

HOW DATA VISUALIZATION TAKES SCHOOLS TO INCREDIBLE NEW PLACES



3
Is “Data-Driven” the
Stupidest Term in
Education?

5
The Four Reasons K-12
Data Initiatives Fail

6
Introduction to
Data Visualization

7
Why Data Visualization
Works

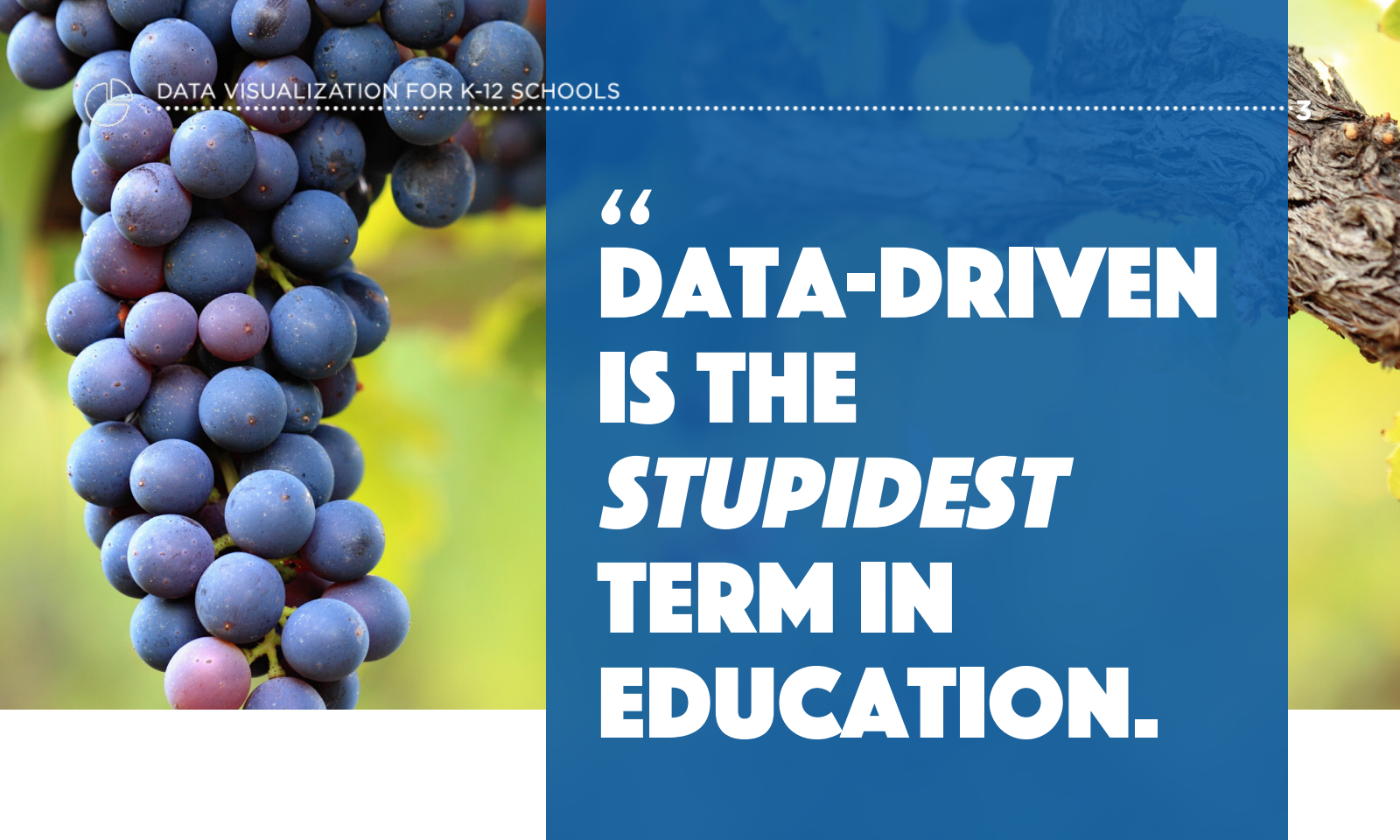
11
How to Start Visualizing
Data at Your School

14
Data Readiness Rubric
for School Software

We scale the
mountain
every day
in our
school.

What data
visualization
does is let us
take in the
view.





“**DATA-DRIVEN IS THE STUPIDEST TERM IN EDUCATION.**”

This quote from George Couros (principal and author of “The Innovator’s Mindset”) gives voice to thousands of frustrated educators across the country.

For the past decade, we’ve endured breathless hype around the “game-changer” that is data in schools. Unfortunately, many school districts have failed to capture sustained, meaningful benefits from their data initiatives.

A Windfall or a Waste?

Districts have taken a variety of approaches to capturing the highly-touted benefits of data-driven education.

Some have invested tens of thousands of dollars into enterprise data-warehousing solutions. Others have relied on their state DOE’s free or subsidized (but often severely limited) systems.

If these options aren’t available, schools often relegate a person/team to the “data dungeon” to spend long hours battling spreadsheets, pivot tables, and unique student identifiers.

For many, their efforts haven’t stuck. Now, it’s not unusual to find our best educators pushing back against what is perceived as yet another distraction from building authentic relationships with their students.

Is data a losing proposition? Or are we slipping into Aesop’s story of “The Fox and the Grapes?”

One day, a fox noticed a beautiful bunch of juicy-looking grapes hanging from a vine. He drew back and leaped, again and again, and could not capture his prize.

Tired, he gave up and walked away with an air of dignity and unconcern, remarking, “I thought those grapes were ripe but I see now they are quite sour.”

Are the grapes actually sour, or are they frustratingly out of reach?

Before we send “data-driven decision-making” to buzzword heaven, let’s explore whether it could be a victim of bad theory, bad technology, or if it’s simply impractical for already overburdened educators.



What's the context for Mr. Couros' thought?

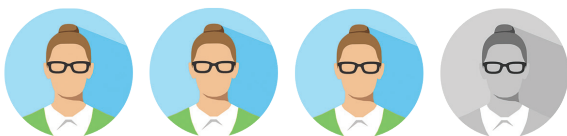
"Data driven is the stupidest term in education. We are child driven. I am not against using 'numbers' to help our students. I am against using 'numbers' to define our students."

Couros' narrative conjures up the distressing tableau of teachers having to cozy up with spreadsheets and taking meaningful time away from students.

This is especially worrisome in an era notorious for surging paperwork duties.

In Ex. 1, we see that nearly half of all teachers spend more time on compliance tasks than those that actually impact outcomes, like collaborating with PLCs.

Despite that, **three in four teachers still believe that data is valuable** to their classroom practice. (Ex.2)



In Ex. 3, we uncover the problem. Despite the value of data, two-thirds of educators are not satisfied with the data or tools they have access to. Can we expect data initiatives to succeed with dissatisfaction this high?



Ex. 1

46%

Teachers surveyed who spent more time on paperwork than they do collaborating with parents or other teachers.

UFT Research Department, "Annual Teacher Survey", 2014.



Ex. 2

78%

Educators who believe that data is valuable for identifying student misconceptions, struggles, and competencies.

Bill & Melinda Gates Foundation, "Teachers Know Best: Making Data Work", 2015.



Ex. 3

33%

Teachers that are not satisfied with the data and tools they have access to.

Bill & Melinda Gates Foundation, "Teachers Know Best: Making Data Work", 2015.



The Four Reasons K-12 Data Initiatives Fail



Because the school year can be so hectic, using data consistently is a luxury many educators don't have. If you ask school leaders what their biggest roadblocks are to using data effectively, you'll likely hear one (if not all!) of the following "Failure Factors."

ARRIVES TOO LATE

In our "instant gratification" era, it is simply unacceptable for data to take weeks (or sometimes months!) to get in the hands of those who need it.

Slow-arriving data ends up documenting, but not driving, our instruction. This is why we must ensure that district and school staff must have immediate access to data they need for teaching, assessing, and accountability.

THE FIX

When districts go to market for software (like Student Information Systems, Learning Management Systems, and Assessment Systems), emphasis must be placed on the system's ability to natively produce instant data analytics and visualizations.

This is the best way to get meaningful data to arrive in time to make instructional pivots.

TRAPPED IN SILOS

Respondents in the "Teachers Know Best" study were emphatic about their desire to have *holistic* student data.

A student's career is much more than assessments, so data views should reflect elements like attendance, behavior, grades, and parent engagement.

This is not easy. In a US DOE study*, researchers determined that "Interoperability among data systems was an issue within the case study districts. None had a fully interoperable set of data systems."

THE FIX

To overcome this obstacle, schools must prioritize instructional and operational platforms that are either natively integrated or that offer API/integration technology.

*U.S. Department of Education. "Implementing Data-Informed Decision Making in Schools", 2009



“It’s just annoying and time-consuming. It’s not difficult to put the data in, but...that’s an hour of time that I need to take these scores and put them over here. I could be using that time to plan a lesson.”

Anonymous Teacher

Gates Foundation, “Making Data Work: Teachers Know Best”, 2015



ONE-DIMENSIONAL

Education artifacts are coming alive all around us. Lesson plans are collaborative and online. Paper worksheets are transforming into interactive experiences inside LMS and formative assessment programs.

Unfortunately, data still too often arrives in flat PDF documents, paper binders, or static online reports. Without the ability to manipulate or explore these views, the impact of this data is stunted.

THE FIX

We must strive for interactivity in our data environments, so that educators can investigate hunches and discover hidden trends. “For example, data from formative assessments may identify broad standards where students struggled, but not the specific concepts or skill sets where misunderstandings occurred.”¹

Like with many of the suggestions in this guide, the key to avoiding this pitfall is in choosing the right set of tools, not in doggedly trying to make existing platforms do what they were not designed to do.

¹ Gates Foundation, “Making Data Work: Teachers Know Best”, 2015

DIFFICULT TO UNDERSTAND

We are educators, not data analysts! Both humans and edtech programs struggle to make sense of a large volume of data coming from disparate sources.

If staff is spending their limited time retrieving and interpreting unintelligible data, it leaves very little time for meaningful action. “The most sophisticated data warehouse in the world will have no effect on instruction if no one has – or takes – the time to look at the data, reflect on them, and draw inferences for instructional planning.”²

THE FIX

In every sector of the technology landscape, there is a frenzied pursuit of a “frictionless” experience. Get people what they need, as quickly as possible, with as little obstruction as possible.

When we think about what a frictionless experience in the K-12 world would look like, we are inclined to abandon the labor-intensive trappings of traditional “data analysis”. Where we land is in the emerging field of “data visualization”, which is discussed in the next section.

² U.S. Department of Education. “Implementing Data-Informed Decision Making in Schools”, 2009



Stop analyzing. Start **visualizing.**

Data analysis in schools has been a resource-intensive, largely manual, endeavor. The technical hurdles of aggregating data in different formats has created the momentum-killing “Failure Factors” in the previous section.

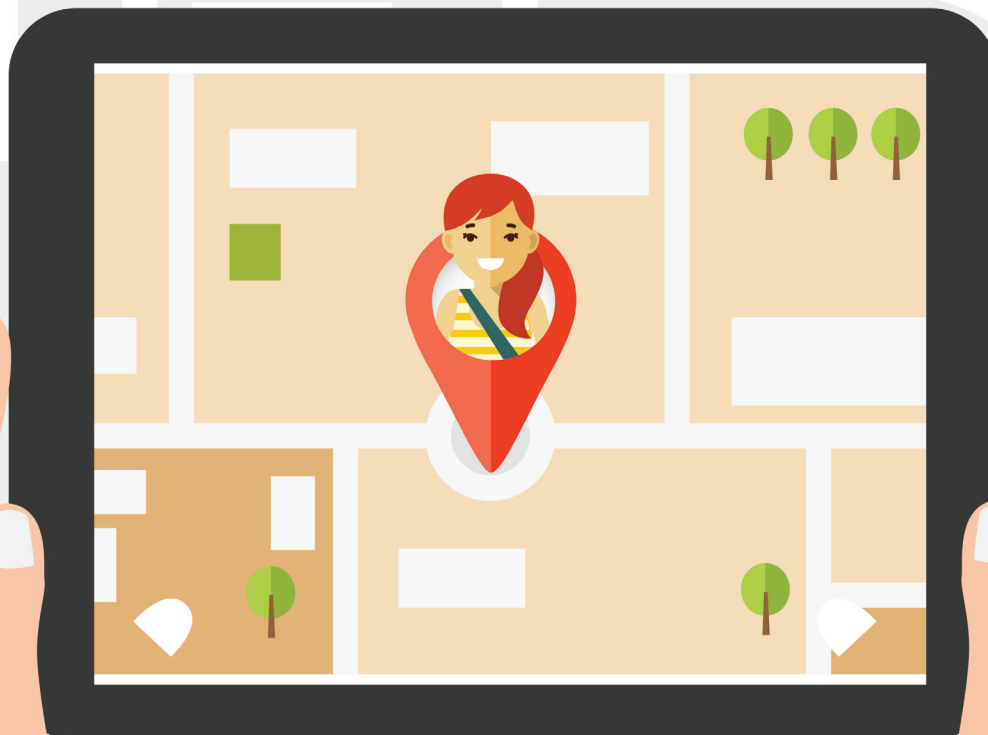
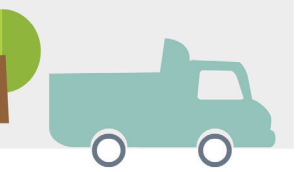
This is why *data visualization* is quickly making traditional data analysis obsolete.

Data visualization is a process by which a district’s data is automatically translated into dynamic, intuitive infographics.

Here is how data visualization improves on our processes of the past:

	<u>TRADITIONAL ANALYSIS</u>	<u>DATA VISUALIZATION</u>
Data entry?	Imported manually	Updated automatically
View of data?	Spreadsheets/PDF reports	Interactive infographics
Source of Insights?	Manual analysis	Automatic alerts

By emphasizing alerts and real-time visual updates, data visualization executed correctly can be like **having GPS for student outcomes.** Instead of trying to capture every twist and turn in a school day, data visualization lets school staff define a desired outcome and let technology guide them toward that result.

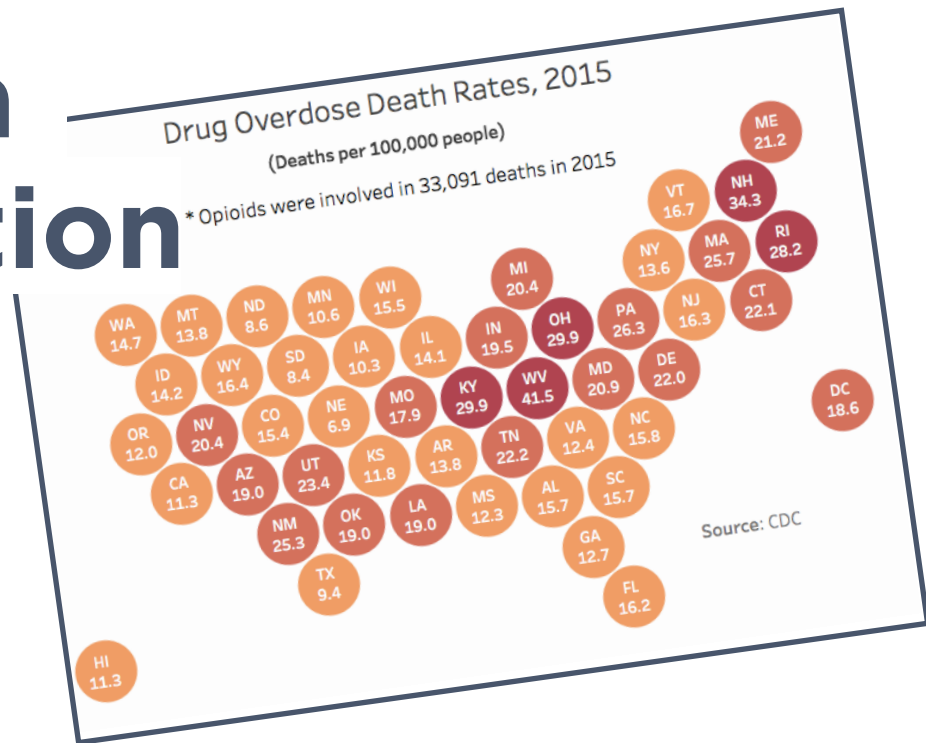




Why Data Visualization Works

Edward Tufte, a Yale statistician and visualization pioneer, encourages us to pursue data views that offer “the greatest number of ideas in the shortest time with the least ink in the smallest space.”

Consider the infographic to the right. Here’s why it works so well:



PEOPLE PREFER VISUAL STORIES

Sight has always been our dominant way to interface with the world. “Hear a piece of information, and three days later you’ll remember 10% of it. Add a picture and you’ll remember 65%*”

**Medina, John. “Brain Rules.” 2008.*

In the infographic above, the story is told with visual cues like:

- Color/Hue
- Spatial Positioning
- Resemblance to Natural World



SIMPLIFIES A LARGE DATA SET

Distilling large amounts of data from across your district is no easy task.

Edtech tools are slowly improving their data handling technology, however, it’s still common for educators to end up with static PDFs or spreadsheets.

With the right tools and techniques, data visualization can eliminate the inefficiencies of spreadsheets and text-based information.



STIMULATES DISCOVERY

A great visualization encourages the viewer to compare data and make spontaneous discoveries.

Ideally, the viewer will have access to several levels of detail. This can be accomplished through either:

Design - Infographics like the one above are cleverly designed to support investigation.

Dynamics: Technology can allow viewers to “drill down” on thought-provoking elements.



WHAT NEW HEIGHTS CAN YOU REACH?

A successful transition to data visualization can lead to spectacular benefits for almost everyone in your education community.

When all of your constituents share a single source of truth, it becomes easy to capture the game-changing benefits of clarity, consensus, and focus.

Here are some effects you'll see.

Freedom from paperwork

With a visualization tool doing the heavy lifting, you'll see a dramatic reduction in manual work.



Faster intervention on downward trends

Don't wait for the end of a marking period to find out what needs attention. Identify improvement opportunities earlier.



High-impact data meetings

Meeting time shouldn't be spent hacking at the weeds. Rather, focus on meaningful insights and action plans.



Better return on investment from budget, PD

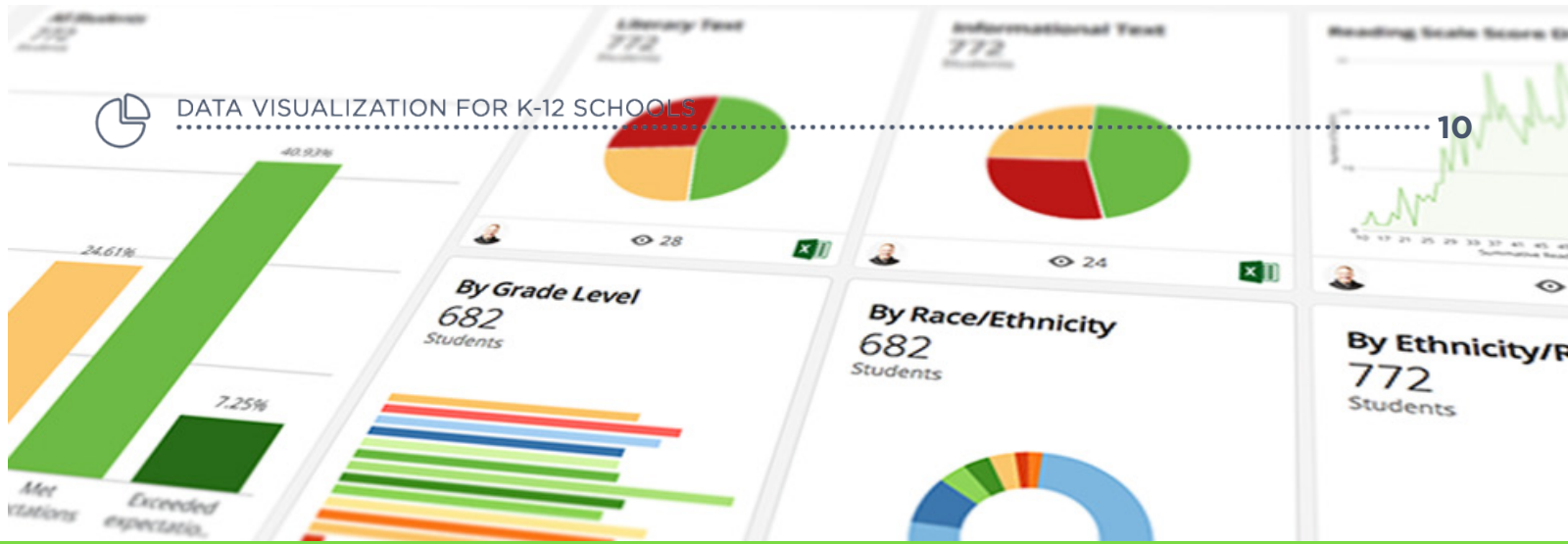
Are your initiatives having the effect that you hoped? Monitor the effects on classrooms, grade levels, students, or entire schools.



Accurate views of student strengths and weaknesses

Explore student achievement from any vantage point; from district to classroom, from standards to grades, or as impacted by factors like absenteeism or behavior.



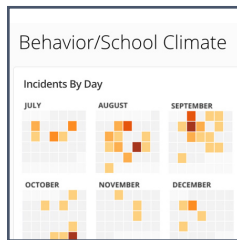
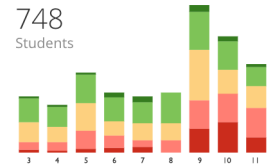


BEYOND THE BAR GRAPH

HOW INFOGRAPHICS DRIVE EDUCATOR INSIGHTS

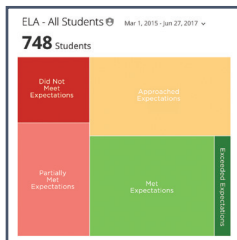
Data visualization is a **revelatory** experience, meant to show us something we haven't seen before. Regular bar graphs can do that, like this view of ELA proficiency by grade (right). However, infographics provide us with insights in new and novel ways. What might your school data look like if visualized this way?

ELA By Grade Level



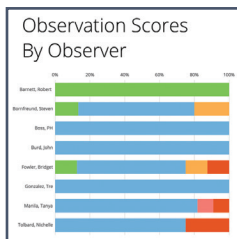
HEAT MAPS

Heat maps are outstanding for viewing data like student behavior, attendance, and grades. In this example, the calendar schema makes it nearly instantaneous to identify days where the school experienced the most issues, delineated by hue/color. Ideally, you'll also have the ability to "drill into" any portion of the infographic to learn more.



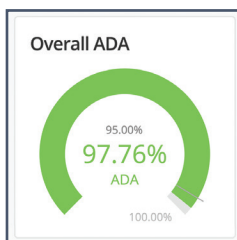
TREE MAPS

Tree maps use size and color to represent classifications in relation. In this treemap, students are classified by performance on ELA benchmark testing. While not precise at this highest level, viewers skimming data views can tell rapidly that most students are still "Approaching Expectations."



STACK CHARTS

This interesting take on bar graphs have tremendous exploratory power. In this example, the school is examining their team of evaluators to ensure interrater reliability. Are there observers that give consistently inflated or deflated ratings (all green or all red)? If so, we've discovered an outstanding coaching/professional development opportunity.



GAUGES

Trying to reach an important benchmark? Stay above an acceptable threshold? Gauges are a wonderful way to check your progress quickly. In this example, the school is aiming to maintain a strong "Average Daily Attendance." The superintendent has set a trigger to alert herself if it drops below 95%, indicated by the grey notchmark.

HOW TO START VISUALIZING DATA AT YOUR SCHOOL DISTRICT

A successful implementation of data visualization rests on a simple premise:

The further staff have to go to retrieve data, the less likely they are to do it.

This is why it is problematic to rely on a state DOE to store, process, and return data. State data is slow to arrive and often concerned primarily with assessment results.

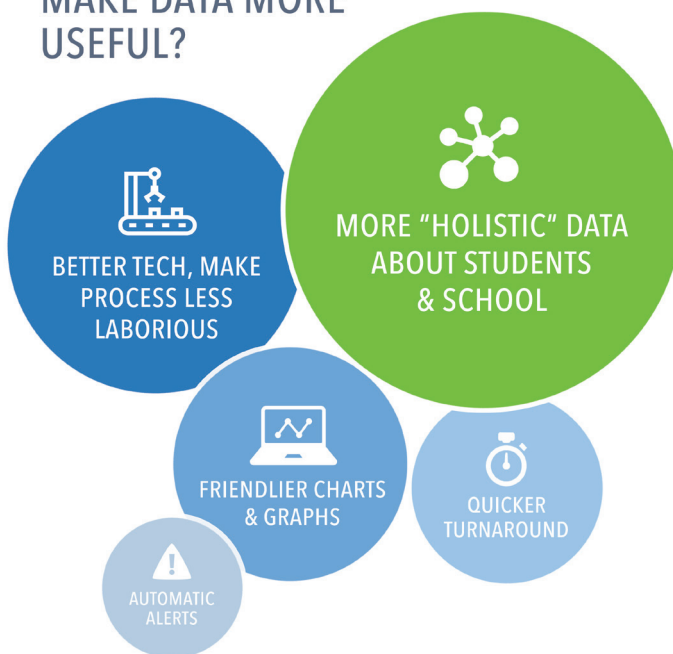
This runs counter to the desires of many data-hungry administrators. In the infographic (right), **school leaders consider “holistic” data to be the single most impactful feature** a data system can have.

The Challenge of Going “Holistic”

Unfortunately, capturing holistic information has proven difficult.

In the 2009 US DOE study **Implementing Data-Informed Decision Making**, researchers point to the lack of data integration as a major stumbling block. “The multiplicity of systems used by LEAs works against the integration of different kinds of information (e.g., discipline and attendance data, program placement information, district benchmark and state test scores) and requires school personnel to go through the ramp-up time to learn to use multiple systems.”

SCHOOL LEADERS: WHAT WOULD MAKE DATA MORE USEFUL?



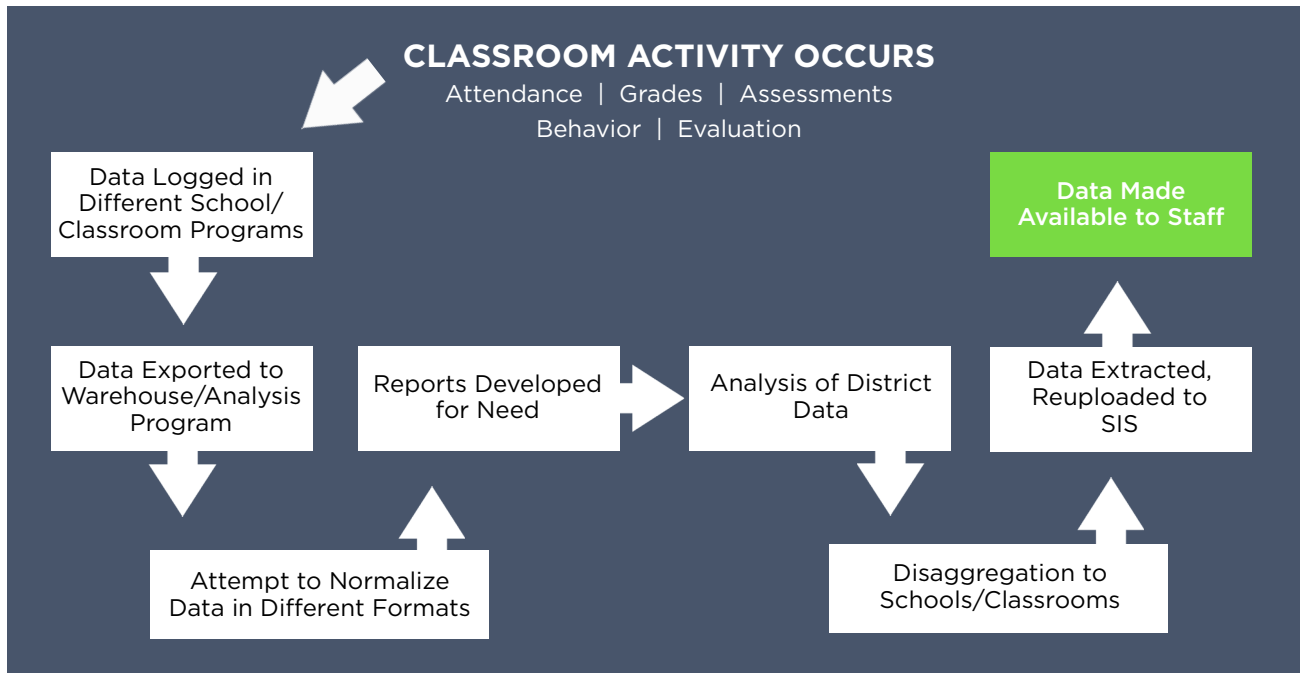
Based on 2017 e-mail survey of 100 school administrators.



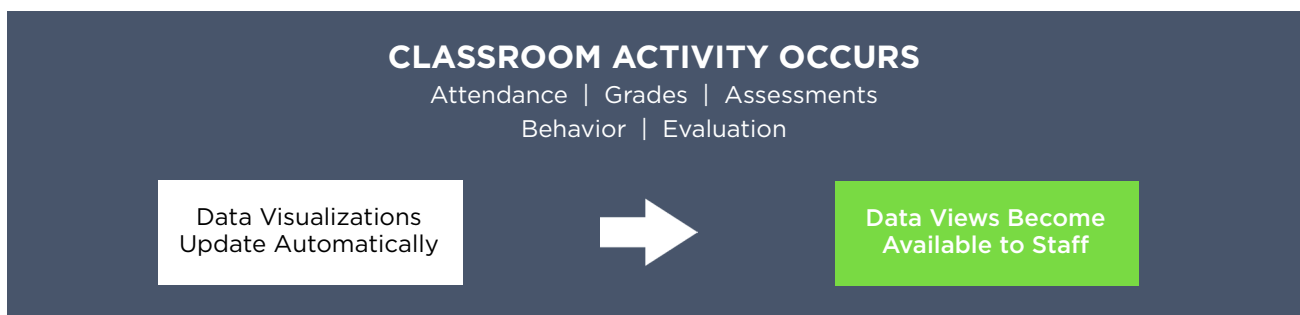
To consolidate holistic data on attendance, grades, assessments, behavior, teacher evaluation, etc., our first instinct has often been to turn to data warehouse software. However, there were big obstacles waiting for us.

Difficulty with Data Warehousing

If it's true that "the closer our data gets to the people that need it, the higher our chances of success," then it becomes clear why data warehouse initiatives often struggle. Despite large investments of money and resources, data warehousing introduces several levels of inefficiency. Consider this workflow:



Is it any surprise how common it is for schools to complain that data takes too long, and that the process is too complex? It's for this reason that the **most effective way to implement data-driven decision making is to prioritize school/classroom management platforms that natively support data visualization.** With a set of data-ready tools, the process looks more like:



We see now how "data-ready platforms" can simplify our process better than data warehouses can. Now what?

Any school district serious about **taking this next step into data visualization has to be prepared for one single, all-important decision.**



“ Despite growing interest in predictive analytics, school districts are struggling to implement the resources they need to be truly effective with data.

We gathered several groups of superintendents and other school officials for a series of informal roundtable discussions on data-related topics during the June ISTE meeting in San Antonio.

They told us the complexity of implementing data warehouse solutions, along with the political difficulty of eliminating data silos, continue to hinder efforts to gain a complete picture of student performance.”

Dr. Kecia Ray
Director, Center for Digital Education, August 2017

THE ONE (AND ONLY) WAY TO **CAPTURE HOLISTIC DATA**

At every moment in your district, data points are popping into existence by the thousands. Teachers are keying in grades, attendance, and discipline infractions. Formative and summative assessments are occurring digitally or on paper.

Until recently, analysis of this data began like an Easter Egg hunt. “Can we run reports out of each system? What student IDs does this system use? Who has access?”

We have become accustomed to chasing the trains as they zoom by. Now, it’s time to critically evaluate the train station itself.

This is why schools MUST begin by auditing their software, starting with the Student Information System.

No one ever wants to think about the intimidating task of switching the district’s SIS. However, as the broker of a large majority of your data, **your SIS should be the first system scrutinized. If you want holistic data, you must strive for a holistic platform.** Here are a few starter questions:

Question 1: Are staff bypassing key functions of your SIS?

When a school finds that key SIS features are inadequate, they often go manual or supplement with other products. Big offenders are behavior/discipline, LMS, assessments, lesson planning, and special education.

If Yes, negative effects like redundancy and siloing get entrenched in the district. Consider upgrading the SIS to prioritize rich, integrated tools.

If No, the SIS meets a minimum standard for comprehensiveness.

Question 2: Is your SIS an ideal data-ready platform?

Use the rubric on the next page to find out!



DATA READINESS RUBRIC FOR SCHOOL SOFTWARE

To make meaningful strides in data usage, it is important to prioritize tools capable of providing relevant, timely data that is approachable to all staff. **How do your software products fare?**

Score each of your mission-critical software products from 1-4 using the scale below. Add other products not listed. Average your scores to get your Data-Readiness GPA, then add bonus multipliers!

- Student Info. System
- Assessment System
- Staff Evaluation
- Special Education
- Grades/LMS
- Behavior/Attendance
- Parent Portal
- Planning/Curriculum

EXTRA CREDIT

ECOSYSTEM BONUS - Data's better when integrated! Add 0.2 for every system that is *natively* integrated to your SIS, or 0.1 for each that is disparate, but integrated through SIF/FTP/API/etc.

Your Data-Readiness GPA:

1 Inadequate

Software serves an operational or instructional purpose, but provides little-to-no ability to aggregate data.

STAFF INTERACTION
Very few staff members use data from this program because it is hard to find or prohibitively difficult to interpret.

2 Suboptimal

Staff are limited to manually extracting data into PDF or spreadsheets and relying on manual processes to glean insights.

STAFF INTERACTION
The staff members who are fluent in the application may access the data a few times a year. They may try to share data with others, but find it to be an unsustainable process.

3 Satisfactory

Software provides timely views of data through the interface. Product offers the ability to run reports in a variety of formats, or also to view a data dashboard that updates in real-time.

STAFF INTERACTION
The majority of staff who use the software access and analyze the data regularly and use it to make instructional/operational decisions. Data format is approachable to most staff members.

4 Future Ready

Product systemically raises data awareness by facilitating insights through both "pulling" and "pushing". All data is updated in real-time.

(PULLING) Staff can quickly view live data dashboards or extract targeted reports. (PUSHING) The system will alert users when certain key data milestones are reached. Staff can schedule reports to be delivered to them regularly.

STAFF INTERACTION
By using innovative techniques like "data visualization", insights are accessible to all staff members regardless of data-savviness. Data views are dynamic and can be "drilled into" to examine activity at any level of granularity.

What should you do with your Data-Readiness GPA?

Check the next page for steps on what to do next!



RAISING YOUR DATA-READINESS GPA

Equipped with tools that are “data-ready”, your school can eliminate resources wasted on manual extraction, aggregation, and distribution of data.

To raise your Data-Readiness GPA:

- Review your completed rubric (previous page.) For systems that score:
 - 1. Inadequate**
Make immediate plans to replace system. Staff are not getting optimal value and system is likely more concerned with compliance than improving outcomes.
 - 2. Suboptimal**
Begin research on alternative products that offer better data views (preferably integrated with existing systems).

Present to stakeholders and gauge interest in upgrading.
 - 3. Satisfactory**
Contact your vendor to find out if data visualization technology is on their development roadmap. If not, urge them to add it.
 - 4. Future Ready**
Congratulations - this product is on the cutting edge of edtech! If this vendor offers other integrated products, consider adding them to gain a more “holistic” view.

DATA VISUALIZATION FEATURES TO ADD TO RFPs

To encourage vendors to support data visualization, it’s important to add this functionality to software RFPs. Here are important things to ask for:

- Integration**
Buying a data visualization tool as a separate product, aka “in a silo” exposes you to the same roadblocks as traditional data warehousing. Prioritize vendors that provide an all-in-one experience.
- Dynamic Interfacing**
Having “interactive data discovery” is the difference between being a paleontologist and being Indiana Jones! Analysis doesn’t have to be painstaking; rather, prioritize products that let you do “data safaris,” with dashboards that support dynamic drilling, on-the-fly rendering to different graph types, and live scaling from district to classroom to student views.
- Speed**
Picking an integrated solution gives one massive benefit: astonishing speed. A SIS that supports data visualization will give you near-immediate feedback on a wide scope of school activity.
- Automatic Alerts**
Are there insights slipping past while you are applied to other tasks? Prioritize systems that offer automatic alerts when key conditions are met.
- Staff Inclusiveness**
Data shouldn’t be the exclusive domain of the analysts and data coaches. Strive for a platform that gives appropriate views to all stakeholders, from teachers to superintendents to school board members.



Need
guidance on
implementing
**data
visualization
technology?**

Contact us to speak with a data visualization expert about technology, implementation, training, and support.

Visit:	oncourseystems.com
Tweet:	oncoursek12
E-mail:	learn@oncourseystems.com
Call:	800-899-7204 x111