Transforming Learning through Exploration and Collaboration

By Stacy Kindopp



Exponential growth in engagement

With a background in drama and theater, Marcy Stein brings a touch of magic to each of the math, English and drama classes she teaches at **Bialik High School** in Montreal, Quebec. Stein is a **SMART Exemplary Educator** and was recently honored with the **2010–2011 Prime Minister's Award for Teaching Excellence**.

With a SMART Board interactive whiteboard in her classroom, Stein loves to use SMART Notebook collaborative learning software to create lessons that capture students' attention.

"The chalk-and-talk approach doesn't work with today's students. I engage my students by getting them to work on an inquiry approach, where they explore and discover concepts on their own," explains Stein.

The SMART Board interactive whiteboard has given Stein a new connection with her students. She cites Marc Prensky's *Digital Natives, Digital Immigrants*, which tells how today's students are "born into the digital world." Stein says that it's necessary for teachers to adapt to the digital world that their students are versed in.

Stein uses SMART Notebook Math Tools to engage her math students. "Working with graphing and geometry is amazing on the interactive whiteboard," says Stein. "The interactivity helps them explore and understand the concepts. Students can move lines around a Cartesian plane or create arcs with the compass in different colors."

The SMART Notebook lessons that Stein creates help her more effectively teach math concepts that were previously difficult to explain to students.

"For example, it's difficult to teach students how to calculate the area of a circle – you can't break it up into equal squares. With the shape division feature in SMART Notebook Math Tools, we can pull apart the circle and rearrange the sectors to create a parallelogram and then the students are able to calculate the area. Being able to manipulate objects like this is fantastic," explains Stein.



"With SMART Board interactive whiteboards in our classrooms, there has been an exponential increase in student engagement," she adds.

To gauge student understanding, she also creates quizzes within her SMART Notebook lessons.

"I will often use web-based games or interactive quizzes to find out if students are grasping a concept. Students feel like it's a game and are very excited about learning," says Stein.

Stein strives to create a classroom environment that keeps students curious and motivated. "I'll even come into class dressed up in a costume if it relates to a concept." With SMART Board interactive whiteboards in our classrooms, there has been an exponential increase in student engagement.

– **Marcy Stein** Teacher, Bialik High School Montreal, Quebec For example, Stein has created a SMART Notebook lesson on integers that features a cauldron with a fire underneath it. She uses the interactive thermometer from the Gallery in SMART Notebook and three-dimensional cubes – blue for cold and red for hot. When it's time to deliver the lesson, Stein shows up to class wearing a cape and witch's hat.

"I'll do whatever it takes to get my kids to learn. Teaching in character is just part of my drama and theater background," laughs Stein.

And her teaching strategies are getting results. Students in Stein's enriched mathematics classes participate every year in the Canadian National



Mathematics League and from 2001 to 2008 and in 2011, the team placed first in Quebec.

Integration instead of isolation At the Will Rogers Learning Community in Santa Monica, California, educators provide an interdisciplinary approach to learning that integrates STEM across the curriculum. Carl Witt, a SMART Exemplary Educator and SMART Certified Lesson Developer, is the STEM coordinator at the

elementary school.

Five years ago, the school implemented a **Cognitively Guided Instruction** (CGI) approach for teaching math, in which there is an emphasis on problem solving instead of memorization and repetition of number facts.

"With this approach, students gained a better knowledge of the logic behind formulas," says Witt.

Because of the success of the CGI approach in math, the school began using the same approach for all STEM subjects. "SMART Board interactive whiteboards have completely changed the way that we implement this teaching strategy for all subjects. It's enabled us to become more collaborative," explains Witt.

The school has a SMART Board interactive whiteboard in every classroom, including their special education classrooms and computer lab. They also have **SMART Response interactive response systems** and document cameras.

"This combination of technology helps us respond to student questions on the fly. If a student asks why it's H_20 instead of OH_2 , we can look it up on the Internet immediately," says Witt.

In keeping with this interdisciplinary approach, Witt works with teachers to develop engineering design projects that enable students to apply what they've learned in science and math.

"We have two planning days in which we go through every science lesson and see how we can incorporate mathematics,

engineering, technology, language arts and art," says Witt.

This year, the first-grade students studied the story of *Goldilocks and the Three Bears* in an interactive SMART Notebook lesson. After the story, they were given an engineering design project in which they had to build a chair that was capable of holding three pounds. For materials, they were given eight pieces of newspaper, one piece of cardboard and an unlimited amount of masking tape.

To help them come up with ideas, their teacher used SMART Notebook to show videos and pictures of chairs and collaboratively brainstorm concepts.

"Our vision is to build on this approach – we want to teach literacy through seamless integration of STEM components. We try to correlate activities to the themes they are already studying. We're moving away from the idea of studying everything in isolation," says Witt.

With this inquiry-based approach to STEM subjects, students explore concepts, experiment and share what they learn. Then, teachers begin to introduce them to the terms and definitions that apply to their observations.

To ensure students are understanding concepts, teachers

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– Carl Witt

STEM Coordinator, Will Rogers Learning Community Santa Monica, California

use SMART Response question sets. "When I use SMART Response questions at the beginning of class, I can gauge where we're at and find out if I need to go back and review concepts before moving on," explains Witt.

A new paradigm for STEM education

Formative assessments are also an essential part of the innovative approach of the **Progressive Science Initiative** (PSI) and **Progressive Mathematics Initiative** (PMI), led by Dr. Robert Goodman, Director of the New Jersey Center for Teaching and Learning (NJCTL).

Goodman is driving the transformation and improvement of teaching and learning in science and math. He began developing the PSI approach in 1999 while teaching at Bergen County Technical School in Teterboro, New Jersey. With the PSI approach, the sequence in which students study the sciences is reversed. "The way we teach science in the United States has been to teach biology and then chemistry and then physics, which doesn't make coherent sense – one doesn't lead to the other," says Goodman.

"So, students are constantly memorizing in the traditional class, rather than understanding. In our classes, students learn physics in a very natural, orderly way, ending with quantum physics, which is the natural beginning of chemistry, and then they do chemistry step by step until they get to organic chemistry and properties of water, which is the natural beginning of biology," he explains.

With this approach, the rate of Teterboro students taking and passing the AP Physics B exam was 16 times higher than that in the rest of the state – and it continues to grow. The success of the program gained Goodman much recognition, including New Jersey State Teacher of the Year for 2006.

Goodman later joined the NJCTL and began focusing on developing PSI and PMI curriculum resources for K–12 classrooms. The content is developed in SMART Notebook and incorporates SMART Response for assessments. The curriculum resources are offered as units, and teachers use formative assessments

to gauge student understanding and pace the instruction accordingly.

"Formative assessments are the best predictor of student learning. In our approach, students sit at round tables and answer questions with their SMART Response remotes," says Goodman.

"If students are split in their responses, we'll tell them to find someone with a different answer and convince them that they're right. They're arguing, the classroom is noisy and they love it. It's very socially dynamic," says Goodman. "When you teach something to someone, it helps you know it better."

Goodman believes that this approach helps students develop the essential skills. "Collaborating together and solving complex problems are the skills needed for the future, so how we teach is just as important as what we teach," explains Goodman.

And because students are constantly participating in assessments, no student falls behind. "We assess student understanding so frequently



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– **Dr. Robert Goodman** Director, New Jersey Center for Teaching and Learning

Trenton, New Jersey

that it's hard to leave the class without knowing the concepts," says Goodman.

Students also have fun opportunities to collaborate and apply their learning. For instance, once students have gained an understanding of how to equate the time, position and acceleration of an object, they will go outside for a class activity and launch stomp rockets. The teacher will give them only a stopwatch and ask them to find out how fast it leaves the ground and how high it goes.

"We've had students working in the rocket lab, doing their computations, and when the bell rang at 3:00 p.m., they wouldn't leave. They stayed with their friends working

on the problem until 4:00 p.m.," says Goodman.

Schools in New Jersey that are implementing the PSI and PMI curriculums are seeing significant increases in student interest in science and math and meaningful performance gains, with a substantial increase in the percentage of students taking AP science exams.

NJCTL offers the curriculum content, including presentations, homework, labs and assessments, for free. Students, parents and teachers from around the world can begin using all

the resources, except assessments, immediately – educators must complete a free registration to gain access to the assessments.

"We're freeing teachers up to teach," says Goodman. "Some of our teachers call this 'reduce your stress' teaching. We're giving them more opportunity to focus on their students instead of being constant curriculum developers."