

The Ed-Fi™ Data Standard: Transforming K-12 Education





Introducing Ed-Fi™

Ed-Fi is a new data standard that transforms education in the United States. Ed-Fi provides essential insights for educators to make informed, data-driven decisions to improve the academic outcomes of every student, while addressing the need for data consolidation and the reality of disparate school data systems with poor interoperability.

The first Ed-Fi implementations will go live in 2011. Twelve states have licensed or are in discussions to license the Ed-Fi standard, representing 34 percent of the nation's K-12 public school students and 39 percent of its teachers. The Michael & Susan Dell Foundation is actively building a coalition of schools, implementation partners, tool vendors, assessment providers and other parties to promote the adoption of Ed-Fi.

This paper discusses the creation of the Ed-Fi data standard, defines the components of the standard, outlines use cases, and overviews implementation and licensing issues.

Today's Education Environment

Each fall at campuses across the country, hundreds of students arrive as blank slates. Teachers and administrators are not familiar with their backgrounds or academic histories, and they have had minimal, if any, interaction with individual children. And limited information is readily available on either the individual students or the population as a whole.

Each day of the school year, new information becomes available as students and faculty interact. In each classroom, educators focus on compiling the profiles that help them positively affect student outcomes. Attendance records are taken. Test scores are recorded. Behaviors are observed. Student progress is charted.

Meanwhile, the central office is focused on operational details and making the school run smoothly. On any given day, the principal is evaluating the substitute teacher fill rate, trying to determine how many teachers are qualified to instruct advanced placement courses, and charting students' success against set standards in math and science.

And in other offices across the state, policy makers and school administrators are monitoring federal, state and district indicators designed to benchmark academic performance, student growth, college readiness and the quality of teaching.

The amount of data and information that must be processed at each campus and district to understand student needs, academic achievement and operational demands, generated a proliferation of information systems to collect and report data.

These multiple systems have, in turn, led to several interrelated challenges:

- **Interoperability.** Many education-related information systems are not designed to exchange data with other systems.
- **Adaptability.** Schools struggle to keep pace with changes to state and federal reporting requirements and adapting their systems to support them.
- **Constrained resources.** Enormous financial pressure in the education sector has made IT resources, whether internally or externally sourced, vulnerable to budget cuts. Basic tasks like running critical ad-hoc reports and implementing, managing and updating existing systems are a struggle.
- **Student record portability.** Data exchange among districts is a significant obstacle in an age of increasing family and student mobility.



Ed-Fi: Focused on Student Outcomes

One important and often overlooked issue underscores the limitations of existing information systems: Many educational data systems are designed solely to comply with state and federal reporting requirements, not to highlight information and trends that improve student performance in the classroom. The focus on compliance doesn't serve educators, who strive daily to track students' academic strengths and growth areas, educational goals, and personal circumstances. Especially with increasing day-to-day responsibilities, larger class sizes and increased student mobility, even the best educators can miss early warning signs such as changes in student behavior or incremental decreases in academic performance.

Since 2005, the Michael & Susan Dell Foundation has invested over \$150 million in 23 school districts and charter management organizations to ensure that educators have continuous access to the information they need to respond to the unique needs of each and every student. During that time, the Foundation also conducted focus group discussions with over 2,600 educators. Both initiatives highlighted two key insights. First, educators across the country want the same kind of information—a holistic portrait of their students that is both detailed and easy to understand. Second, the multiple and often non-interoperable information systems used by schools, districts and states nationwide cannot effectively deliver that information where and when it's needed most. While several initiatives have attempted to address this challenge (see *Comparable Standards and Initiatives* later in this paper), none have adequately tackled it.

Two elements are required to effectively impact student outcomes:

1. A data exchange standard that unifies student performance data from disparate systems
2. A toolkit for building customized, user-friendly dashboards that provide actionable information to educators and other parties based on the data compiled from these systems

Until now, no solution has successfully brought these two elements together.

The Ed-Fi Data Standard

Ed-Fi is an XML-based universal data standard that facilitates data exchange among student data systems in the K-12 education sector. Development was funded by the Michael & Susan Dell Foundation based on input from vendors, state education agencies and local education agencies. Ed-Fi augments existing systems instead of replacing them. Ed-Fi seeks to improve student achievement by extracting student information from a variety of sources, and by then standardizing, integrating and communicating this information to educators and other parties through Web-based dashboards, reports and other applications. Equipped with actionable insights, educators can make informed decisions on what steps are needed to improve the academic outcomes of students.

THE ED-FI VISION

By 2015, the Foundation aims to cover 50 percent of states and reach 75 percent of students and teachers with the Ed-Fi standard, providing the majority of teachers in the United States with actionable insights that can be used to make informed, data-driven for improving academic outcomes of every student.

The Ed-Fi solution comprises the following components:

- **Unifying data model (core schema)** – This is the central XML schema definition (XSD) that defines the common data elements such as the attributes, types and structures, on which the rest of the standard is based. The core schema serves the majority of schools' educational needs and provides the building blocks for additional schemas, such as the interchange and extension schemas used for more specific situations.



- **Data exchange framework (interchange schemas)** – These are schemas that depend on the core schema and serve as connectors to send and receive information among systems. Interchange schemas differ from the core schema in that each interchange schema defines the data exchange in highly specific scenarios, while the core schema defines a broad set of objects used in many general situations. Vendors can create new interchange schemas to accommodate new scenarios.
- **Application framework (extension schemas)** – These are additional schemas that extend the XML types in the core schema and enable new types to be added. Extension schemas may be necessary to provide specific data for state education agency (SEA) reporting, or to address specific reporting needs for grants and other education programs.
- **Example relational database model with metrics and sample dashboards** – The Ed-Fi solution includes an example relational database model as well as the metrics needed to define performance management indicators. This toolkit provides the elements necessary to build dashboards.

The extensibility of the Ed-Fi data standard means that virtually any information systems that collect, manage, report on, or provide analysis of student data can be unified. These include but are not limited to student information systems, grade book applications, curriculum and lesson planning systems, and benchmark testing and reporting systems. The kinds of data exchanged among these systems might include, for instance, records on students' grades, absence rates, transcripts and standardized test scores. Ed-Fi can also unify other operational systems including accounting and human resource systems.

The Flexibility and Responsiveness of the Ed-Fi Data Standard

The Ed-Fi core schema includes over 400 granular data elements, and the flexibility to add more as necessary. Ed-Fi enables these elements to be combined to accommodate continuously evolving accountability and performance metrics.

This flexibility means Ed-Fi can support current reporting needs and adapt to future ones. The definition of graduation rate, for example, is calculated by different states using up to nine data elements, such as entry date, entry grade level, withdraw date, and withdraw reason, which are typically dispersed across multiple information systems. The National Governors Association uses seven of these elements, New York uses six, and Texas has several variants but will standardize on eight in the future. If new reporting standards require additional data elements, these will be added to the core, interchange, or extension schema as needed. Moreover, these changes can be implemented quickly and easily.

Comparable Standards and Initiatives

The Ed-Fi solution shares some characteristics with other established and emerging educational standards, such as Common Education Data Standards (CEDS), schools interoperability framework (SIF), Post-Secondary Education Standards Council (PESC), national education data model (NEDM) and National Center for Education Statistics (NCES). However, Ed-Fi also supports a more teacher- and student-centric goal than these other standards, none of which focuses on the specific goal of improving student outcomes.

Ed-Fi does not replace other existing standards. It complements and enhances them; first, by sharing disparate data and translating it into element-level detail, and second, by offering broad coverage at the school, district or state level. This interoperability enables Ed-Fi to coexist among systems that states have already implemented, and enables states to build on prior investments in existing IT systems and processes.

WHY XML?

XML is well-suited for the Ed-Fi data standard because it is a widely used, vendor-independent technology standard designed to communicate both the structure and contents of documents. XML provides methods to automatically validate, query, and transform commonly used file types (e.g., XSD, Xpath, and XSLT). Moreover, because XML is in widespread use, software and technology vendors can employ existing tools and knowledge to implement Ed-Fi and reduce overall implementation costs.

HOW DOES THE COMMON EDUCATION DATA STANDARDS (CEDS) INITIATIVE IMPACT ED-FI?

The U.S. Department of Education's common education data standards (CEDS) were developed by a national consortium of education data stakeholders. This consortium provides valuable input, which is why Ed-Fi uses CEDS as a reference model and aligns to it wherever possible.

**The key differentiators between Ed-Fi and other standards and initiatives include:**

- **Focus on student performance.** The primary purpose of Ed-Fi is to integrate data from multiple information systems and give educators instant access to current, accurate student-specific data to increase academic growth and achievement. It does not attempt to replace schools' operational systems, compliance reporting systems (though it certainly can be used for that, as well) or systems for making budget allocation decisions.
- **Actionable intelligence.** Ed-Fi focuses on data all the way to the individual student level, unlike other initiatives that focus only on aggregate-level performance data (i.e., at the school, school district, or state level). Ed-Fi thus enables teachers to develop more effective, progress-based lesson plans when warranted.
- **K-12 focus.** Ed-Fi is currently focused on K-12 students. While it is not intended to address the complete set of data related to higher education students or those entering the workforce, the data standard will address connections to that information for the purpose of evaluating education outcomes. In the future, Ed-Fi might also address Pre-K students.
- **Vendor neutrality.** Successful Ed-Fi implementation does not require specific hardware or software choices. It is architected to fully integrate with existing infrastructure and accommodate future innovations.
- **Transparent governance.** Ed-Fi was developed with funding from the Michael & Susan Dell Foundation for public use and benefit. It will be governed by the future multi-state led Ed-Fi Alliance.
- **Flexibility.** Ed-Fi accommodates continuously evolving reporting requirements from district, state and federal agencies. See *The Flexibility and Responsiveness of the Ed-Fi Data Standard* earlier in this paper.
- **Support for vertical reporting.** Ed-Fi goes far beyond simple horizontal reporting by supporting push and pull models throughout the reporting chain. See *Use of Dashboards for Vertical Reporting*, below.
- **Ease of implementation.** Ed-Fi is built on familiar, widely-adopted XML standards and includes data elements with plain-English names and definitions that make sense in the education space, as opposed to complex jargon or codes.

Ed-Fi at a Glance

- Built in XML
- Vendor neutral – does not depend on the choice of vendor's software, hardware, operating system or development tools
- Free to license
- Implementable today
- Aligned and compatible with existing standards
- Designed to augment existing systems instead of replacing them
- Creation funded by the Michael & Susan Dell Foundation and governed jointly with a multi-state working group as part of the future Ed-Fi Alliance

Dashboards Powered by Ed-Fi

Educators require timely, relevant, and actionable information about their students' academic performance to achieve meaningful change and improve student outcomes. Educators with ready access to this information can monitor student performance, identify early warning signs and emerging growth opportunities, and intervene appropriately to ensure that all students avoid failure and reach their full potential.

Ed-Fi can convey this information through dashboards—browser-based collections of interactive charts, gauges, reports, and other visual indicators that an educator can use to monitor student performance on an ongoing basis. Views are tailored to the educator's role (teacher, principal/campus leader) or some other role.

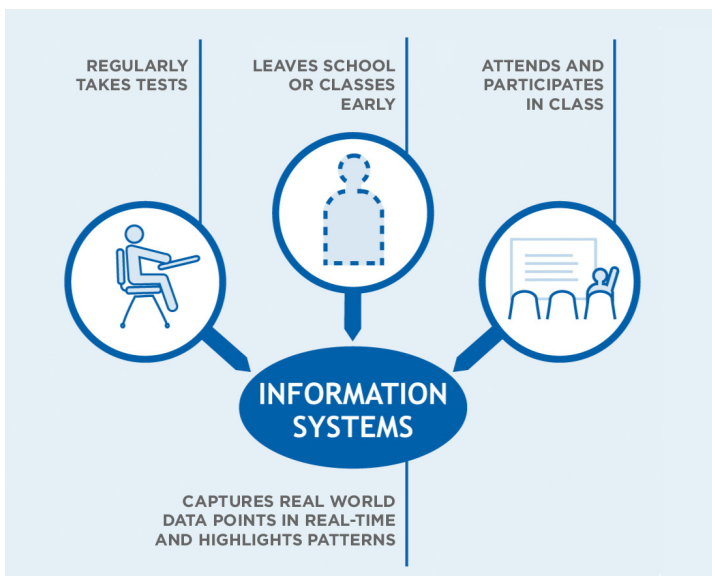


FIGURE 1

Data points, often from a variety of information systems, are pulled together into metrics that reflect real world events. Teachers need to know about more than test scores to know enough to make better instructional decisions for each and every student.

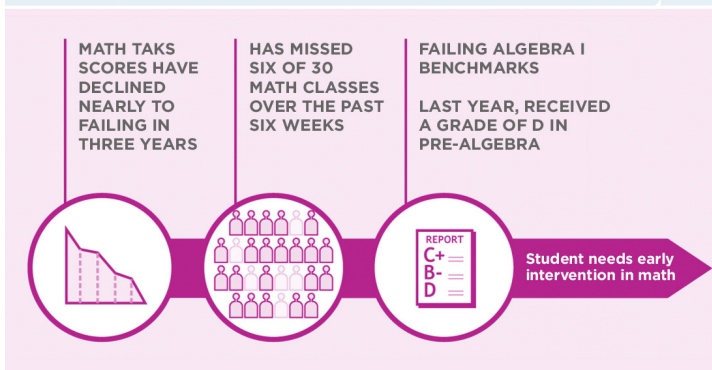


FIGURE 2

Leading indicators are designed to flag emerging issues before they become serious. An Ed-Fi-powered dashboard allows the teacher to capture the intervention selected and keep track of whether the intervention is working. Giving teachers access to the information and data that can help them analyze student performance, adjust instructional strategies and better determine what's working and what isn't working can improve student outcomes.

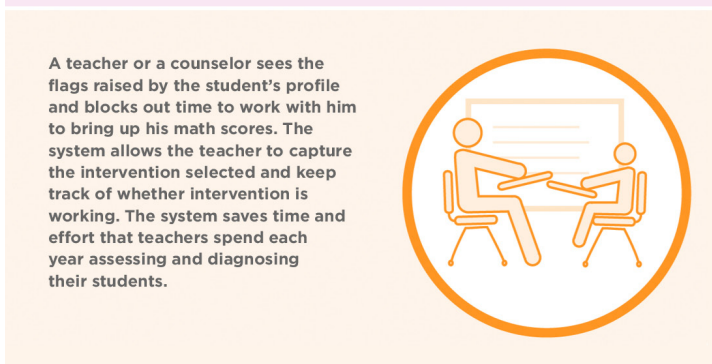


FIGURE 3

Teachers and principals must be given access to appropriate resources, training, and time during the school day to review information on their students on a regular basis. Teachers and principals must have access to effective interventions grounded in research.



Use of Dashboards for Vertical Reporting

These multiple views enable the dashboards to be used by district- and state-level policy makers, as well as to supplement or replace broader state-level or federal accountability and other reporting processes.

Multiple dashboard views also meet the needs of teachers, campus leaders and district leaders with highly differentiated responsibilities and information requirements. For example, the classroom teacher needs extremely granular student data, such as individual grades or standardized test scores, to monitor each student's progress. The campus-level educator needs access to the same data plus high-level information on the aggregated performance of students in order to understand campus performance and trends. The superintendent needs even higher-level data across multiple campuses to get a picture of the relative strengths and challenges of campuses within a district.

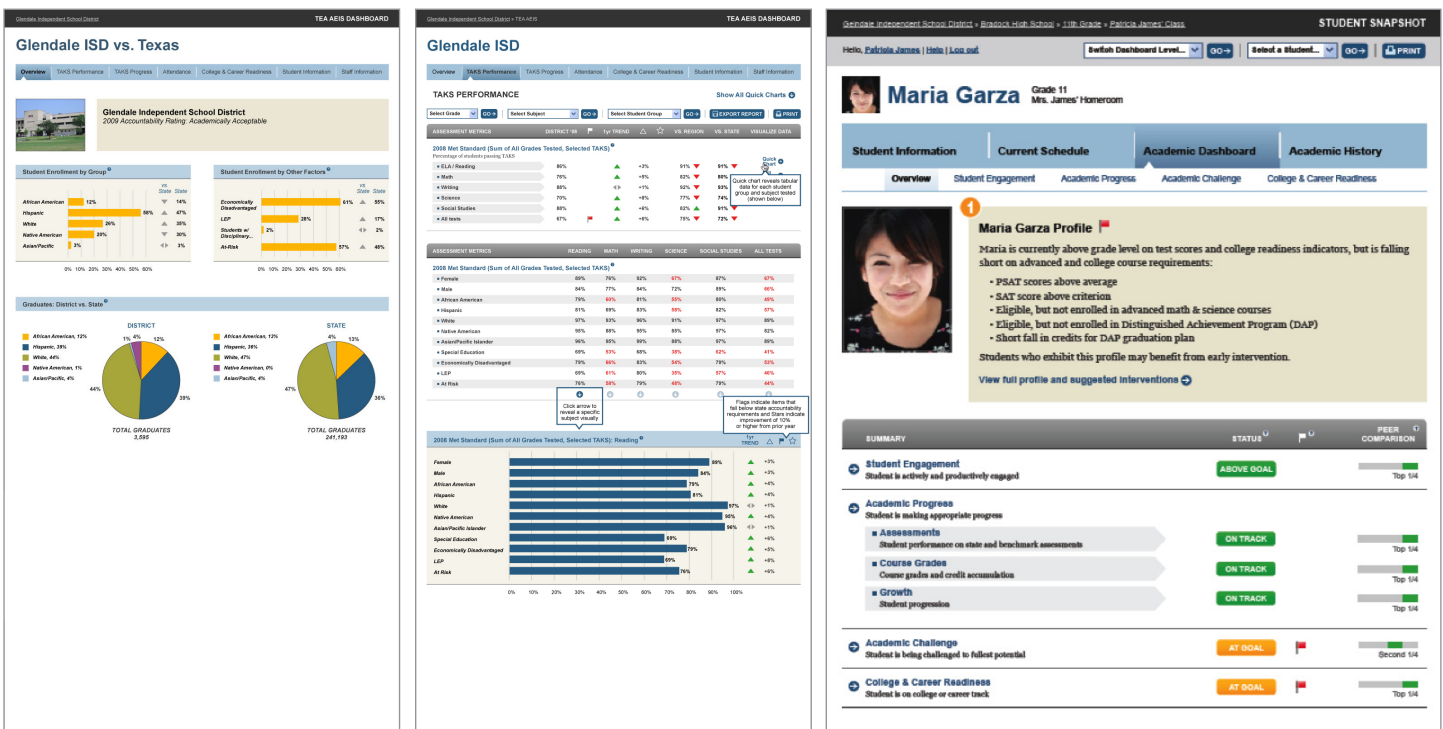


FIGURE 4

Ed-Fi enables easy transmission of data from the Student to State level, with consistent formatting and user-friendly reporting

Implementing Ed-Fi

In most states and other large-scale implementations a phased roll-out of Ed-Fi is appropriate. An implementation typically begins in a small number of pilot districts before being rolled-out state-wide. Any implementation and usage plan should take into account that implementing the Ed-Fi data standard and implementing Ed-Fi dashboards are different activities, with steps and requirements that vary depending on the situation and the role of the implementer.

The Ed-Fi data standard was designed to be extremely easy to implement. The primary requirements are expertise with industry-standard XML toolsets and business process modeling. Aspects of implementations can be performed by systems integrators or product vendors. For example:

- For a product vendor with an existing product, a data standard implementation may be as simple as exporting data to one or more of the Ed-Fi data interchange schema. For example, a student information system (SIS) vendor might implement a mechanism to supply data in the Ed-Fi student enrollment, student attendance and student grade data interchanges in order to feed data to a centralized data system.



- For custom data projects (e.g., most data warehouse and data integration projects), implementation would involve using the Ed-Fi data exchange framework for data transfers between systems. Ed-Fi defines several XML-based standard data transfer schema (e.g., student attendance, student enrollment, assessment results, etc.) and also provides an extensions framework for customizing the existing schema to meet specific needs.

The Michael & Susan Dell Foundation provides extensive documentation to support implementations of the data standard.

Implementation of **Ed-Fi-enabled dashboards** constitutes a separate project similar to other software development projects, with a cycle of requirement definition, analysis, development, testing and refinement. The Ed-Fi Dashboard Toolkit contains material that can be used throughout the development cycle. For example, the dashboard visualizations are helpful in eliciting requirements, the metric definitions can save work in the analysis phase, and the data exchange standards can save work in the development phase.

Licensing Ed-Fi

States, districts, schools or systems integrators can obtain a completely free, non-transferable license to use the Ed-Fi data standard. The license provides perpetual, unrestricted access and usage rights to the components identified in The *Ed-Fi Data Standard* section. For information about licensing, see www.ed-fi.org/contactus.

A license to use the Ed-Fi data standard includes sample dashboard views and a copy of the relational database model and metrics that define performance management indicators, which enables third-party vendors to build dashboards.

The cost to implement Ed-Fi depends on several factors. Any fees would be charged to states or school districts by third party vendors (typically systems integrators), not by the Michael & Susan Dell Foundation or the Ed-Fi Alliance. Additional costs will vary based on the complexity of the implementation and several other factors, such as your choice of application vendor.

Ed-Fi: The Right Choice for the Education Challenges of Today and Tomorrow

The time to extract more value from school information technology is now. We need to shift the focus from simply collecting aggregate data to empowering educators with the actionable student-level insights they need to improve the lives of every K-12 student in the United States. Start transforming education in your state, district, school and classroom today with Ed-Fi.

Learn more at www.ed-fi.org

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