implementing research lessons enhances student math learning and helps teachers deliver lessons to encourage students' higher-order thinking. As a result, students record their own ideas to help them with understanding, thinking processes, and misconceptions when solving math word problems. Through the research lessons, students are able to use a variety of math strategies and pictures as visual representations to show how to solve word problems.