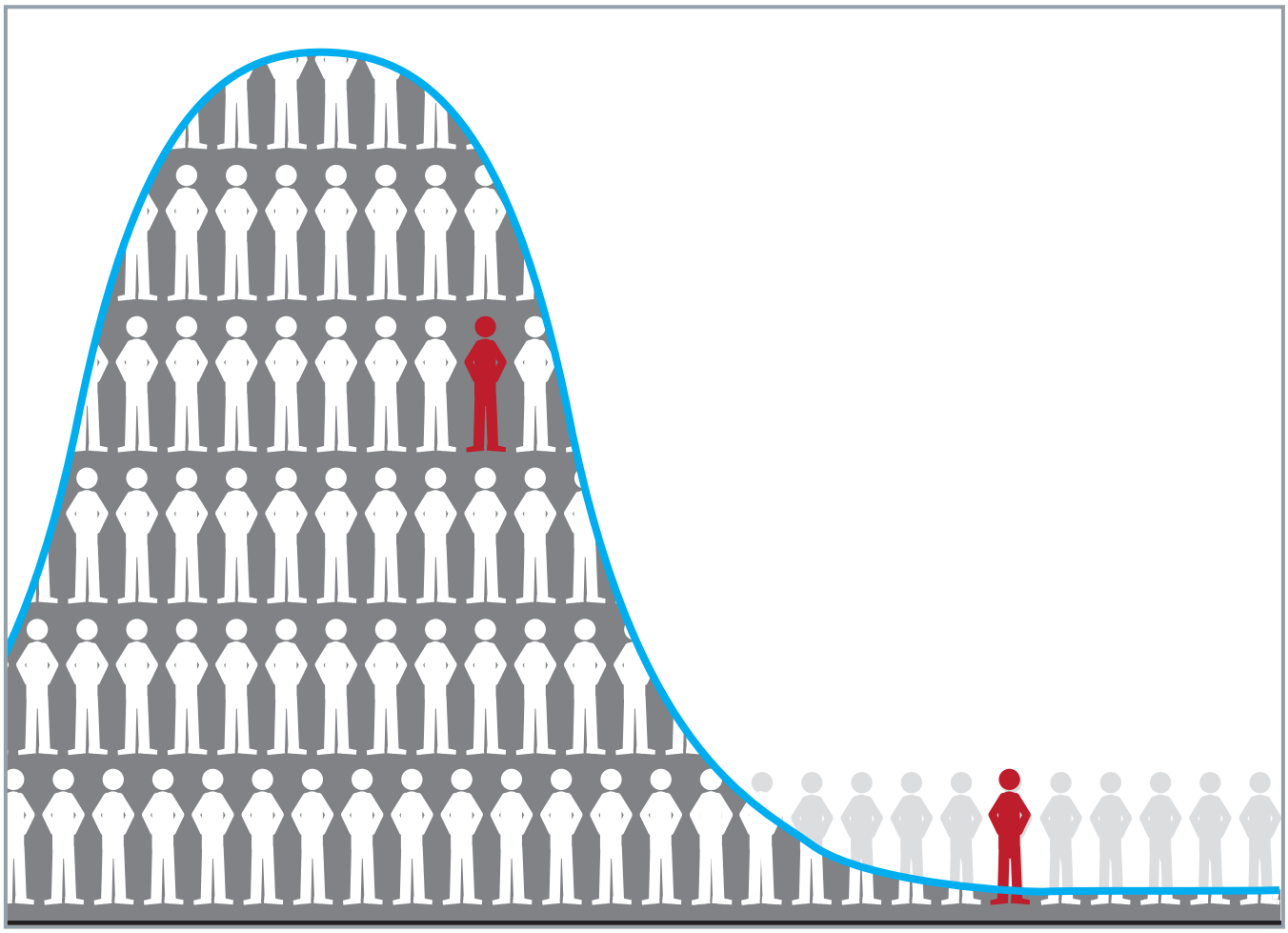
New Visions for Public Schools

# Navigating the Data Ecosystem:

## A Case Study of the Adoption of a School Data Management System in New York City



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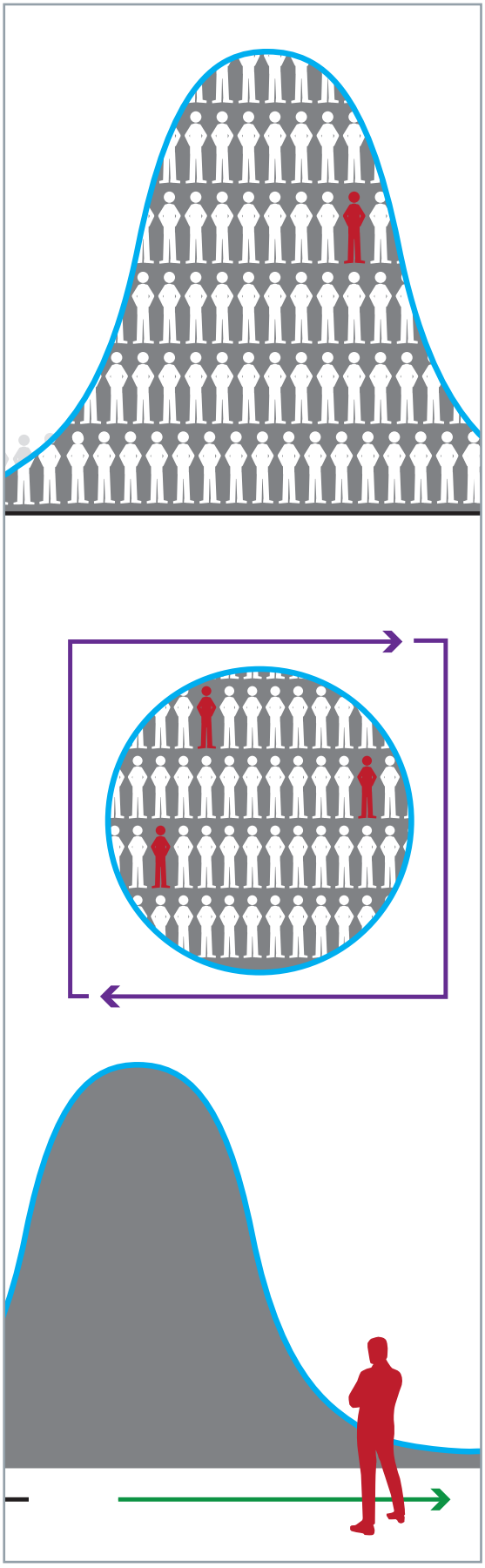


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# Navigating the Data Ecosystem:
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## Introduction

In recent years, schools and school systems have experienced an explosion in the availability of student data, particularly related to student performance. Along with this increased availability has been a growing push for teachers to use data to inform their classroom practices, under the belief that doing so will lead to improved student outcomes. Federal programs such as the American Recovery and Reinvestment Act and Race to the Top have established incentives to encourage schools to develop data-driven instructional practices, and a multitude of state and privately funded initiatives have further pushed schools in this direction. To support schools in this effort, hundreds of millions of dollars[1] have been spent by public and private educational entities to help teachers and schools make sense of and use data through the development of school data management systems (SDMS)[2] and teacher-facing dashboards. These investments have resulted in a proliferation of data systems promising to help teachers make use of data to drive their instructional practice.

New Visions for Public Schools is no exception. In fall 2010, New Visions introduced a commercial SDMS, DataCation,[3] to its network of schools. DataCation comprises multiple portals for teachers, administrators, students and parents providing ready access to student, classroom and school-level data.[4] From September 2009 to May 2013, DataCation's reach has extended from 23 schools in New York City to 2,982 schools in California, New Mexico, New York, Virginia and Wisconsin. During this time, DataCation has been awarded statewide dashboard contracts in New Mexico, New York and Virginia.[5]

The rationale underpinning our decision to roll out an SDMS is tied to multiple, interdependent factors such as (1) the increasing emphasis on accountability and the consequences for schools that fail to meet regulatory requirements, (2) a deeper understanding of student warning signs that present well before students reach high school, (3) the ever-changing high school graduation and college admission requirements

1 Stein, M. (2003).

2 In this report, we introduce the acronym SDMS to refer to School Data Management Systems. While sensitive to adding yet another acronym to the field of education, we believe the current options (e.g., "Dashboards," EWS – "Early Warning Systems," SIS – "Student Information Systems") tend to refer to specific use and a narrow range of functionality. SDMS refers to a more robust range of data collection, data reporting and technological functionality that platforms such as DataCation provide educators and that extend beyond the more traditional systems.

3 DataCation is a division of CaseNEX, LLC, and an independent, third-party vendor. This report is the product of New Visions for Public Schools and does not necessarily reflect the views of DataCation or its parent company, CaseNEX, LLC.

4 See Appendix for a description of the DataCation platform.

5 Personal communication with Peter Bencivenga, president of DataCation.

in New York City and (4) the fragmented data structures that impede efficient, consistent and accurate data management and analysis.[6]

Simply deciding as an organization to adopt a new technology, however, does not ensure that the organization's stakeholders will embrace it — even when it is provided free of charge.[7] The field of education is littered with attempts at incorporating new technologies that were never ultimately taken up by schools, and a large body of literature examining why schools struggle with assimilating new technologies into their routine practices speaks to the extent of this problem.[8] Two recent studies from Cincinnati[9] and New York City[10] have shown that, despite investments in expensive dashboard technology, teachers in these cities have not embraced the use of data in their classrooms. These reports found that barriers to the effective use of student data by teachers include a lack of sufficient training and support, a lack of time to engage with data and, perhaps most important, a lack of appropriate data that are aligned to the needs of classroom teachers.

Rogers[11] describes the requirements for successful adoption of an innovation, in this case an SDMS. He explains that the innovation must be better than that which it replaces, it must be compatible with the culture and values of the target users and it must be simple. While initial adoption of a technology is necessary and important, it is not the end goal, in and of itself. Rather, the end goal is long-term sustainability of reform that yields successful student outcomes. Coburn[12] argues that significant and lasting change rests upon reform strategies that can go deep, are sustainable, can spread and are "owned" by end users. Taken together, Rogers's and Coburn's theories help explain how the adoption of an innovation at the individual level is inherently linked to meaningful and sustained reforms at the aggregate level.

The rollout of DataCation to our network of 75 schools represents what we have learned, often in hindsight, and presents a unique case study of how theory plays out when applied. These are the goals of this report:

1. Describe Rogers's theory of adoption and diffusion and Coburn's theory of sustainable reform as applied to the rollout of an SDMS.
2. Discuss how the ecosystem in which an initiative operates is the essential context for understanding and applying both theories.
3. Define reasonable expectations around educator use of an SDMS.
4. Share lessons learned.

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6 Fairchild et al. 2011.

7 In much the same way that many states and districts provide dashboards to schools free of charge (such as the New York City Department of Education's ARIS system), New Visions assumes the cost of providing DataCation to our network. As a third-party vendor, however, DataCation is available to schools and districts nationwide for a fee.

8 Ertmer 1999; Butler & Sellbom 2002; Earle 2002; Ertmer 2005; Hew & Brush 2007.

9 Tyler & McNamara 2011.

10 Gold et al. 2012.

11 Rogers 2003.

12 Coburn 2003.

## Adoption Begins with the Individual

Adoption of an innovation at the individual level is at the heart of any reform initiative. Rogers[13] describes three important characteristics of innovation that motivate individual adoption patterns:

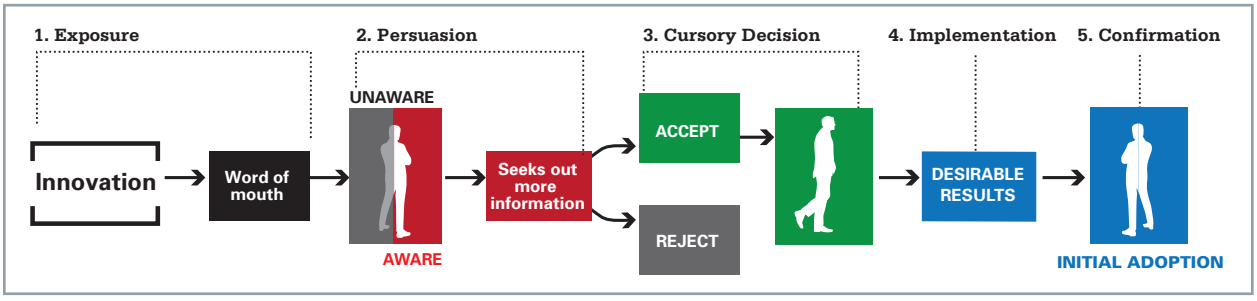
1. **Relative advantage** — the extent to which the innovation is seen as better than the technology that preceded it. The greater the perceived relative advantage, the more rapid its rate of adoption (e.g., an educator who has trouble accessing student data through slow and fragmented data systems might find an integrated, real-time student information platform advantageous compared to older systems).

2. **Compatibility** — the extent to which the innovation aligns with an individual's values, experiences and needs. An innovation that is incompatible with the values and norms of an individual will not be adopted as rapidly as an innovation that is compatible (e.g., an educator who works in a school with a strong data culture might adopt an SDMS more rapidly than an educator in a school without an emphasis on data-driven decision-making).

3. **Complexity** — the extent to which an innovation is perceived as difficult to use and understand. An innovation that is simple to understand will be adopted more rapidly than one that requires the adopter to develop new skills and understandings (e.g., an educator who is familiar with her school's data systems — even if inferior to a new SDMS — might find learning the new system overly taxing and cumbersome; or, as an SDMS evolves, the platform may become more complex and difficult to master).

While these three components are the prerequisites of long-term adoption patterns, each individual goes through a five-step preadoption decision-making process that culminates in initial adoption or nonadoption. (See Figure 1.) In the first stage of the decision-making process, an individual acquires knowledge wherein he or she is made aware of or exposed to the innovation. Following the acquisition of knowledge, an individual in the second stage, persuasion, may seek out more information about the innovation. In stage three, the individual makes a decision to try or not.

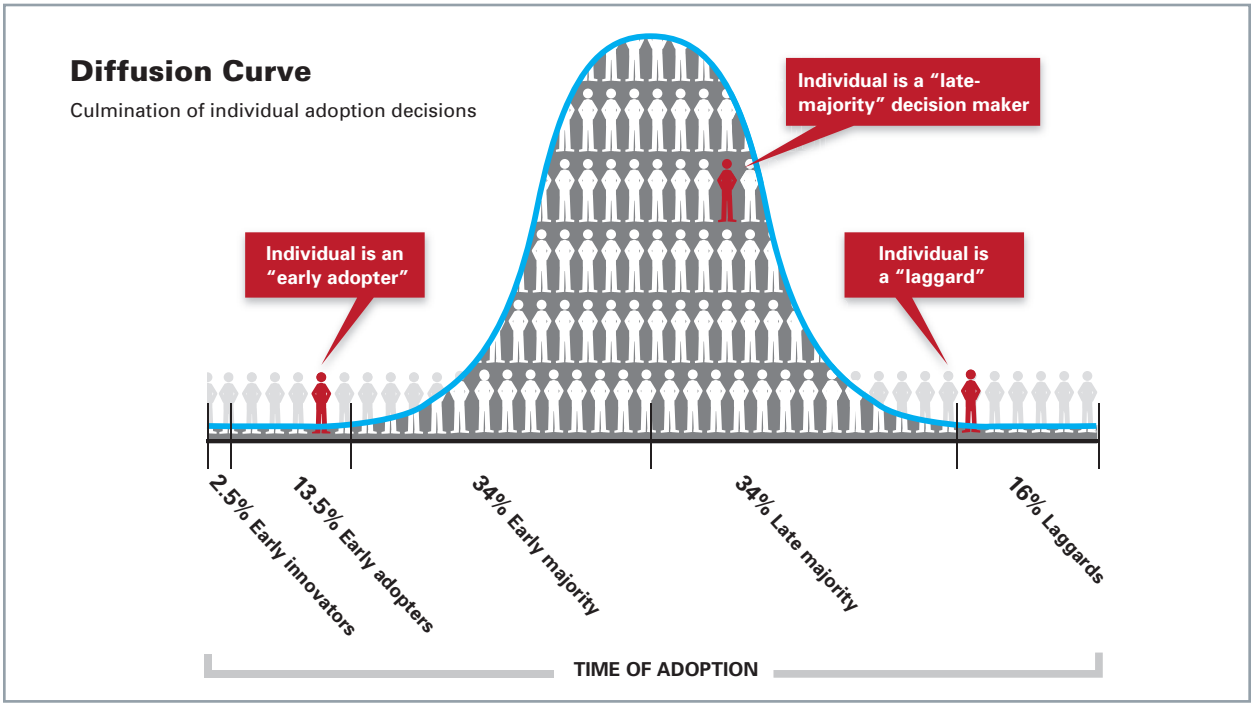
***Figure 1. Initial Decision to Adopt Process***




13 Rogers 2003.

In stage four, the individual implements the innovation, determining its usefulness and ease of use.[14] Based on early experimentation with the innovation, the individual then decides whether or not to continue use, which is initial adoption. Individuals have various predispositions and characteristics that make them more or less likely to adopt an innovation. For instance, "early adopters" move through the decision-making process faster than "laggards." (See Figure 2.)

***Figure 2. Adopter Types Relative to the Diffusion Curve***

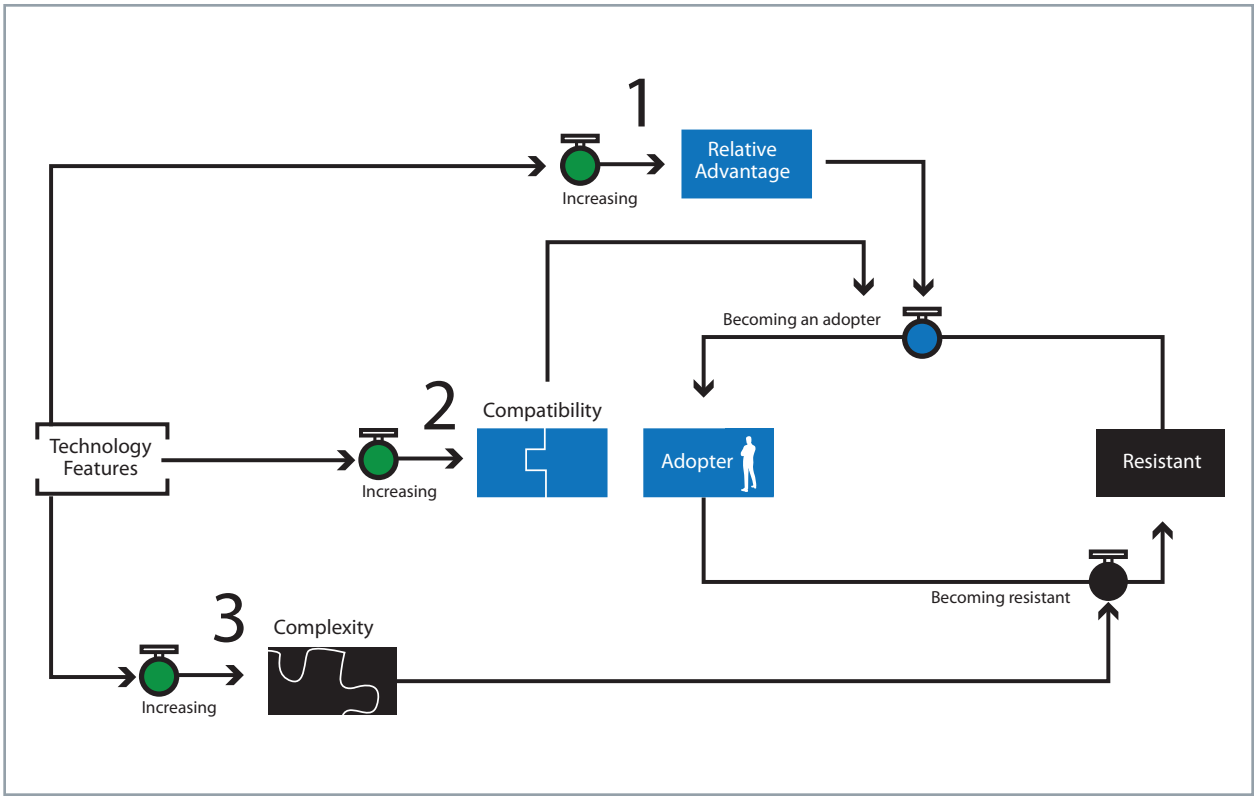



In addition to the speed with which users decide to adopt, Rogers notes that the time it takes for an innovation to diffuse through a population (Figure 2) is also contingent upon the homogeneity of the social system and the strength of communication channels. To the extent that a social system comprises more individuals predisposed to adopt an innovation, the faster the innovation will diffuse. For example, teachers who are comfortable and adventurous with technology may be more likely to adopt an SDMS than teachers with less technological familiarity and savvy. In schools where communication is sporadic and teachers confine themselves to their classrooms with little interaction, the adoption of an SDMS may be slower than in schools with strong cultures of collaboration, inquiry and robust communication structures.

Relative advantage, compatibility and complexity are not independent of one another, however, and user behavior is not static. Figure 3 illustrates the interdependencies and the highly dynamic nature of adoption.

14 See Davis's (1989) Technology Acceptance Model (TAM) re perceived ease of use and perceived usefulness.

***Figure 3. Dynamic Complexity and Instability Related to Sustained Adoption***




The user's perceptions of relative advantage, compatibility and complexity are influenced by his or her interaction with the technology. Features that are perceived as better (relative advantage) and compatible with the user's values promote adoption, while those that seem complex may lead to resistance. In systems thinking, the structure of the system is mapped using the language and visual images of "stocks" and "flows." Stocks represent accumulations of information, material or psychological states that build up or diminish over time through the actions of flows. Flows are the "filling or draining" process that change the amount of stock over time.[15] In Figure 3, advantage (1) and compatibility (2) flow into the pipe "becoming an adopter," which fills up the stock "adopter." The countervailing effect of complexity (3) drains "adopter" and creates the conditions for "becoming resistant." The systems map highlights both the dynamic, interconnected nature of the adoption process and its inherent instability. At any moment in time an adopter can become resistant.

15 Meadows 2008.

## Authentic Adoption Invokes Scale

Adoption by an individual is but the first obstacle to the ultimate goal, successful student outcomes; and, often, the distance between an educator's decision to adopt an innovation and the improvement of student performance is wide. Coburn helps us bridge this gap. Coburn's theory of scale implicitly draws upon theories of adoption as the prerequisites of successful reform. In what is an oversimplification of Coburn's point, an authentic reform is one in which the hearts, minds and practices of individual members of a school (and the reformers who support them) are deeply changed for the long haul.

Coburn defines the core dimensions of scale as depth, sustainability, spread and ownership. Depth characterizes the "deep and consequential" change within the classroom. Here she differentiates what she means by "depth" and "surface." Changes on the surface are modifications to structures and procedures, while changes with depth affect teachers' beliefs, teacher-student interactions and pedagogical principles. The depth of change and the mechanisms that support it must be maintained over long time periods. Sustainability, then, speaks to the distal nature of reform and gives scale "meaning over time." Coburn notes how externalities such as the "dissipation of resources" and changing priorities often undermine the sustainability of reform. Spread is the diffusion of the reform both across schools and within schools. Ownership represents the changing hands of reform from the external to the internal, from the reformers through the implementers to the educators.

Coburn's message is clear: successful, on-the-ground implementation, dependent on authentic ownership of the end users, breeds successful scalability. Rogers helps us to understand the correlates of authentic ownership at the individual level: relative advantage, compatibility and simplicity. And it is the context or ecosystem that serves to stimulate individual adoption and drive reform.

## The Ecosystem of Reform

An ecosystem is a system of interacting and interconnected reforms and stakeholders. It establishes historical context and makes Coburn's point about executing reforms effectively and thoroughly that much more urgent. Earlier reforms often establish the preconditions for a later reform. If reform initiatives have not successfully met Coburn's rigorous criteria, this will have implications for later reforms. Thus, determining the success of an SDMS in supporting data-driven decision-making within schools requires that we consider the larger reform ecosystem. Without it, interpretation of success or failure of the current reform is overly narrow. In other words, recognizing where the present initiative lives relative to other reform initiatives matters.

The rollout of DataCation did not live in isolation of other reforms — in fact, its adoption was highly dependent upon previous reform initiatives. The implication of this suggests that when reform proceeds poorly, not only does it affect that which is being reformed, but also may have a cascading effect on the adjacent reforms within the same ecosystem. Though countless stakeholders are involved in the design and implementation of school reforms, we focus on two types that converge within the ecosystem.

Reformers and on-the-ground implementers coexist within the same ecosystem, but each views it from a different vantage, and each has a different role. The job of a reformer is to move the field from one place to another — to a desired state. They hold the long view. The on-the-ground implementers are charged with meeting educators where they are with innovative tools (like DataCation) that bridge the gap between current state and desired state. They see the immediate.

## The Long View: Present and Future Reforms Build upon Adjacent Reforms

The ecosystem[16] in which we rolled out DataCation was shaped by a series of local and national reforms set in motion years earlier (see Figure 4). In June 2002, the New York State legislature granted Mayor Michael R. Bloomberg his request for control over the New York City school system. The following month, Bloomberg selected Joel Klein — chairman and chief executive of a global media company and a former federal prosecutor — to serve as schools chancellor. Together, Bloomberg and Klein launched a radical reform of the New York City education landscape, including a major reorganization of the district's management and operating structure, the establishment of a leadership academy to train new school principals, the establishment of uniform curriculum citywide, the development of a community engagement process and the reorganization of large, comprehensive high schools into smaller schools.[17] Through these reforms, collectively known as the Children First initiative, Bloomberg and Klein largely dismantled the labyrinthine education bureaucracy they had inherited and replaced it with a system that pushed considerably more decision-making authority down to the schools. In exchange for greater autonomy in decision-making around things like budgeting, hiring, scheduling and programming, principals would be held accountable for the successes and failures of their schools.[18]

16 Coburn & Turner 2011 present a compelling framework related to data use and educational improvement. Organizing principles in their framework include the organizational / political context, process of data use, interventions to promote data use (tools, data initiatives, policy) and potential outcomes (organizational change, changes in practice, student learning). Our understanding of the unfolding use of data in schools is linked to Rogers' theory of adoption and diffusion, to Coburn's theory of scale, and to chronological events (the ecosystem of reform).

17 DeRoche 2006.

18 The Children First initiative represents multiple reforms implemented and updated over a number of years. For a comprehensive account of this initiative, please see DeRoche 2006.

At the same time these local reforms were moving forward, the federal government was enacting a new set of accountability requirements via No Child Left Behind (NCLB). This push for accountability at federal and local levels necessitated that schools have real-time access to data. That is, a growing culture of accountability established the need for an SDMS at the school level.

While these top-down accountability requirements were pushing schools to produce student performance data, another New York City-based reform movement began taking root that empowered teachers to use this data to improve student learning. Known as teacher-led inquiry, this reform movement grew out of a program, launched in 2004, between New Visions and Baruch College of the City University of New York, called the Scaffolded Apprenticeship Model (SAM). Through the program, schools formed inquiry teams comprised of teachers, school leaders and other school staff who were trained to use student data to identify specific barriers to student learning and propose solutions to bring about schoolwide improvements. An evaluation of SAM[19] found those schools that implemented the program most rigorously experienced cultural shifts toward using data to evaluate student learning and instructional decision-making.

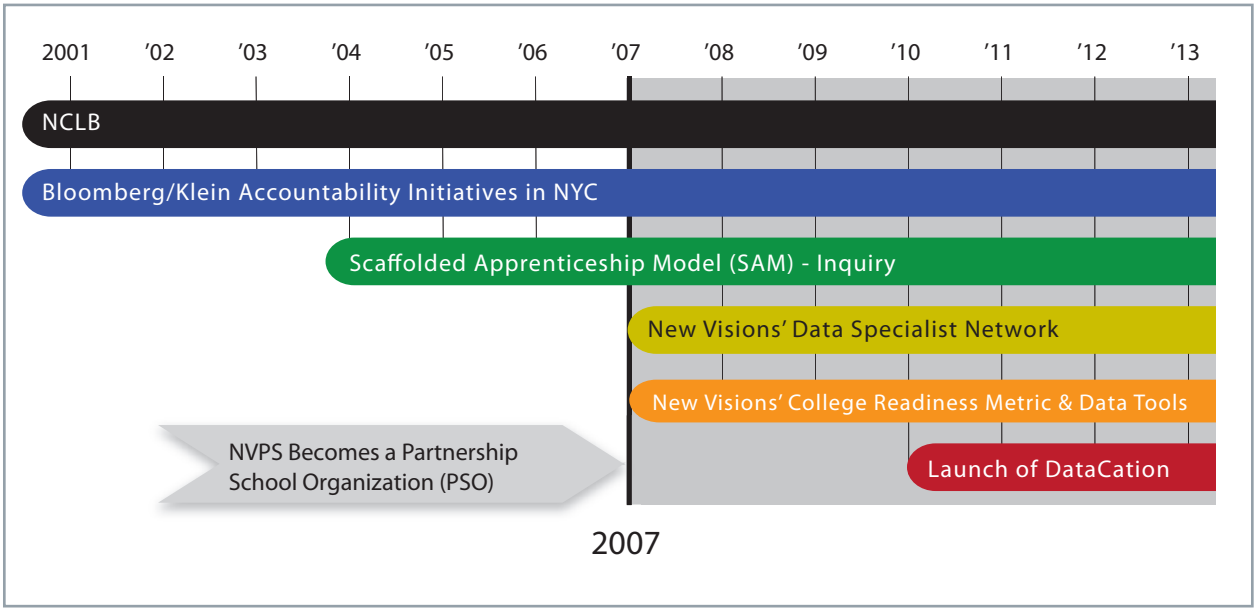
Grade teams and other collaborative structures had existed in ad hoc fashion in many schools throughout New York City for years. The formalization of inquiry teams forced greater focus on and routinization of these team structures and practices, and many of the schools in the program began to support multiple teams. By fall 2007, the New York City Department of Education mandated that each school in the city have at least one inquiry team.[20]

In response to this environment of accountability, which permeated the ecosystem, New Visions rolled out the "College Readiness Metric" to schools in 2007 and developed a suite of data tools that helped educators, students and parents track student progress to graduation and college/career readiness. The goal was to translate and simplify the city's accountability reform elements for different stakeholders — making the early accountability reforms more concrete and actionable. At the same time, New Visions established a Data Specialist Network (DSN) of schools to better support those individuals charged with overseeing key data responsibilities within schools (the data specialists). The DSN was conceived as a learning community comprised of monthly professional development sessions that cover relevant school-based data topics such as NCLB accountability, New York City Progress Reports (the main accountability tool the city uses to grade school performance), Regents exam analysis and general data verification.

19 Talbert et al. 2012

20 For more information on the SAM program and inquiry teams in New York City schools, see Talbert et al. 2012 and Panero Scharff and Talbert 2013.

***Figure 4. The Ecosystem of School Reform in New York City Since 2001***




When viewed from this vantage, it is clear that the DataCation initiative is a reform embedded within a larger, more complex, data-driven ecosystem. Adjacent reforms likely amplified the adoption of DataCation. That is, the places where DataCation was more likely to diffuse and work best were in those schools where inquiry was successfully implemented and where the implications of the accountability system were well understood and anticipated.

## The Immediate View: Meeting People Where They Are

Bloomberg and Klein were driven to reform education at the district level. This reform had to come first, set the expectations and establish the incentives. To be compliant with district accountability and regulatory requirements, principals were motivated to reform their schools. But teachers on the frontlines just had to get the work done. In other words, teacher adoption of data platforms, while not independent of the larger ecosystem, takes place at a different level within the system — at the microlevel. The obstacles to adopting dashboards[21] may be reflecting the inherent disconnect between the technology (which is generally oriented at the macro- and mesolevels) and the targeted user — the teacher (who is generally oriented to the microlevel). The intervention, therefore, had to foster macrolevel reform but also enable teachers on a microlevel to get their work done faster and better (Rogers's "relative advantage" argument). Even if teachers are predisposed to, and supportive of, the lofty goals of education reform, a system that simply feeds "up" rather than meets the teachers where they are is not a relative advantage to them.

21 See Tyler & McNamara 2011 and Gold et al. 2012.

In their book *The New Edge in Knowledge*, Carla O'Dell and Cindy Hubert describe work that is either "above the flow" or "within the flow." They write: "Enabling employees to do their work more easily — by collaborating and capturing and sharing knowledge without an additional burden or interruption on their part" is working within the flow. However, when you ask "employees to stop their work process to move to another mode to reflect, capture, or share," you are asking those employees to work above the flow. If you want employees to work outside of their day-to-day flow, "then you will need to explain why and ensure there is an intrinsic or extrinsic payoff."[22]

School data management systems like the ones examined by Gold et al. and Tyler and McNamara are not well equipped for aiding teachers "within the flow" of their day-to-day work. Systems that do not provide teachers with data that is both timely and relevant to their immediate roles as educators stand little chance of being embraced. That is, they offer no relative advantage. These systems may offer valuable insights for school-level planning, but they will fall short as tools for supporting data-driven classroom practices. Indeed, in their analysis of ARIS[23] usage, Gold et al. found that while overall usage of the system was not widespread, the heaviest users tended to be administrators or other staff with school-level responsibilities.

But even the most thoughtfully designed SDMS, one that supports work within the flow, is unlikely to generate consistent usage across all user all of the time. What, then, are reasonable expectations of data use?

## What's Reasonable? Expectations Regarding Educator Use of Data

When we consider reasonable usage expectations of an SDMS, four variables influence usage independent of the characteristics of the technology[24]:

1. Role of the educator (working at the "school-level" or the "classroom-level")
2. Relevance (timeliness of data at the moment it is needed)
3. Availability (some types of data are only made available at certain moments in time)
4. School Culture (some schools have structures like inquiry teams that support data usage within the school)

22 O'Dell & Hubert 2011 (p.11).
23 ARIS: New York City Department of Education's Achievement Reporting and Innovation System
24 See Coburn & Turner, 2011 for a framework for examining "data use in the context of data use interventions" (p. 174).

## Role of the Educator

Over the last three years of on-the-ground implementation of the DataCation platform, we have observed that educators spend more time looking at certain types of data depending on the roles they play in their schools. Roles and responsibilities often determine the granularity of data required to do a job: for some educators, macrodata (i.e., at the school level) is more directly related to key responsibilities than mesodata (i.e., at the department or grade level) or microdata (i.e., student level).

Roles and responsibilities necessitate that an SDMS functions similar to a microscope in a science lab. By easily allowing users to move from lower to higher levels of magnification and vice-versa, an SDMS aggregates and disaggregates data in ways that are relevant to the diverse needs of specific user types within a school. For example, Table 1 highlights the types of data that educators commonly use within the flow of their day-to-day work, the level of data aggregation that supports them in their job and the frequency with which they need these data. For example, item analysis data (data on a specific question on an exam) is likely to be much more relevant to a teacher than to a guidance counselor. An assistant principal who might be concerned with trends across departments would focus his or her analysis at a higher level of aggregation (meso) than would a teacher, whose main concern is the performance of his or her students (micro).

***Table 1. Data Attributes (Level, Type, Need) by Educator Role***

| | DATA LEVEL | DATA TYPE | DATA NEED |
|---|---|---|---|
| **Teacher** | Micro | Course Grades<br>Attendance | Daily |
| | | Item Analysis | Each Assessment |
| **Guidance Counselor** | Micro/Meso | Course Grades<br>Attendance | Weekly/Each Marking Period |
| | | Credit Accumulation<br>State Exam Data<br>Progress to Graduation | Each Term and State Exam Cycle |
| **Principal, Assistant Principal & Data Specialist** | Meso/Macro | Course Grades<br>Attendance | Each Marking Period |
| | | Item Analysis | Each Assessment |
| | | Credit Accumulation<br>State Exam Data<br>Progress to Graduation | Each Term and State Exam Cycle |

Teachers' data needs are taking place at the microlevel (See Table 1). They are concerned with data that helps them understand better who their students are, what they know, what they can do and how their learning changes over time. Specifically, they are looking at attendance within their classes, managing assignments and course grades and analyzing assessments. They are looking at their individual students every day. From a diagnostic perspective, teachers need item analysis tools that help them identify and track the specific content and skills that students are struggling to master over time. This information helps teachers identify areas for reteaching and curriculum modifications. From a management perspective, teachers need a way of easily collecting course grades related to specific student work, identifying missing or incomplete assignments and keeping attendance. These data highlight for teachers those students who may be at risk of falling behind and who would benefit from additional supports to move them back on track.

Guidance counselors are not only concerned with data that help them advise individual students, but also they need to understand how *cohorts* of students are progressing toward high school graduation and college readiness. They need to move between the individual student data and aggregate cohort data. Guidance counselors regularly monitor student course grades and attendance across all subject areas, track credit accumulation and state exam passage and support their students in meeting key graduation requirement and college readiness benchmarks over the course of their school careers. Guidance counselors' data needs span from the individual student profiles to patterns across the entire school. In this way, they need technology that supports a micro-, meso- and macroview.

Principals, assistant principals, and data specialists share the same concern for their students as teachers and guidance counselors, but they primarily view data at meso- and macrolevels. More so than their colleagues, school leaders rely upon school-level data for compliance reporting, interpreting external accountability benchmarks and monitoring the progress of the core operational and instructional systems within their schools. This includes drilling down from school-level data to the mesolevel where they can analyze trends within and across cohorts, subpopulations, departments and classrooms and form hypotheses about the findings that emerge. School leaders also need data at the student level to support conversations with teachers, students and parents.

By mapping the different data needs of educators (Table 1) to the types of data and data reports available in DataCation (Table 2), we can begin to set reasonable expectations for DataCation usage (Table 3).

***Table 2. DataCation Portals and Available Data Types***

| PORTAL | AVAILABLE DATA TYPES | DESCRIPTION |
|---|---|---|
| **Data-Driven Classroom (DDC)** | Item Analysis | Provides educators with the ability to collect and analyze item-level assessment data from any placement or simulation exam, periodic assessment, year-end exit exam or high-stakes accountability exam. |
| **Skedula** | Attendance<br>Course Grades | Provides educators with a full online gradebook, attendance and behavioral tracking systems and a single location to access student information related to demographics, special services and historical academic performance. |
| **Data Tools** | Credit Accumulation<br>State Exam Data<br>Progress to Graduation | Provides a collection of reports that support educators in understanding performance patterns, setting goals and monitoring progress in credit accumulation, Regents passage and progress to graduation. |
| **NCLB/Grad** | Credit Accumulation<br>State Exam Data<br>Progress to Graduation | Provides a collection of reports that support educators in measuring progress against the accountability provisions of No Child Left Behind (NCLB) and the academic policies set forth by the New York City Department of Education. |

***Table 3. Expectations of Educator Usage by Portal***

|  | DATA-DRIVEN CLASSROOM | SKEDULA | DATA TOOLS | NCLB/GRAD |
|---|---|---|---|---|
| **Minimal Usage** | Guidance Counselors | School Leaders | Teachers | Teachers |
| **Moderate Usage** | School Leaders | Guidance Counselors | School Leaders | Guidance Counselors |
| **High Usage** | Teachers | Teachers | Guidance Counselors | School Leaders |

Because the role of the teacher requires frequent, even daily access to course grades and attendance, we expect that Skedula usage will be higher for teachers than, say, for principals. Conversely, we expect lower levels of usage for teachers than for principals of the Data Tools and NCLB/Graduation portals, which are used primarily to monitor cohort performance and predict accountability outcomes. Usage expectations of specific users offer a broad frame of reference when evaluating the implementation of DataCation in New Visions' network of schools. As the ecosystem changes and as educators become more adept with using data, the benchmarks may also shift.

## Relevance and Availability of Data at Certain Moments in Time

Expectations of data usage should also be shaped by the relevance of data at different times throughout the school year and the availability of data. Relevance and availability are influenced by a variety of factors, including school programming structures and assessment systems, state exam cycles, and local, state and national policy. For example, New York State currently offers three opportunities for students to sit for a Regents exam each year — January, June and August. A policy change that reduces or increases the number of Regents exam administrations would alter usage patterns.

At the school level, programming structures define when course credit is awarded and the number of marking periods in which official report card grades are posted. The availability of assessment data depends on the frequency with which teachers and teacher teams administer baseline, periodic and summative assessment exams. These decisions influence how often credit accumulation, marking period and assessment data are available for school leaders and teachers to analyze. A school with an annualized programming structure, where credits are awarded for all courses once at the end of each year, will have a different workflow for data analysis and decision-making than would a school on a trimester system, where credits are awarded three times throughout the school year. In either case, usage is predicated on when data are needed and available for educators to do their jobs.

## School Culture

Culture drives practice. A school can promote a culture of inquiry only if there are systems in place to support regular analysis of student data. But in multiple studies, teachers have cited the lack of time for data analysis as a major barrier to using data systems, and in some cases they reported feeling they must choose between data-driven work and their teaching.[25] Effective data use within the context of inquiry requires that time be made available to teacher teams specifically for this activity.[26] In their review of this research for the What Works Clearinghouse, Hamilton et al. conclude that schools should make this structured collaborative time a priority, ideally happening a few times each week, depending on individual school needs. When we consider adjacent reforms such as inquiry, we would expect schools with a strong culture of inquiry to have different DataCation usage across all platform portals than schools with weaker inquiry structures.

The value of usage data is descriptive and diagnostic. It is both a

25 Feldman and Tung 2001; Ingram, Louis and Schroeder 2004; Means, Padilla and Gallagher 2010.

26 Herman and Gribbons 2001; Huffman and Kalnin 2003; Ingram, Louis and Schroeder 2004; Supovitz and Klein 2003; Wayman and Stringfield 2006.

prerequisite to successful reform and a point of context to understanding levels of success. Poor adoption of an SDMS — while it may signal a lack of advantage, compatibility or simplicity — may, in fact, signal a failure of previous reforms or an incompatible ecosystem. Looking solely at usage provides a limited picture, as it is only a single contributor to taking a reform to scale, as described by Coburn.

## Lessons Learned

Since its introduction in September 2009, DataCation has grown in usage from a small network of New York City schools to nearly 3,000 schools in five states. The expansion of DataCation is tied in important ways to Rogers's theory of individual adoption patterns and Coburn's theory of scale. In New York City, DataCation was rolled out after the introduction of previous reforms (NCLB, New York City Accountability, Inquiry, College Readiness Metrics and Data Specialist Network). DataCation further amplified the adoption process by meeting users within the flow of their work.

But the desire to meet users within the flow of their work results in platform redesign, and, redesign often invites complexity. Removing the obstacles presented by complexity can be addressed by implementing other, high-leverage strategies like training and responsiveness. Trainings, school visits, webinars and ongoing technical support alleviate the anxieties that innovations introduce and help users feel at ease with the system. In the case of DataCation, the attention to training and professional development decreased its perceived complexity.

As DataCation becomes more embedded within schools, analyzing the usage data from the platform to identify signs of adoption, diffusion or disengagement serves practical purposes. For example, monitoring the extent to which educators move beyond core portals may provide insights into school culture and may inform ongoing training needs. Likewise, when usage drops off or does not expand beyond a core group of educators, we can (1) explore additional training opportunities, (2) recommend platform modifications to meet educators' needs or (3) examine how the evolving data culture within a school has irrevocably changed users' perceptions of the platform's compatibility and relative advantage.

What this means for the individual is that the decision to adopt is never a final one. What this means for the system is that change will surge and falter and then surge again, as users adopt then abandon technologies as new innovations enter the scene. With an ecosystem that is perpetually in flux, it is incumbent for innovators to understand the processes by which their creations are adopted and diffused among their stakeholders. Otherwise, they risk their well-intentioned innovations fading into obsolescence.

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# Appendix

## DataCation Overview

**DataCation** is a comprehensive, web-based SDMS that comprises an array of tools enabling educators, parents and students to track student progress toward graduation and college readiness. The portals included in the New Visions package support educators in breaking down complex student data to inform and support instruction, professional development and curriculum planning and to track school progress against high-stake accountability targets and district goals.[1]

**Skedula** is the home portal of the DataCation system, providing teachers with full online gradebook, attendance and behavioral tracking and a single location to access critical student information related to demographics, special services and historical academic performance.

**Pupil Path** provides parents and students with online access to upcoming course assignments, course progress reports, official report card grades, daily and period attendance, anecdotal logs, student transcripts, graduation eligibility and more.

**Data Tools** provide a collection of reports that support school leaders and teachers working through a cycle of continuous improvement to understand performance patterns, set goals and monitor progress.

**NCLB/Graduation** provides a collection of reports that support school leaders in effectively using data to meet the accountability provisions of No Child Left Behind (NCLB) and the academic policies set forth by the New York City Department of Education.

**Data Driven Classroom (DDC)** provides school leaders and teachers with the ability to easily collect and analyze item-level assessment data from any placement or simulation exam, periodic assessment, year-end exit exam or high-stakes accountability exam.

## Skedula

Skedula is the landing portal of the DataCation platform. From this site users access an online gradebook, attendance and behavioral tracking tools, and key student data such as demographics, special services and historical academic performance. From Skedula, users can access all portals through a single sign-on, making it easy to toggle between portals when needed. Administrators can set user rights, sync their data and access DOE source data files directly.

### Student Portfolios

The student portfolio page provides teachers and administrators with a comprehensive picture of each student, including all data extracted from ATS and STARS alongside real-time gradebook, attendance and behavioral data generated within Skedula. Educators can access student schedules, biographical information, transcripts, exam history, attendance, in-progress course averages, official report card grades and more. Schools also have the option of attaching digital Individual Education Plans (IEPs) for easy teacher online access.

### Gradebook

The Skedula gradebook supports teachers in capturing and tracking student progress on course assignments and core learning objectives over time. Teachers or administrators can define course categories and valid grades and set and lock grading policies across courses. Teachers can attach files and learning standards to each assignment and instantly share messages with parents, students and other staff on a student's progress. Administrators can quickly identify students at risk of failing so that they might proactively target student interventions

1 For more information on DataCation products, visit www.datacation.com.

and teacher professional development. Course progress reports with in-progress course averages can be generated by teacher, period, course or grade-level.

### Attendance and Behavioral Tracking

Skedula allows school staff to track attendance and behavioral trends for individual students or custom student groups created within Skedula. Teachers can take period attendance each class, which can be compared to official daily attendance records to identify cuts and attendance reversals. School administrators can view attendance reports by student, course and teacher. The anecdotal logs feature can be used to monitor dean's records, phone log, parent communication and more.

### Data Analysis and Downloads

Skedula's data analysis tool provides full-scale analysis for custom queries on attendance, gradebook, credits, Regents exam passage, report cards, teacher progress and more. Skedula data are also available as Excel or CSV download, providing school administrators with immediate access to and ownership of their student data.

## Pupil Path

Pupil Path provides parents and students with online access to upcoming course assignments, course progress reports, official report card grades, daily and period attendance, anecdotal logs, student transcripts and graduation eligibility.

### Event Feed

The Pupil Path event feed provides parents with a daily snapshot of all the information entered into Skedula about their child in a single day. This includes course and daily attendance information, anecdotal logs, new assignments, course grades, and messages sent to parents or students by school faculty and staff.

### Course Calendar

The Pupil Path course calendar allows students and parents to view assignments in one or multiple courses in a single calendar view. Past assignments show assignment grades, while future assignments outline assignment details and allow parents or students to directly message the teacher. Assignments are color coded by course, making it easy to navigate through information.

### Grade Breakdown

The Pupil Path grade breakdown screen provides students and parents with color-coded bar graphs displaying in-progress course averages as well as progress broken down in each course category (homework, classwork, tests, etc.). Attendance pie charts are shown for each course with the ability compare attendance averages across classes.

### Internal Messaging

The Skedula – Pupil Path internal messaging system connects students, parents and school staff through a single, web-based platform. Teachers and administrators can customize parent and student messages with student grades, attendance and anecdotal information. Parents and students can message school staff directly through the system and instantly receive school announcements, new calendar listings and information on upcoming events.

### Student Trackers

Individualized student trackers provide an overview of a student's course performance, Regents exam passage, credit accumulation and attendance. The trackers help to translate graduation requirements into a visual display that makes progression through middle and high school easy to understand.

## Data Tools

The Data Tools portal provides a collection of reports that support school leaders and teachers working through a cycle of continuous improvement to understand performance patterns, set goals and monitor progress.

### New Visions for Public Schools On-Track Metric

The Data Tools provide an overview of school progress based on the New Visions for Public Schools "on-track metric." There are two on-track metrics within the Data Tools portal: the high school readiness metric, which sets student performance benchmarks

in attendance, course progress and exam performance in grades 3 through 8; and the college readiness metric, which sets benchmarks in credit accumulation and Regents exam passage for each semester in grades 9 through 12. All reports in the Data Tools portal are color-coded in accordance with the on-track metric.

### All School Reports

School overview reports show percentages of students who are on-track, almost on-track, and not on-track to meet middle and high school graduation requirements and college readiness goals. Reports can be filtered by cohort, grade level or custom student groups that can be created in Skedula. School leaders and teachers can drill down to access the raw student data underpinning each report. The student sorter function provides a spreadsheet that includes all the data within the portal, such as student demographics, credits by subject area, attendance percentages, Regents exam scores and K-8 exam history.

### High School Reports

Credit accumulation reports support high school leaders and teachers in identifying students off track in specific subject areas. Regents exam reports break down Regents requirements for different diploma types and support schools in identifying students who are missing required Regents exams. Credit accumulation and Regents passage data are integrated to identify performance patterns and trends in progress toward graduation within a school. These reports can be used to inform conversations around what strategies and systems need to be in place to address the needs of students who share similar performance patterns.

### Student Trackers

The Data Tools portal produces three individualized student trackers: the high school readiness tracker for middle school students, the college readiness tracker for high school students, and the transfer tracker for students enrolled in transfer schools.[2] The trackers translate graduation requirements into a visual display that makes progression through middle and high school easy to understand. Schools can print trackers in bulk by course, period, teacher or grade level and use them to engage students and parents in understanding what it takes to be college ready and create individualized plans to support students in meeting their goals. Trackers can also be found on the Skedula Student Portfolio page and in Pupil Path.

## NCLB/Graduation

The NCLB/Graduation portal provides a collection of reports that support school leaders in effectively using data to meet the accountability provisions of No Child Left Behind (NCLB) and the academic policies set forth by the New York City Department of Education. School leaders can use this portal to proactively address student academic performance and to predict students who are academically at-risk.

### NLCB Reports

Using the NCLB Reports, school leaders can identify their accountable subgroups within each of the three areas of accountability assessed by No Child Left Behind: performance, graduation and participation. School leaders can view performance index calculations for each accountable subgroup and forecast subgroup AYP eligibility with respect to AMO, EAMO and Safe Harbor[3] targets in multiple

2 Transfer schools are ungraded secondary schools for students who are overage and undercredited and who have attempted 9th grade at least once.

3 AYP – Adequate Yearly Progress: Adequate Yearly Progress is the measure by which schools, districts and states are held accountable for student performance under the current version of the ESEA.

AMO – Annual Measurable Objective: NYSED has assigned an Annual Measurable Objective for the Performance Index of each subgroup. The AMO for years 2011-12 through 2016-17 increases gradually, so that by 2017 each subgroup statewide will have bridged half of the gap between its 2010-11 performance and full proficiency (PI of 200).

EAMO – Effective Annual Measurable Objective: To account for statistical margins of uncertainty (in particular, in smaller accountability groups), NYSED has established an Effective Annual Measurable Objective (EAMO). A school is considered to have reached its performance objective if it meets the EAMO, even if it falls short of the AMO.

Safe Harbor: A provision that is in place if a school failed to meet its Performance Index requirement for a subgroup. Safe Harbor is met if a subgroup's Performance Index has bridged 10 percent or more of the gap between the previous year's PI and full proficiency (PI 200).

cohort years. School leaders can identify the number of students who need to improve in order for the school to meet each accountability benchmark and identify which specific students to target for intervention.

### Graduation Reports

Using the Graduation Reports, school leaders can view students' credits, test scores and programs for promotion and graduation eligibility and systematically gather data to enhance college preparation. School leaders can filter, sort, organize and analyze performance data by school, grade, ethnicity, gender and more. Upon grade completion, administrators can analyze report card data by department, course and teacher; determine course and teacher passing percentages, and identify achievement trends across time. Course grades and credit accumulation data can be used by school programmers to prevent errors in student course programming. Regents exam data can be used to determine which students have not passed required exams and which students are ready to be challenged with more rigorous course work. School leaders can also compare student course performance to Regents exam performance and drill down to specific students to target for intervention.

## Data Driven Classroom (DDC)

The DDC portal provides school leaders and teachers with the ability to easily collect and analyze item-level assessment data from any placement or simulation exam, periodic assessment, year-end exit exam or high-stakes accountability exam. These data support educators in pinpointing student strengths and weaknesses, modifying instruction, and targeting remediation in time to make a difference. School leaders can also use this data to identify the professional development needs of their teaching staff.

### Answer Sheet Creation

Through DDC, teachers and school leaders can create scannable answer sheets for any assessment they wish to administer, including placement and simulation exams, periodic assessments and year-end exit exams. Answer sheets support a combination of multiple choice, true/false and short and long constructed response items and are printed preslugged with student information, which automates data collection, minimizes data entry and saves teachers valuable instructional time. Scanned answer sheets are saved and archived as .pdf images, enabling educators to access a portfolio of student work that builds up over time.

### Standards Alignment

Each assessment question created within DDC can be aligned to state standards or to the Common Core Learning Standards in mathematics or literacy. Alignment to standards significantly enhances the item analysis reporting available in DDC by providing teachers and school-level inquiry teams with the ability to pinpoint which learning objectives presented the greatest challenges to students.

### Item Analysis Reporting

After an assessment is administered and scanned, school leaders and teachers can quickly identify achievement trends across students. Reports can be easily filtered and sorted by teacher, course, gender, ethnicity and more to evaluate testing skill levels and diagnose strengths and weaknesses of individual students and student groups. Using the custom reporting feature, educators can compare and contrast results across exams and systematically gather longitudinal data about student performance on assessments. Reports can also be generated that compare assessment results against classroom grades, Regents exam scores and other statewide exams.

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New Visions for Public Schools, founded in 1989, is dedicated to improving the quality of education children receive in New York City's public schools. Working with the public and private sectors, New Visions develops programs, solutions and strategies to energize teaching and learning and to raise the level of student achievement. As a partnership support organization, New Visions is accountable for improving student achievement across 75 New York City public schools, serving more than 46,000 students. As a charter school network, New Visions has opened six charter high schools, with plans for a network of 18 schools over the next few years. As a laboratory, New Visions researches and develops novel solutions for schools, teachers and students. Our goal is to graduate all students ready for college, career and life.

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