UNLOCKING THE POWER OF DATA

Building an effective analytics program involves people, process and technology. Here's how to get started.

INTRODUCTION

Data analytics, while already important, is about to become crucial for our nation's K-12 school districts. Two new federal policies — the Every Student Succeeds Act (ESSA) and the National Education Technology Plan (NETP) — will demand growing sophistication in how districts measure student achievement and assess their own performance. This report offers practical advice and proven strategies to help districts meet these new requirements and ultimately improve learning outcomes through data-driven decision-making.

ESSA — the successor to No Child Left Behind — ties federal education funding to accountability plans developed by districts and approved by state education departments. This gives districts new flexibility in how they measure and report their performance, but it also demands that districts develop new expertise around data analytics and create new infrastructure for effective data capture and sharing. In addition, ESSA — coupled with NETP — pushes districts toward personalized and project-based learning, which will require them to develop data-driven assessment methods that give teachers, students and parents rapid feedback on educational progress.

To get a sense of how prepared districts are to meet these new requirements, the Center for Digital Education (CDE) partnered with Technology Integration Group (TIG) to host a series of roundtable discussions during the ISTE 2016 Conference and Expo. During 3 roundtable sessions, we engaged more than 40 policy and technology leaders from districts of varying sizes and geographic location. Not surprisingly, our participants identified a range of challenges. Among the most significant:

- ✓ Developing meaningful metrics for district and student performance
- ✓ Creating a single version of truth, even if data is coming from multiple systems
- ✓ Putting data and analysis tools into the hands of teachers
- ✓ Giving students access to and control of their own data
- ✓ Reporting data to parents and community members

But along with the challenges were signs of progress. Several districts said they had formed multi-stakeholder accountability and assessment teams tasked with developing performance metrics for schools. Others are developing data dashboards and visualization tools to help teachers interpret student performance data. A few are attempting to put students in charge of their own data by giving them access to assessment results and training them on what those results mean. Perhaps some of the most interesting work involved analyzing a range of data — attendance, behavior issues, test scores and other factors — to generate early warnings for students in danger of failing or dropping out.

This report is guided by the challenges and potential solutions identified by our roundtable participants. Our intention is to provide practical advice for meeting real-world analytics demands and offer lessons learned from leaders in this space.

FIRST STEPS

Our ISTE roundtables confirmed school leadership is invested in the power of data for overall school improvement. Data-driven decision-making is on everyone's mind. We can all agree that there is a plethora of student data that could help us move from being data-rich and information-poor to successfully utilizing data to make critical decisions related to student achievement.

So, where to begin? Implementing a data-driven approach will impact people, process and technology. Here are the basic elements and first steps involved in getting started:

CREATE A PROJECT CHARTER.

This is a working document that defines the goals, resources, risks and timeline of an analytics project. It ensures all team members are on the same page and contains a mutually agreed-upon definition of success.
Recommendation: Facilitate workshops where stakeholders can collaboratively brainstorm their requirements for an analytics solution. This creates buy-in, which will help ensure early success. While it may not be intuitive at first, inviting resisters (or devil's advocates) to the initial workshops is actually helpful; they often provide a wealth of information that can be used to stave off opposition during implementation.

DEFINE ROLES AND RESPONSIBILITIES.

Be inclusive. Identify talent from traditional and non-traditional pools that can help get the initiative up and running. Create roles and responsibilities during the workshops and include them in the project charter.
Recommendation: Create data champions within each school and department, and at the district office. Data champions do not have to come from the IT department. Educators have a deep understanding of their students' circumstances — including academics, behavior, demographics, growth and development — which makes them the most impactful resource available to understand the data.

COLLECT ACCURATE, "LINKABLE" STUDENT AND FINANCIAL DATA.

Collecting good, reliable data takes time and discipline. Start with what is available and build upon it. There is usually already ample data that can be used to measure and manage performance. But it probably doesn't come in convenient, automated reports — and the data sources may not initially speak to each other (i.e., "linkable"). Still, the data is there waiting to be assembled and analyzed.
Recommendation: Think big, start small and keep it simple. Begin with one data source and scale your efforts as you make progress on your analytic journey. Always strive to use simple, straightforward tools and techniques to collect data. Implementing "quality checks" is very important.

Check the quality of data already in place and develop a quality assurance process for any new data coming in.

LINK DATA ACROSS TIME.

Once you begin collecting accurate basic data, you can link the information to understand student performance over time. The data, once linked, should reveal patterns and opportunities for growth. This information also must be interpreted carefully to avoid false conclusions. For example, it's possible for students to improve their test scores without actually gaining content knowledge or academic skills; therefore, it's imperative that educators are able to determine whether students are becoming more adept at test taking or actually mastering content.

Recommendation: Longitudinal data must be collected frequently enough to reflect engagement and performance over an extended period of time. Annual or semiannual reports on test scores are inadequate for capturing achievement and growth for students and schools. Also, consider linking professional development to student achievement and growth in order to measure the impact of teacher training.

ENSURE ACCESS TO THE DATA.

To become truly data-driven, users throughout your institution need access to relevant and up-to-date information. Your initiative must include a strategy for delivering timely data for teaching, learning and accountability.

Recommendation: Set a goal to make data available for analytic use within 24 hours of archiving the information. It will take time to achieve this availability goal. Also, discuss data in professional learning communities (PLCs) to drive its use in instructional practices.

PUT FOCUS ON ASSESSMENT AND PEDAGOGY.

Administrators and teachers should be able to easily correlate and cross-reference information, as well as access comprehensive student profiles in a real-time data-rich environment. The data should provide analysis of instructional strands from both formative and summative assessments.

Recommendation: Present historical and trend analysis visually through graphs and matrices (both aggregated and disaggregated). Data visualization should allow for queries that can be answered by mining various data fields. Use PLCs to support conversations about how data can maximize strengths of staff while minimizing weaknesses.

EMPLOY DATA MINING.

Data should elevate conversations among all stakeholders (educators, administrators, students and parents). Teachers and administrators, in particular, must be empowered to perform data mining that is critical to student achievement and growth. Data mining can be a powerful tool for developing strategies to close achievement gaps within student subgroups.

Recommendations: Provide stakeholders with self-service and real-time data mining capabilities. Focus your IT support team on data quality, end-user support and technology infrastructure instead of data management and report generation.

ASKING THE RIGHT QUESTIONS

Data-driven districts put systems in place that reward curiosity, improve analysis skills and rethink learning. Analytics isn't only about getting the right answers — it's about asking the right questions. So, where does your school district fit in on the analytics maturity quotient?

STAGE 1: REPORTING

What happened?

STAGE 2: ANALYSIS

Why did it happen?

STAGE 3: PREDICTION

What will happen?

STAGE 4: OPERATIONALIZE

What is happening?

STAGE 5: ACTIVATE

Take action!

- 🟦 Pre-Defined Queries
- 🟩 Tactical Queries
- 🟦 Ad-Hoc Queries
- 🟥 Automated Decisions
- ⬛ Analytical Modeling

DEVELOPING MEANINGFUL METRICS

Timely qualitative and quantitative data enables effective teaching, observations and evaluations; thus, the data must be put into the hands of those working in schools and classrooms. You can't manage what you do not measure; therefore, we encourage you to create metrics.

FOR TEACHERS

Teachers tend to use analytics to evaluate students across a broad spectrum of data points to identify trends. Additionally, they often use this information to create cohort groups that help identify students who require additional instructional services.

CREATE BASELINE STUDENT PROFILES.

Creating baseline student profiles is a good place to start when developing useful metrics for teachers. Use historical standardized testing data to visualize trends in tested content areas. Include baseline reading and mathematics levels, as well as available behavioral data.

Recommendation: Track student outcomes. Among the most important measures are those that provide coherent data on how students are doing beyond state assessments. Consider capturing student performance, student- and classroom-level analysis, and post-high school status.

FOR ADMINISTRATORS

Administrators need an approach that lets them quickly see the big picture and drill into specific details. Predefined key performance indicators (KPIs) based on market research can give administrators immediate answers to their most pressing questions — those that revolve around student performance, budget activity and projected outcomes.

TRACK INSTRUCTIONAL AND CURRICULAR OPERATIONS.

Instructional and curricular operations have led district leaders to devote more time to providing professional development and related resources. Key data to analyze could include: What professional development is delivered to which teacher or paraprofessional? When? For what length of time? And by whom? What tutoring or afterschool programs are delivered to which students? What is the selection criteria for admittance into tutoring or afterschool programs? For what length of time? And by whom? Which reading programs and which math programs are used by which schools and how well are they implemented? At what cost? And with what results?

Recommendation: Track students and staff. Schools have systems to track these types of data in place today based on state and federal requirements. Key data variables to analyze could include: Students, schools and classrooms they attend, and the teachers and staff in those classrooms (aides, tutors and other staff working with the students); authorized staff positions, the location of the positions, the purpose and reporting relationships of the positions, whether they are filled and by whom, and whether they are full or part-time; district assets and materials, where they are located, and the transfer of assets between locations.

ANALYTICS IN ACTION

A little over three years ago, leaders at the Katy Independent School District in Texas began sketching out their vision for creating a data-driven culture. Today, principals at the district's 61 schools use data dashboards — populated by information from business, student information and learning management systems — to make better decisions and gain a deeper understanding of campus performance. The district also is poised to roll out teacher dashboards that will provide assessment data and other information to support a shift toward personalized learning in Katy classrooms.

"Katy ISD understands that each student is a unique individual who requires differentiated instruction to meet the learning standards," says Darlene Rankin, director of instructional technology for the district. "Building this real-time, interactive dashboard connects all the data points of a student to provide a broader, deeper look into the student's progression and deficiencies."

Here's a look at how Katy planned and implemented its analytics vision:

THE PLAN:
Starting in September 2013, Katy began building three- and five-year roadmaps for using data analytics to improve student learning, become more transparent and make better financial decisions. Although the vision included using data analytics in the classroom, rolling out analytics dashboards to more than 4,500 teachers and nearly 75,000 students was too big for a first step. Instead, the district opted to begin with principals — a relatively small user group that could have a large impact on student performance. "Strategically, we decided to start with leadership at the campus level," says Jamey Hynds, director of business intelligence for the district. "They are hands-on with teaching and learning, as well as budgeting and resource allocation."

THE STAKEHOLDERS:
With backing from the superintendent and district CIO, Katy's technology and instructional technology departments began laying the groundwork for the analytics effort. Next, representatives from the district's assessment and teaching and learning divisions became involved. Since principals would be the first user group, the planning team also began working with a group of six principals, two each from elementary, middle school and high school campuses. That group ultimately was expanded into a larger user committee to develop the data dashboards.

THE TECHNOLOGY:
The foundation for Katy's analytics effort is an enterprise data warehouse, which serves as a hub for information gathered from multiple district applications, including the student information system, learning management system, assessment system and financial system. The district also created a single portal — dubbed the Performance Management Portal — where anyone in the district can securely log in and view data dashboards appropriate for their job. Dashboards were created using data visualization software. "We've built about 170 dashboards so far to provide views into the data," says Hynds. All of the data is updated at least daily, some of it every few minutes.

THE DATA:
Improving data quality and implementing governance were two key issues for Katy. Hynds says much of the preparation for the district's analytics effort involved analyzing data to ensure that quality information is being fed into the warehouse. Although it was a heavy lift, Hynds says the result was transformative. "The data you wind up with is so much better. It improves the whole district." To ensure privacy and security, the district works directly with its Department of Administration, Governance and Legal Affairs on each major data initiative involving student information.

THE EVOLUTION:
Katy's principal dashboards are now in their second generation, and the district recently released a new set of dashboards for financial staff. Next, Katy will launch teacher dashboards that are expected to reshape learning in its classrooms. The teacher dashboards will include test scores, assignments and other data pulled from the district's learning management system, as well as information from other applications. Insights gained from the dashboards will help teachers tailor learning to the needs of individual students and address performance issues proactively, says Rankin. "If we can take all the data points from formative assessments to state assessments and use that information to direct students' learning, that's going to be a big game-changer."

"We've built about 170 dashboards so far to provide views into the data."

Jamey Hynds, Director of Business Intelligence, Katy Independent School District

EVALUATING TOOLS

Before you can evaluate analytics tools, you'll need to establish the scope of your analytics program. Key factors include the number of people who are expected to utilize the initiative, as well as the types of data that will be accessed. Anticipated budgets for the initial project, sustaining the program and growing the program over time also are fundamental issues to consider. To simplify the selection process, you may wish to classify product features and functions into categories, such as must-have, nice-to-have and will-not-use.

Recommendation: Although a product may have features that meet your criteria, make sure you understand potential extra costs or other considerations involved in actually obtaining those functions. For example, will an analytics tool require custom coding to provide the capabilities you want? Will you need to purchase an add-on from a third party? Does your project require enterprise or basic versions of the software? These conditions all may mean additional time and expense.

As the evaluation criteria can be subjective, it is important to provide clear definitions of what the comparison will be based upon:

✓ Ease of analytical use

Develop ease-of-use criteria for each type of user defined in the roles and responsibilities section of your project charter.

✓ Speed of access

Query performance will vary based on the complexity of queries and amount of data involved. Dashboards with multiple visualizations may need to get results from many queries. A best practice is to create several pre-built query scenarios and compare how each product performs on these specific examples. A poor practice is to just have evaluators arbitrarily rate the speed.

✓ Scalability

Establish a testing environment to determine scalability in terms of both the number of concurrent users and data metrics such as volumes, variety and veracity. Plan for the Internet of Things (IoT) when evaluating scalability, as it will be a near-term requirement.

✓ Choosing a platform

You'll have a number of options here, including on premises versus cloud and open source versus commercial software. It is also worth noting that edge-based analytics — which bring analytics to the data, rather than the other way around — are starting to replace the centralized data center model. This approach can supplement or augment analytics capabilities

in situations where insight needs to be acted upon quickly. As data sets grow larger and IoT-enabled devices grow smarter, edge-based analytics will become an important strategy for those looking to implement the most efficient analytics architectures.

✓ Training

Establish separate criteria for training users and system administrators. Training may include in-person and online classes (live or pre-recorded). The train-the-trainer approach is the most efficient in ensuring adoption.

✓ Documentation

There also should be separate criteria for user online help versus technical documentation, which will help mitigate unpleasant results and dissatisfaction.

6 LESSONS LEARNED

✓ Educating end users

At first, users will tend to want reports that are similar to those generated by their old system. You'll have to teach them how to use additional reports, dashboards and visualization tools. You'll also have to explain how to choose the most appropriate output based on the questions users want to answer.

✓ Satisfying multiple teams

When multiple teams use the same report, there are usually disagreements about what data needs to be visualized and how to visualize it. Use industry standards to choose your visualization method. Choosing which data to visualize requires consensus among the project leads. Leverage your data champions.

✓ Dealing with unpleasant results

Initial metrics generated by your project may represent less than satisfactory scores. Users' first reaction is usually, "This is wrong. How was it calculated?" Address these concerns promptly, especially if the metrics define the performance on an individual or group. Mitigate this perception by explaining the differences between the old and new reports, including formulas that are used during the user acceptance testing, and by providing a help link on the metrics with the formula definition.

✓ Maintaining data quality and validity

Static inputs are fine for data that doesn't change. But dynamic data needs to be captured automatically from the source. Manual work should be avoided to minimize the potential for introducing human errors into the project.

FINAL THOUGHTS

Being a data-driven school district is not about successfully installing software. It's not even about getting teachers and administrators to use that software to make better decisions. A true analytics program focuses on people. It goes beyond simply giving power-users the information they are asking for; it helps and encourages all levels of the school and district to think about what data and decisions are needed to make fact-based decisions, and how to take things to the next level.

You're probably already collecting much of the data you need. However, it will take some work to pull that information together and extract real intelligence from it. Think big, start small and keep at it. Begin with a single data source and scale your efforts as you gain experience. Create an inclusive analytics vision that meets the unique needs of your community, and involve a broad range of stakeholders in the plan. You won't get there overnight, but you'll steadily build a data-driven culture.

We hope the information presented here not only equips your district to meet the emerging mandates of ESSA and NETP, but also empowers you to use analytics as a tool for innovation and improved student outcomes.

This piece was developed by the Center for Digital Education with information and input from TIG.

TIG

Technology Integration Group®

TIG offers a robust education solutions portfolio that includes analytics. Our Business Analytics and Big Data Practice has multi-threaded capabilities that leverage TIG's Integration roots along with Business Intelligence, Data Warehousing, and Big Data expertise and couples it with advanced statistical techniques. TIG's team of data scientists assist educators in gaining predictive, actionable insight leading to better decisions impacting student learning and achievement.

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