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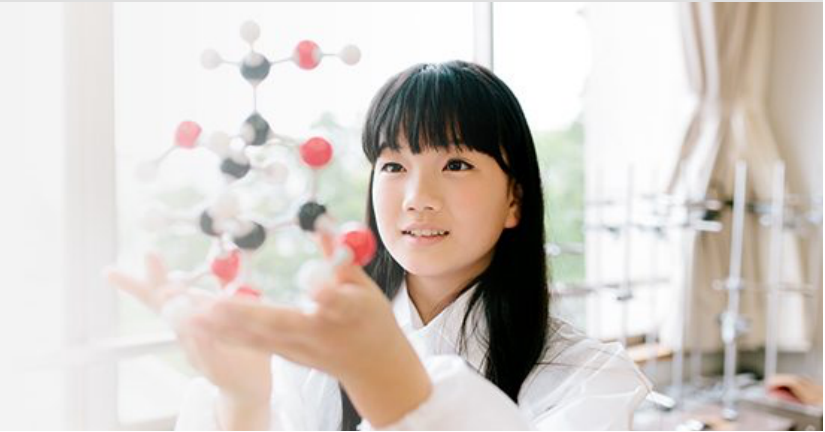
AI/Watson

How AI is helping to transform education in Japan

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A fourth-grade science class is just beginning. Students are settling into their seats as the teacher poses a question: *Why does a heated aluminum can collapse when it is rapidly cooled?*

Instead of consulting a textbook or listening to a lecture, students are assigned to one of three experiments. One experiment involves

cooling a bag of vapor. Another involves heating and cooling a bottle of milk with a balloon attached to the opening. The third involves cooling a heated conical flask with a hard-boiled egg perched on top. The classroom buzzes with energy.

Next, students discuss their results in small groups, sharing their own observations while integrating the ideas of classmates. They question, compare, explore, speculate and reflect. Their voices fill the room, challenging the idea that classrooms should be quiet. Natural curiosity drives them toward an answer and helps them retain the information longer.

What I just described is not a typical Japanese classroom. It's part of a growing network of schools across Japan adopting a new method—one that encourages creativity, collaboration and problem-solving rather than uniformity and memorization.

An evidence-based approach to education

At the Consortium for Renovating Education of the Future (CoREF)—launched at the University of Tokyo in 2008—we're helping to transform Japan's educational system by applying the latest research in the cognitive and learning sciences.

What we've found is that an active, collaborative approach to learning can dramatically improve education quality. The method we promote—the Knowledge Constructive Jigsaw method—encourages students to piece together a deeper understanding of a topic by considering it from multiple angles, working as part of a group.

It's a big departure from traditional education in Japan. Which is why we must consider every aspect of implementation—not only the effect on students, but also the impact on teachers, lesson plans, resources and technology.

AI technology helps teachers thrive in a new kind of classroom

To use the Knowledge Constructive Jigsaw method in their classrooms, teachers must adapt. Instead of delivering static curriculum to a group of passive students, they should follow an "Anticipation-Action-Reflection" cycle—designing student-centric lessons,

monitoring and providing feedback on student activity, and collaborating with colleagues to continuously improve.

In theory, this is a great idea. In practice, it's difficult. Teachers simply cannot monitor all student conversations, as there are likely to be multiple small groups working simultaneously.

Given the constraints of the traditional classrooms, we saw technology as the best option for overcoming the challenge. We introduced IBM Watson Speech to Text technology in the IBM Cloud to help monitor the quality of student interactions, fueling the planning and feedback cycle. The AI technology has become an essential piece of our strategy for rolling out the Knowledge Constructive Jigsaw method to a wider network of schools.

Here's how it works:

- When teachers create their lesson plans, they tell Watson which key words they expect to arise during the exercise, indicating where is degree of understanding of students.

- Watson records and transcribes student discussions, scanning for expected key words.

- Teachers review Watson's output to assess student learning and continuously refine lesson plans.

- Lessons are archived in a database for other teachers to use.

Revitalizing education in Japan

Imagine how far education can progress with evidence-based learning methods and AI-powered assistive tools. Instead of teaching to a test, teachers can work to inspire creativity and a love of learning. Students can strengthen their capacity for independence and collaboration. Society can benefit from new generations of active learners who are motivated to solve problems and try new things, driving economic innovation and growth.

CoREF is one piece of a larger effort to achieve this educational transformation in Japan. With a widespread interest in the topic, from the cabinet of the prime minister and advanced learning institutions to cognitive researchers and industry at large, the revitalization project is a promising vision on the horizon. We look forward to exploring how AI and other emerging technologies might help us get there.

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