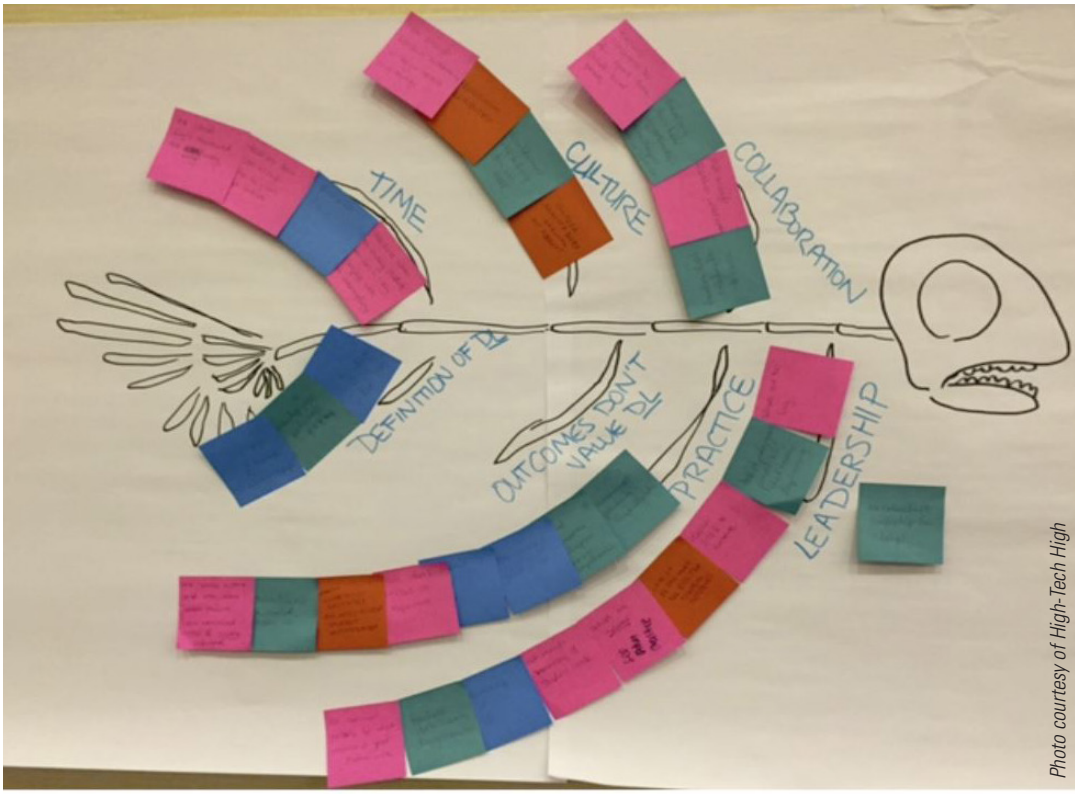

Photo courtesy of High-Tech High

District uses improvement science principles to increase math scores

Victoria Bill
IFL mathematics fellow

When a district successfully shifts their trajectory of students' performance, many people ask how they did it. New Brunswick Public Schools' use of strategic decision-making, grounded in improvement science principles, and greater collaboration across role groups resulted in impressive gains in mathematics scores across the district.

In what ways did the district support teaching and learning that lead to this growth in student learning?

Central office leadership in collaboration with instructional leaders across the district systematically provided classroom teachers with a full range of support—from resources to learning opportunities—that focused on the Effective Teaching Practices for Mathematics.

How did the district determine if the new learning about the effective teaching practices made its way into classrooms across the district?

New Brunswick administrators collected and used a variety of data to formatively assess the impact of the implementation of effective teaching practices. Building administrators collected and analyzed data and artifacts from third through fifth grade classrooms to find out what type of instruction was happening in mathematics classrooms. This included the instructional tasks being used and samples of student work from instructional tasks. They also collected and analyzed survey data from teachers and students along with state math assessment data.

Analysis of the data showed several correlations between the district's support for effective teaching practices and the impact on teaching and learning in mathematics classrooms. State assessment data revealed high scores in the math domain of fractions, the area of study where teachers delved most deeply during their professional development. Teacher survey data indicated that teachers were using high-level tasks regularly in the classroom.

The analysis also provided insights into areas that needed further attention:

- Student work samples contained little evidence to indicate that students were making use of mathematical models.
- Student work samples showed few students providing evidence of mathematical reasoning.
- Student survey data revealed that the majority of the talk in the classroom was teacher talk which contrasted with what teachers themselves reported.

These insights served as the focus for the district's next series of changes. Dr. Aubrey Johnson, superintendent, challenged principals to try small tests of change to spark an inquiry into ways to deepen and improve the learning opportunities for the students.

See below for examples of tests of change.

Early in the implementation of these change cycles, principals reported that they felt focused and re-energized by the rapid and actionable steps within and across tests of change which have also provided a window into the ways their schools are working. Additionally, student work that was collected and analyzed showed improvement in student performance, which served to bolster the efforts of principals and teachers alike.

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Test of Change	Evidence to Be Collected
If mathematical models are made more public and used to reason about mathematics during teacher-to-administrator and teacher-to-teacher discussions, will there be an increased use of models in math classrooms?	Collect examples of models in math classrooms and note features of models.
If the writing in the mathematics classes is analyzed, will the list of characteristics align with characteristics of writing about mathematical reasoning?	Collect student work and note mathematical reasoning and process writing.
If students are asked to explain what they understand in mathematics, will they be able to talk about what they are learning?	Collect student responses and note patterns by grade level.

levels of language acquisition represented in the room.
6. Be willing to accept imperfect language from students as they learn to master English and academic language.

Engaging EBs in complex tasks around challenging texts in English is no simple feat, but with the right tools at teachers' disposal, we know that it is one they can accomplish. Careful planning and consideration about appropriate texts, student characteristics, and the tasks that best scaffold instruction help facilitate EBs to engage in the kinds of discussions that will not only build English, but also create critical thinkers and speakers. ■

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Coaching Corner *continued from page 2*

that are relevant and meaningful to their own specific situation (students, grade, subject, etc.). Coaches must work with teachers to determine which potential goal(s) make the most sense under the umbrella of overarching district priorities. Coaches allow teachers agency over their own learning by asking probing questions that encourage deep reflection." Such an interaction, rooted in mutual respect, positions both coach and teacher to be continuous learners, and to begin with a unique dialogue dependent on aspects particular to the teacher.

Differentiation has both a cognitive value and social value. Meeting individual needs is one way that coaches build relationships, as well as supporting professional learning. When coaches are viewed as a trusted resource, a cultural revolution is underway. Dr. Keene shares the following phrases from teachers describing the coach in their building: "Makes me a better teacher" and "Safe person to ask" as well as "Makes me think more deeply—clarifies ideas when I engage in cycles" and "Helps me reflect on my learning." "Coaching is now a part of our culture," Dr. Keene explains. "No one says, 'I don't want to be coached.' Instead, they say, 'The coach has my back.'"

Dr. Crystal speaks to the socio-cognitive value of the coach-teacher relationship in this way: "Teachers must trust coaches and feel safe enough to be vulnerable, take risks, and change course based on evidence of student learning and reflection."

Such trust is not the result of a one-size-fits-all approach. Rather, differentiation is one significant hallmark of *Content-Focused Coaching* implemented thoughtfully and responsively. ■

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Welcome Courtney Francis

We are pleased to announce Courtney Francis has joined our team at the Institute for Learning as the new director of online learning and product development!

Courtney received an MS in Educational Technology and Applied Learning Science from Carnegie Mellon University in 2018, supercharging her ability to design learner-centric educational tools based on cognitive science, data analysis, and technology trends.

Courtney is looking forward to applying her expertise in educational technology and product management experience in industry, startups, and academia to help IFL's online courses reflect our important education research and the effectiveness of our face-to-face workshops, and to position IFL to apply our research-backed instructional methods more broadly in real-world settings. Read more about Courtney on our website at https://ifl.pitt.edu/about-us.cshtml. ■

Improvement science *continued from page 3*

The principals reflected on their work and named three common practices:

- Stay focused on mathematics content and student reasoning.
- Take an inquiry stance and cultivate inquiry.
- Engage in authentic collaboration.

Why did the common practices named by the administrators matter?

Taking an inquiry stance when positioning the test of change was one of the ways principals engaged teachers in the work. Principals created space to work alongside teachers so that they could take on issues and problems of practice collaboratively. Together, they brainstormed ways they might engage in small tests of change and identified the evidence they would collect to learn about the change. Since this practice was new to everyone, working jointly allowed them to establish clarity about why the evidence was needed, the types of evidence that would be helpful to analyze, and processes for collecting evidence that would be least disruptive to teaching and learning.

As data were collected and analyzed, principals took great care to cultivate dispositions in which everyone avoided leaping to definitive conclusions. Teachers and administrators had to learn to be tenacious, to probe their own and others' ideas and interpretations, to doubt, and to be skeptical. Working in this way is a learned process and requires a great deal of discipline on behalf of both the principals and the teachers.

Throughout this process, principals and teachers focused on very important practices in mathematics—the use of models and explanations and writing about mathematical reasoning. These effective teaching practices are ones that will support students in deepening their understanding of mathematics. When analyzing student work through these lenses, teachers and administrators can gain a deeper understanding of what students know and what they need to learn.

Additional insights will also be shared by New Brunswick principals at the IFL Leader Summit in June. ■

*See the February issue of ***Bridges*** to read about more details of this growth in student achievement in mathematics.