

A Vignette of Science Education in District USA-X

School District USA-X is located in a medium-sized city somewhere in the United States. The district has three high schools. East HS is the fastest growing with high teacher turnover and 1,200 students in a building designed for only 1,000. The student population is diverse in terms of race, ethnicity, and socio-economic status. The average teacher has been teaching for fewer than five years. West HS has 1,000 students, a less diverse student population, and a mix of new and veteran teachers. Central HS is a magnet school for science, math, and technology with 600 students and mostly veteran teachers. The district high school science program includes physical science in 9th grade and biology in 10th grade, with most students then taking chemistry in 11th grade. A few students enroll in physics or an AP science course in 12th grade. Most students graduate with three years of science and go on to a state university. A recent report from guidance counselors states that ACT scores have declined over the past five years.

Year One: Getting Started

Summer

It's May and Tony Martinez, the District Science Supervisor for District USA-X, is pondering his next steps. While the state has not adopted the Next Generation Science Standards (NGSS; NGSS Lead States, 2013), it has revised the state standards based on the *Framework for K-12 Science Education* (NRC, 2013) and the NGSS with its emphasis on phenomena- and problem-based instruction and three-dimensional learning. Tony knows that the goals of the revised standards will be new to the district's science teachers and they will likely find it challenging to change their instructional styles.

The good news is that District USA-X will have funding available next year to select and purchase new instructional materials for the 10th grade biology course as part of the district's materials adoption cycle. Tony reflects on the 25 biology teachers in the district and thinks to

himself, "Most—though not all—of our teachers rely heavily on the adopted textbook for sequencing lessons and designing instructional activities. We have an opportunity now to adopt instructional materials that are better aligned with the revised standards, and they can support teachers as they make changes in the way they teach."

Tony begins to form a plan. Knowing the time for adopting materials is coming, he figures it is better to get a jump start on things instead of waiting and making a rushed decision.

A week later, Tony meets with the science department chairs from the three high schools in the district. He shares his plan to focus on 10th grade biology, explaining that it makes sense not only because of the funding earmarked for biology but also because this is where they can impact the largest number of students. Tony provides information about **NextGen TIME**, a program he learned about while attending the NSTA national conference in March. For the most part, the chairs are interested in what the program has to offer and commit to reviewing over the next month the tools and processes that are part of **NextGen TIME**.

In June, Tony and the three department chairs meet again. After reviewing the **NextGen TIME** materials, the group is in general agreement that they will be a valuable resource for selecting and implementing new instructional materials. Their first step is to decide who will be on the Materials Leadership Team (MLT) and how they will get the necessary funding from the district for leading this effort. They also want to find out more about their current 10th grade biology program.

Ryan Novak, who has taught biology for four years and just became the department chair at East HS, is excited about this new opportunity and agrees to serve with Tony on the MLT. Alan Hoffman, a veteran chemistry teacher and the department chair from West HS, is less enthused than the others. He thinks a markedly different

biology program will be a hard sell and will meet with a lot of resistance from the teachers in his school.

Kayla Johnson, a mid-career biology teacher and the department chair from Central HS, disagrees. Like Tony, she feels that change is necessary if District USA-X teachers are going to meet the needs of all students and the goals of the revised state standards.

As a chemistry teacher, Alan decides not to join

**District USA-X
Materials Leadership
Team (MLT)**

**District Science
Supervisor:** Tony

**Biology Teacher
Leaders:** Ryan*, Kayla*,
and Armaan
*Department chair

the biology-focused MLT but will attend periodic meetings. He recruits Armaan Patel, a biology teacher from West HS, to serve on the team with Tony, Kayla, and Ryan. Armaan is an

experienced teacher and interested in looking at new biology materials, although, like Alan, he isn't convinced a different program is a good idea. With Armaan on board, the MLT is complete.

Before school is out for the summer, the team holds its first formal meeting to discuss the **NextGen TIME: Prepare Phase** materials. Armaan comments, *"I thought this was just about picking out a biology program. I didn't realize NextGen TIME also supports us in implementing a new program and monitoring our progress in using it."* Ryan adds, *"I didn't realize we would be analyzing prospective instructional materials in such depth. No wonder it requires some professional learning to do this."* By the end of the meeting, the MLT has identified four major tasks to complete before the fall semester: (1) request biology instructional materials to review from publishers and other curriculum developers, (2) recruit additional teachers to serve on the Selection Team, (3) assess the readiness of this team to evaluate materials for the extent to which they support the revised standards, and (4) get ready for the prescreen. The team also decides they will talk with all the district biology teachers about the upcoming materials selection and adoption

during a half-day district curriculum meeting just after school is out.

At the curriculum meeting Tony highlights the revised state standards and what the emphasis on three-dimensional, phenomena- and problem-driven student experiences for science instruction in the district. Tony and Ryan study a **Prepare Phase** tool to help them assess the current state of district support and teacher practice district in light of the new emphases in the standards. Kayla introduces **NextGen TIME** and presents a brief overview of each phase of the tools and process using the slides shown here.

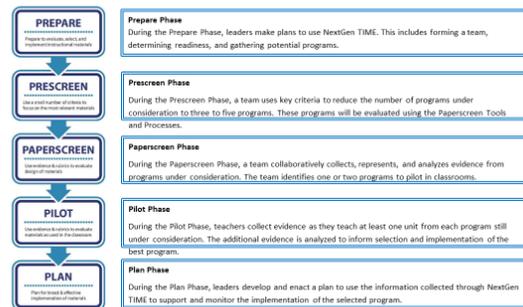
NextGen TIME



- Is ...
 - a suite of tools and processes
 - collaborative and evidence based from start to finish
 - an investment in curriculum-based professional learning
- Is not ...
 - a thumb test
 - only about selecting instructional materials



NextGen TIME



Kayla describes how the tools and processes that accompany each phase of the project will support them through the selection process as well as implementation of the new program. She communicates the timeline with the teachers and the different roles that are involved in the process. Finally, she asks for any teachers who are interested in serving on the Paperscreen

and/or Pilot Phases to let her know via email by the end of the week. The teachers leave the meeting with a mixture of feelings. Some are excited about using such a well-thought-out process to get new materials. Others are excited about new materials but apprehensive about how different materials that align with the revised state standards might be. Many of the veteran teachers express ambivalence—having been through other adoption processes they’re not sure if this will really be any different. A few teachers appear antagonistic toward the whole approach.

During the next couple of months Tony reaches out to materials publishers and curriculum developers, as well as his supervisor network, to identify candidate programs. By the end of the summer he has received five sets of instructional materials to review. All indicate that they were designed to align with the NGSS.

The MLT meets two more times during the summer. During the first meeting they decide that the four of them will take on the role of prescreening candidate materials and will also serve on the Selection Team along with additional district teachers. Kayla reports, *“I received emails from five biology teachers expressing interest in serving on the Selection Team, one from East and two each from West and Central. Ideally, I think we should have one more teacher from each school. I was pleased to see Sarah Russo from Central among the volunteers; she is definitely a leader at our school and I nominate her for the Selection Team.”* Armaan nominates Derrick Washington from West High School, noting that they often team up to introduce new ideas to the science teachers at their school. Ryan reports that the sole volunteer from East, Grace Liu, is a young teacher who has just finished her second year of teaching. But he has been mentoring her and has been impressed by her rapid improvement in instruction and her commitment to student learning. The MLT agrees to add these three teachers to complete the Selection Team. Next, they agree to use some of the suggested resources linked to the **NextGen TIME: Prepare Phase** to determine which materials to request

from publishers and developers and continue to discuss readiness of members of the Selection Team to evaluate materials.

At the second meeting, the MLT analyzes the information collected and identifies five biology programs to prescreen. They also recognize that they all could benefit from a deeper understanding of phenomena- or problem-driven three-dimensional teaching and learning and that some need a deeper appreciation of the role of instructional materials in improving teacher practice and student learning. The team decides that while they could benefit from a common experience, they will trust the process and won’t take the extra day or two required for such an experience that would go beyond the time they’ve set aside for evaluating, piloting, and selecting a new biology program.

Fall

Following the common learning experience, the MLT feels ready to prescreen the five sets of instructional materials that Tony collected. They use the **NextGen TIME: Prescreen Phase** tools and processes to determine whether the materials are designed to engage all students in making sense of phenomena and/or designing solutions to problems through student performances that integrate the three dimensions of the state standards. By the end of October, they have screened all the materials and identified three programs that warrant a more thorough review. Because of her experience facilitating professional development activities at Central HS, Kayla will work closely with Tony to lead the Paperscreen Process.

Winter

In November Tony calls the first meeting of the Selection Team. He works with Kayla to introduce the team to the **NextGen TIME: Paperscreen Phase** tools and processes. These include guides for reading selected units from the programs and

District USA-X Selection Team

Tony, District USA-X
science supervisor
Kayla,* Central HS
Ryan,* East HS
Grace, East HS
Derrick, West HS
Sarah, Central HS
Armaan, West HS

*Department chair

gathering evidence from them; rubrics for scoring the use of innovations specified by the revised state standards, student work, student progress, and support for teachers; and charts for recording the strengths and limitations of each program.

The team identifies three days to meet to learn how to apply the Paperscreen Tools and Processes using a life science program that is not under consideration by District USA-X. Kayla explains that it is easier to learn the process knowing there is no possibility that those materials will be selected. She also notes that the process will go more quickly with the five candidate materials once they have learned the process.

The team decides to meet every two weeks to apply the Paperscreen Tools and Processes to the three sets of instructional materials. By the beginning of early January, they have completed a thorough evaluation of each program.

When the Selection Team meets later in January, they use the evidence they have collected to narrow their choices to two sets of instructional materials and apply the Program Rubric.

Tony calls a meeting to hear the recommendations from the Selection Team. They make sure to include Alan because they want to discuss the pilot test. The Selection Team discusses their findings. They decide that both programs are worthy of piloting, although they strongly considered piloting a unit from only one of the programs. Together they decide to pilot one unit (the same genetics unit) from each program in classrooms during the current semester. The Selection Team will continue working together through the Pilot Phase and Tony will borrow a classroom to try out a few of the lessons from each program.

Spring

In early spring, Tony and Kayla organize the first meeting of the Pilot Team and again lead them in learning about the **NextGen TIME: Pilot Phase** tools and processes. They examine tools for collecting evidence of student work and learning, for recording their insights about teaching the

lessons, and for the helpfulness of teacher supports in the program.

The team decides to test the genetics unit from each program during March. Three of the teachers will teach the unit from one program and three will teach it from the other program at the same point in the semester. They also identify five similar lessons from each program for collecting the evidence specified in the Pilot Tools. They make plans to meet after teaching each chapter in the unit to share the evidence they gathered. Tony thanks the team members for the extra time they are giving for the pilot test. He promises to provide pizza or other snacks at these meetings and that the district will pick up the cost.

Tony visits each Pilot Team member's classroom while she or he is teaching the unit, noting in particular the way students respond to the phenomena-based lessons and the extent to which he sees evidence of three-dimensional learning. As agreed, the pilot teachers meet after teaching each chapter to look at student work and discuss implementation issues.

During this time, Tony begins studying the **NextGen TIME: Plan Phase** resources more closely so the MLT can move quickly once a selection decision is made. He communicates with the publisher of one program and developer of the other to make sure that they would be able to deliver the materials by early August if the school board approves their recommendation in their June meeting. He also works with them to explore the professional learning services they can and will provide alongside their purchase.

The Pilot Team meets in mid-April to synthesize the data from the pilot test. Based on these data, which include student reflection on their learning, assessment of student work, and the teachers' perspective on the quality of the instructional support provided for each set of materials, the team recommends one program for adoption. During this meeting, Kayla expresses concern that they haven't kept other teachers in the district apprised of their progress. Her concerns are based on a conversation she, Alan, and Ryan had at a recent department chair

meeting. She reports that Alan agrees with her. Ryan shares his reasons for being less concerned: The biology teachers in his school expressed interest and curiosity about the genetics units the pilot teachers taught. The other teachers had noted somewhat enviously that his and Grace's students seemed very engaged in their learning.

The MLT is successful in getting board approval in June to purchase the recommended biology instructional materials. School board members are impressed with the selection process the team conducted and the evidence it presented. The school board decides that all biology teachers in District USA-X will implement the new instructional materials beginning the next school year.

Year Two: Scaling Up

Summer

Early in the summer the MLT and Alan meet to review the **NextGen TIME: Plan Phase** tools and processes. Based on this guidance, the team develops a vision of effective science teaching and learning in District USA-X. Their next step is to develop an action plan for professional learning for their biology teachers. The action plan includes a strategy to address a few of the key pieces of feedback from the Pilot Phase, a kick-off institute involving all biology teachers, and a plan to build capacity among the pilot test teachers to be coaches for the rest of the biology teachers in their schools. The action plan also includes a process for monitoring the implementation of the new biology program.

Toward the end of the summer the MLT leads the Biology Teacher Institute to introduce the district's biology teachers to the new materials and the instructional strategies central to it. The session includes a half-day orientation from the program developer. Throughout the learning experiences, the team highlights the ways in which this new program will enhance student learning and help them meet the revised state standards.

During the institute, the team encounters a lot of resistance from veteran biology teachers throughout the district. Most of these teachers

are upset they were not consulted about the newly adopted program. In addition, many of them view textbooks as resources for teaching and have a different understanding of instructional materials from those on the MLT and Selection Teams who participated in the selection process.

When the MLT meets to debrief, Alan reminds the team that he has been concerned all along about gaining teacher support for changing the biology program. Everyone on the team is concerned about the future use of the new biology program. Kayla tries a strategy she learned in previous professional development focused on the process of change. *"Please take a minute to write down what you feel are the reasons for the resistance."* As she charts responses in the following discussion, the team begins to reach some common understandings that help members think more productively about an approach to address the resistance. During this time, she checks for agreement to make sure that Alan supports the selection decision.

Ultimately the MLT identifies strategies from the **NextGen TIME: Plan Phase** resources to help mediate the resistant teachers' concerns and could support them in better using the new biology materials. The team also likes the resources for organizing study groups for ongoing professional development, but they are concerned about the time it will require for the informal teacher coaches to lead this work (as well as the time for all biology teachers to meet together). Tony agrees to meet with the superintendent and the high school principals to find a way to use their district-wide professional learning community (PLC) time for biology teachers to work together.

Fall-Winter

During the fall semester, Tony and the three department chairs observe biology classrooms in the three high schools. Their overall impression is that teachers with less teaching experience are beginning to implement the new instructional materials and that veteran teachers are using the

new materials as a resource to supplement activities in their existing curriculum.

Spring

At the beginning of the spring semester, the MLT receives district support for a formal coach at each school to facilitate study groups, along with time during the school day for the groups to meet. The team hopes that these study groups will ease teachers' apprehension about the new biology instructional materials and enhance effective implementation of the program.

In May, the MLT meets again to reflect on the impact of the study groups and the new instructional materials. A presentation by several study group members shows how the quality of student work has improved. The change is attributed to both the instructional materials and the professional development that supported effective implementation of them. The district's data also indicate that more students are enrolling in chemistry classes. More reluctant teachers are beginning to take notice of the excitement generated in classrooms where the materials are being used more consistently.

As a result of sitting in on a study group, Alan better understands the biology instructional materials and how they link to his own philosophy of teaching. He is considering how they could use a similar process for selecting new chemistry materials. Alan also points out that teachers at all three high schools have commented on the need for more three-dimensional assessments in the program. *"An opportunity to work on developing three-dimensional assessments with teachers from all the schools could help us sustain the use of these instructional materials,"* he states. Tony adds, *"That makes sense to me. It's gratifying that the district's biology teachers are working together on the implementation process."*

Summer

The new school-based coaches meet with the MLT early in the summer to plan another Biology Teacher Institute in August to help teachers build from lessons learned during their first year of implementation. They lay out a plan for

professional learning for the next year that more directly brings to light the challenges and benefits for using the new materials with a goal of getting more reluctant teachers on board.

Alan requests to meet with the MLT early in the summer as well. He wants to use **NextGen TIME** tools and resources next year to select new chemistry instructional materials; however, drawing on lessons learned from the biology material's adoption, he wants to ensure greater participation from the teachers at each school. Tony and the other chairs agree that this is a great idea and they help Alan to form a communication plan to keep all teachers in the loop during the process. Alan formally joins the MLT. Tony says, *"I'm glad we discovered NextGen TIME. It's a lot of work, but the resources it provides give us support for each step of the process. Hopefully all our work will translate into students doing well on state assessments that are based on the revised standards."*

References

- National Research Council (NRC). (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academy Press.
- NGSS Lead States. (2013). *Next generation science standards: For states, by states*. Washington, DC: The National Academies Press.

The NextGen TIME resources are available for download at: nextgentime.org