DATA QUALITY CAMPAIGN
Using Data To Improve Student Achievement

The Right Data to the Right People at the Right Time: How Interoperability Helps America's Students Succeed

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Using data to inform decisions has long been a hallmark of high-performing organizations. The growth of available technology provides educators more timely and user-friendly access to data, especially longitudinal data, and with an increasingly mobile student population, sharing those data across districts, states and even higher education systems has never been more imperative. Recent events, such as the large interstate movement of approximately 372,000 students from Louisiana and Mississippi displaced in the wake of Hurricane Katrina, have highlighted the importance of such a system not only for educators but also for policymakers.

Many education data systems are not able to share information due to incompatibilities in technology and lack of human capacity, which together inhibit the quantity and quality of longitudinal data. Fortunately, interoperable systems, defined as an environment in which diverse data systems seamlessly exchange information with little or no additional effort, are becoming more prevalent due to the leadership of several organizations such as the Schools Interoperability Framework Association (SIFA) and the Postsecondary Electronic Standards Council (PESC). With these systems, policymakers will be able to answer timely questions, such as:

- How well do high school exit requirements align with postsecondary entrance requirements?
- What characteristics of high school graduates, including courses taken, predict postsecondary success?

Highlights

In this brief, find out more about:

- Interoperability and how it improves data-based decisionmaking.
- The current status of interoperability in education.
- Case studies on entities at all levels that are building and leveraging interoperable data systems:
  - Naperville (IL) Community Unit School District 203;
  - Virginia Department of Education; and
  - Indiana Commission for Higher Education.
- Hallmarks of interoperable data systems and lessons learned from other industries.
- Additional reports and resources on interoperability in education and other industries.

- Which students require remediation in core subjects upon entering college?
- What are the career paths of college graduates upon departing from community colleges and universities?
- How does programmatic spending relate to student achievement? What is the return on investment?

Answering these and other policy questions requires not only having longitudinal data but also connecting and exchanging information among disparate data systems that frequently are designed and maintained in isolation from each other. For example, to determine which high school programs provide the greatest

return on investment as measured by graduation from a two- or four-year higher education institution, policymakers must be able to assess longitudinal data from within and across P–12, postsecondary and financial data systems. Currently, this is possible in only a few districts, states and postsecondary institutions.

In addition to interoperable systems, data portability improves data quality, access and use. Portability is the ability to exchange student record and transcript information electronically from system to system, across districts, and between P–12 and postsecondary institutions — within a state and across states. Portability has at least three advantages:

- It makes available the academic records of students who move to a new district and/or state;
- It reduces the time and cost of transferring students' records and transcripts; and
- It increases the ability of states to distinguish dropouts from students who transfer out of state.

Improving Data-Based Decisionmaking through Interoperability

For years, educators, administrators and policymakers have collected data and built complex and often disjointed repositories for everything from student demographic details to statewide aggregate student information. Access to these data has been limited to a select few, with a wall of paperwork, bureaucracy and technological incompatibility preventing many stakeholders from using existing information to make better decisions. Those who have needed to integrate data from different locations often have had no alternative but to manually import and export files or hand-key data off paper printouts from incompatible systems.

For timely and efficient access to these data, the systems within which they are stored must be capable of exchanging data quickly and easily with the systems that need the information: This is the definition of interoperability. An example of lack of interoperability is when two people who speak different languages are talking and neither is able to translate. They can exchange words, but until they can find a way to interpret what each other is saying, they are unable to use the information or gain from the interaction. Information technology systems often speak different languages or dialects, not only when the products come from different suppliers but also when different generations or variants of products find it difficult to communicate.[1]

Interoperability begins with compatible software and hardware technology, but it does not end there. Effective interoperability also requires significant changes in how organizations work and, especially, in their attitudes toward information. Policymakers and data system managers need to work together to ensure that the systems, procedures and culture of an organization maximize opportunities for exchange and reuse of information, internally or externally.[2]

Benefits of Interoperability: Improving Data Use and Quality

Governors, state board members, chief state school officers, district superintendents and other policymakers increasingly are embracing efforts to build and use longitudinal data systems, and it is vital that these efforts address the issue of interoperability. With budget constraints and increasing federal and state accountability

[1]The Open Group, *Interoperability Matters to the User, More Detail.* www.opengroup.org/bus_area/interoperability/info1/info2/IBinfo2.html, accessed May 14, 2007.

[2]Miller, P., "Interoperability: What Is It and Why Should I Want It?" *Ariadne,* Issue 24, June 2000. www.ariadne.ac.uk/issue24/interoperability

requirements, the ability to efficiently generate valid and timely data is critical to the successful operation of schools, districts, higher education institutions and states. By taking a systematic approach to data management and implementing software that adheres to agreed-upon interoperability standards and data definitions, education agencies can redirect resources and staff from redundant and often ineffectual, data-centric tasks to valuable student-centered education.

Creating a unified interoperable system to move data offers tremendous cost and time savings. For example, the Ontario College Application Services (OCAS) automated transcript exchange and achieved substantial cost and capacity savings.[3] Processing a hard-copy transcript cost $4.18, but processing an electronic transcript cost $1.14, a savings of $3.04 per transcript. OCAS processes 34,000 high school and 105,000 college transcripts per year, resulting in savings of more than $400,000 annually for the schools. These savings do not include the additional staff time gained by reducing data entry. In addition, because all of the data are aggregated into a single store, updates are made and distributed quickly. This enhances data quality by guaranteeing that everyone has access to the most current and accurate data available.

The underlying premise of interoperability — creating a federated but unified data system — can act as the catalyst to the kind of organizational improvements in education that many private-sector businesses undertook a decade or more ago. By looking at their management and operational systems from a data perspective, businesses were able to implement technology to increase efficiency and productivity and improve their operations. Interoperable systems offer the same opportunity in education today.

Other benefits of implementing an interoperable system include:

- **Reducing the burden on school staff to enter data.** When a student enters a school, information about that student must be entered many times over to

Fundamentals in Designing State Longitudinal Data Systems

Although a principal focus of the Data Quality Campaign is ensuring that states adopt and use the 10 essential elements of a longitudinal data system, it also is imperative that states implement a series of foundational infrastructure improvements to enhance the collection, availability and use of high-quality education data. In fact, some states are already working on such plans. Following are fundamental features states need to incorporate when constructing their longitudinal systems:

- **Privacy protection** — The preservation of student privacy is a critical component of any longitudinal data system.
- **Data architecture** — The design of longitudinal data systems must make use of best practices for coding, storing, managing and using education data.
- **Data warehouse** — Aggregating data into a single store is a prerequisite for timely policy analysis.
- **Interoperability*** — Data must be able to move horizontally between systems and vertically between entities without the need for customized programming, data manipulation by the end user or vendor interventions.
- **Portability*** — Student record and transcript information must be exchangeable electronically from system to system, across districts, and between P–12 and postsecondary institutions — within a state and across states.
- **Professional development around data processes and use** — Building a longitudinal data system requires not only the adoption of key elements but also ongoing professional development of the people charged with collecting, storing, analyzing and using the data.
- **Researcher access** — Providing access to the data to outside researchers with appropriate privacy protections allows critical research to be done at no cost to the state or school districts.

**These topics are discussed in detail in this issue brief.*

[3] Postsecondary Electronic Standards Council, "Interview with Barry Billing," *The Standard*, Volume 7, Issue 11, November 2006. www.pesc.org/publications/standard/11-06.pdf

Interoperable Data Systems — Learning from Other Industries

As consumers and citizens living in the digital age, we rely on interoperability in many aspects of our daily lives. These services are made possible by communities of interest working together to exchange personal and sensitive information while ensuring data are actionable and secure. For example:

- **Financial networks** — Every bank now connects to a single network — the ATM network — where data and currency are exchanged between thousands of banks and millions of consumers. However, the ATM network did not always exist; banks worked together to build it. Initial resistance to an open ATM network was extinguished once consumers recognized the ease and reliability of use and banks realized immediate cost savings. Similar financial networks support the interoperability of credit cards, the availability of direct payroll deposit and "speed pass" pay-at-the-pump gas cards.
- **E-ZPass™** — An E-ZPass™ electronic token enables a consumer to pay a fee electronically in place of currency and traverse toll roads and public parking lots more quickly and efficiently.
- **Motor vehicle registration and driver's licenses** — Data interoperability standards permit law enforcement in any state to determine quickly the status of a driver's license and vehicle registration and insurance. We may not think of this as a blessing when the flashing lights appear in the mirror, but the system reduces vehicle theft and fraud and plays a role in abating terror threats. Its early warning feature also saves the lives of unknown numbers of law enforcement personnel every year by alerting them to threats before they approach a car during a traffic stop.

Education is not alone in its struggle to achieve compatible and portable data systems. Organizations and agencies in other industries also are adopting initiatives to seamlessly and securely exchange personal information while making it actionable for policymakers and practitioners.

Schools Interoperability Framework Association (SIFA)
www.sifinfo.org

SIFA is a nonprofit membership organization whose members include more than 485 software vendors, school districts, state departments of education and other organizations active in primary and secondary (P–12) markets. These organizations have come together to create a set of rules and definitions that enable software programs from different companies to share information horizontally between systems and vertically between entities. This set of platform-independent, vendor-neutral rules and definitions is called the *SIF Implementation Specification.* The SIF specification makes it possible for programs within a school or district to share data without any additional programming and without requiring each vendor to learn and support the intricacies of other vendors' applications.

Postsecondary Electronic Standards Council (PESC)
www.pesc.org

Established in 1997 and located in Washington, D.C., PESC is a nonprofit, community-based, umbrella association of colleges and universities; professional and commercial organizations; data, software and service providers; and state and federal government agencies. PESC's mission is to lead the establishment and adoption of data exchange standards in education. The goals of the mission are to enable the improvement of institutional performance and foster collaboration across educational communities to lower costs, improve service and attain system interoperability.

U.S. Department of Veterans Affairs
www1.va.gov/cprsdemo

The Veterans Health Information Systems and Technology Architecture, supporting ambulatory and inpatient care, delivered significant enhancements to the original system with the release of the VA Computerized Patient Record System (CPRS) for clinicians in 1997. CPRS offers a single interface for health

care providers to review and update a patient's medical record and to place orders, including medications, special procedures, X-rays, patient care nursing orders, diets and laboratory tests. CPRS is flexible enough to be implemented in a wide variety of settings for a broad spectrum of health care workers and provides a consistent, event-driven, Windows-style interface.

Centers for Disease Control and Prevention (CDC)
www.cdc.gov/nchs/otheract/phdsc/phdsc.htm

The Public Health Data Standards Consortium is an important vehicle for promoting standardization of information on health and health care. The National Center for Health Statistics was instrumental in establishing the Consortium in 1999. Members of the Consortium serve as health data collectors and users who actively support the overall goals of developing, promoting and implementing data standards for population health practice and research. The Consortium is committed to bringing a common voice from the public health and health services research communities to the national data standardization efforts.

American National Standards Institute (ANSI)
www.ansi.org

ANSI coordinates the development and use of voluntary consensus standards in the United States and represents the needs and views of U.S. stakeholders in standardization forums around the globe. The Institute oversees the creation, promulgation and use of thousands of norms and guidelines that directly affect businesses in nearly every sector.

U.S. Environmental Protection Agency (EPA)
http://oaspub.epa.gov/edr/EPASTD$.STARTUP

The EPA's data standards program promotes the efficient sharing of environmental information among the EPA, states, tribes and other information partners through the cooperative development of data standards. In partnership with the Environmental Data Standards Council, the EPA is developing data standards for environmental information collection and exchange. The use of common data standards among partners will foster consistently defined and formatted data elements and sets of data values and will provide public access to more meaningful data.

U.S. Department of Defense (DoD)
www.chips.navy.mil/archives/00_jul/data_interoperability.html

In November 1999, the Department of the Navy Chief Information Officer established the Data Management and Interoperability Integrated Product Team to address enterprise-level data management. Reinforcing the need for this effort was a statement in a Feb. 7, 2000, memorandum by Art Money, assistant secretary of defense for command, control, communications and intelligence. In calling for a new data strategy for the DoD, Money stated that "[g]aining and sustaining Information Superiority requires DoD to field information systems that are interoperable at the data level." A truly interoperable institution is able to maximize the value and reuse potential of information under its control. It also is able to exchange this information effectively with other equally interoperable bodies, allowing new knowledge to be generated from the identification of relationships between previously unrelated sets of data.

The National Center for Biomedical Ontology
www.bioontology.org

The National Center for Biomedical Ontology is a consortium of leading biologists, clinicians, informaticians and ontologists who develop innovative technology and methods that allow scientists to create, disseminate and manage biomedical information and knowledge in machine-processable form. Its vision is that all biomedical knowledge and data are disseminated on the Internet using principled ontologies so that the knowledge and data are semantically interoperable and useful for furthering biomedical science and clinical care.

assign the student to classes, assign bus routes, allow provision of free or reduced-price meals, authorize checking books out of the library, enroll the student in special services, create a comprehensive student academic record containing assessment results and other performance indicators, and so on. With interoperable systems, the data can be entered only once and then shared as needed with the rest of the school, district and state systems.

- **Decreasing cycle time.** Delays in sharing data impede the delivery of services to new students and reduce the effectiveness of a school's programs. Interoperability provides access to data on demand. When a diagnostic assessment is made of a student, the results can be shared immediately with those responsible for intervening. When grades and credits are entered, the school activities and affairs that are dependent upon them have the information right away (e.g., eligibility for extracurricular activities, scheduling of tutoring, etc.). If interoperability extends to the postsecondary level, colleges and universities can help high school counselors with authoritative, real-time course selection advice — allowing students to learn exactly which courses will prepare them for which majors at the college they hope to attend.
- **Improving data quality.** Every time a person must manually enter data, there is a risk of error; similar risks arise when data are migrated manually between systems. Interoperable systems automate data exchanges in ways that significantly reduce the chance of error.
- **Supporting data-driven decisionmaking.** Good decisions require timely and accurate information. When interoperable systems deliver better quality data more quickly, all decisionmakers benefit.

Interoperability in Education Today

Across most of the education sector, data systems are disparate and unconnected. Each subunit of an education organization focuses on its immediate needs, overlooking coordinating with others; the result is a range of technology solutions that can talk to each other only poorly, if at all. Multiple, uncoordinated data requests often collect the same information repetitively and at different times, leading to errors, data-reconciliation challenges and reporting discrepancies. The discrepancies, in turn, can incite questions from students, parents and the press about the education institution's ability to meet the needs of its learners.

The lack of data interoperability is not isolated to one level of education. Due to inconsistent data at the secondary and postsecondary levels, it is difficult, if not impossible, to talk about P–20 alignment of policies and practices across levels. During their education, students often move between districts and states; for conclusions about student outcomes to be valid, student information needs to be coded and reported consistently across every institution in which the student takes courses. Consistent data sets that span P–12 and postsecondary also provide vital information to a transferring student's new institution, so it can develop an appropriate learning environment. For example, to understand which high school courses predict postsecondary preparation, secondary and postsecondary systems must use the same course codes to connect previous education with higher learning achievement.

In addition to challenges associated with coordinating data systems, standards and definitions, often a culture of mistrust and apprehension about change precludes interoperability from becoming a reality in education. Federal and state student privacy protection laws have

not evolved as quickly as technology, resulting in ambiguity about how these laws relate to state agencies and state longitudinal data systems. To avoid violating student privacy, organizations and individuals have at times been denied access to these data. However, as illustrated by the ATM network, sensitive information like a bank account number can be exchanged for the purposes of connecting disparate systems without sharing superfluous information, such as the user's Social Security number, that does not serve the needs of the consumer.

Tremendous amounts of money are invested each year in designing and implementing sophisticated data systems that do not communicate with each other. In these systems, further resources are needed to manually import and export data, hand-key the same data across systems, or even purchase the latest upgrade in an attempt to solve the issues and problems. Consumer demand for better and more efficient financial transactions provided the banking industry with the incentive to override their proprietary technology and develop interoperable systems. Just as the demand from policymakers and educators for better information is increasing, the culture around sharing and collecting data also is evolving to one in which seamless data exchange is fundamental to answer the instructional and policy questions being asked today.

Ensuring Interoperable Data Systems: Case Studies

Naperville Community Unit District 203 — *Small Investments Increase Timeliness, Use and Enthusiasm for Data*[4]

Four years ago, Naperville Community Unit District 203 in Naperville, Ill., 26 miles west of Chicago, realized it was struggling to manage data from eight separate information systems. Time required for data entry at the start of the school year was significant. For the first month of school, six to seven people performed data entry full time. The process to keep the data in these systems synchronized was extremely time consuming. For example, when a new student entered the district midyear, it took a week to update the food service system. Additionally, troubleshooting data errors was very difficult. Information technology staff had to check various applications to find the source of the error, and fixes needed to be made in multiple applications.

Naperville has nearly completed its second year of a strategic Schools Interoperability Framework (SIF) implementation and already has realized benefits from data interoperability. The district had a methodical approach, implementing one application at a time, and used existing applications to keep the costs down. The estimated cost to date for all the functionality Naperville has implemented and plans to implement through 2008 is $271,000. The majority of this amount was invested to develop new functionality and new software applications that Naperville chose to purchase but that were not required for interoperable success.

For the 2005–06 school year, data entry was significantly reduced. Preliminary estimates indicate that once the data systems are all interoperable, Naperville will have reduced its data entry time by at least two-thirds. Additionally, with a single point of data entry, troubleshooting has become much easier and faster. There is only one place to go to find and correct an error, and what previously took one week now takes a couple of hours. This significant savings frees up the IT staff for other projects.

[4]Schools Interoperability Framework Association, *Analysis of Costs and Benefits Associated with Implementing SIF,* June 2006. www.sifinfo.org/upload/Docs/SIF_Cost_Benefit_Analysis_Summary_060605.pdf

With interoperable data systems, Naperville is finding more ways to use applications to address data analysis and broader No Child Left Behind goals. Naperville brought its data together into a new data warehouse at the end of May 2006. The district plans to add an easy-to-use interface so that administrators and teachers can quickly and easily view student profiles. The next step will be to add local assessment, survey, perception and human resources data and use statistical software to help predict how students will do on high-stakes test. The goal is to identify struggling students so that the appropriate intervention can be provided. Future plans include analyzing projected growth in student performance to affect the money that is spent on intervention programs. Faster reporting of assessment data and analysis to principals and teachers will enable assessment staff to focus on higher-level work. As a result, the quality of the data analysis will improve dramatically.

As the benefits of data interoperability and data warehousing begin to touch operations throughout the district, this technology solution is becoming more visible, and other departments are taking notice. For instance, human resources and financial operations in Naperville now want to track highly qualified teacher status for No Child Left Behind reporting and make budget and pay-scale projections. Although Naperville has just started down a long implementation path, it is heading in a direction that holds great potential to streamline reporting and fiscal processes, improve operational efficiencies, and enable innovative analysis that will improve student performance by directing more effort toward teaching and learning.

Virginia Department of Education — *Leveraging Political Capital to Streamline Data Systems while Maintaining Local Responsibility*

With approximately 1.2 million students enrolled in public schools, the Commonwealth of Virginia's public school system is the 12th largest in the United States.[5] Virginia's school system is composed of 132 operational public school divisions and 88,000 public school teachers teaching in approximately 1,878 public schools. With such a large network of local education agencies, many disparate and uncoordinated data systems exist.

Virginia's tradition of local responsibility for public education — as established by the constitution of Virginia and the Code of Virginia — encourages diverse data systems. Local school boards have control over data system purchases and decisions, so the current statewide system architecture comprises a highly distributed and diverse statewide computing environment. In response to the existing local investment in hardware and software as well as a gubernatorial call for increased data use, the Virginia Department of Education envisioned interoperability across disparate local systems, which would provide a vehicle for seamless state reporting.

Forces that supported the expansion of interoperability efforts in Virginia include the governor's P-16 Education Council and the Council on Virginia's Future. Both councils have established goals for education in Virginia with measurable, data-driven objectives. Recognizing that P–16 alignment is not possible without seamless longitudinal data, Virginia's P-16 Education Council stated:[6]

> *"Education reforms must be data driven. The performance of our educational system should be measured and improved systematically, and policy choices should be informed by outcome data. This requires the ability to link data from existing systems to evaluate the effectiveness of instruction, intervention and teacher education programs."*

And it recommended that Virginia "create a robust P–16 data system" that includes "ongoing sophisticated

[5] www.SchoolMatters.com, accessed May 8, 2007.

[6] Virginia's P-16 Education Council, *Report to the Governor and General Assembly*, October 2006.

analyses of the effectiveness of Virginia's education system with particular emphasis on smooth transitions from one level to the next."

Given Virginia's numerous local data systems, the Virginia Department of Education realized that it could not satisfy the data requests needed to answer policy questions around P–16 alignment without interoperable systems that could exchange data across districts and K–12 and higher education institutions. Therefore, Virginia adopted SIFA's specification to improve data quality and reduce administrative burden. Initially, the commonwealth provided software, installation and training to 83 of Virginia's 132 school divisions, enabling them to obtain student identifiers that are compatible across their unique data systems, which facilitates streamlined data exchange. Virginia expects to enable an additional 12 school divisions by July 2007.

Virginia is seeking to adopt interoperable standards statewide to allow the commonwealth to achieve full interoperability among and across K–12 and higher education systems. Policy and instructional decision-makers will have access to accurate and timely data to explore issues such as the postsecondary outcomes of K–12 graduates and the classroom performance of recent teacher education graduates. In addition to offering insights into various policy questions, the paperless processes in K–12 and higher education afforded by interoperable and portable data systems will enable scarce resources to be redirected toward student instruction.

Indiana Commission for Higher Education — *Portable Data Promote Cost Savings and Build Capacity, while Streamlining K–16 Data Exchanges Within and Across State Lines*[7]

The benefits of portable electronic data far outweigh the effort needed to overcome the challenges, one of the biggest of which is integrating what are now separate databases into a seamless K–16 system. The challenge is not always to build one unified database; instead, sometimes it is necessary to synchronize information among institutional databases, which have disparate student information systems that handle data differently. In this distributed environment, success depends on adopting national transcript standards or schema, such as those developed by the PESC, and takes the voluntary participation of many people in both K–12 and postsecondary education. As with any large-scale or statewide effort, policymakers and data managers need to work together to ensure this is a priority.

Through interoperable data systems, the Indiana e-Transcript Initiative allows high schools and colleges to electronically send transcripts among Indiana schools, between schools and colleges, and soon, from college to college. Students register online for the service and indicate the destinations to which they would like a copy of their transcript sent. The transcripts are sent electronically to the requested school(s), and the school(s) then can download the information in PDF or raw data format. The student is notified by e-mail when the transcript is sent by the high school guidance counselor and again when the receiving school downloads the transcript.

The online student request and high school upload processes also work for colleges outside of Indiana. The Midwestern Higher Education Compact (MHEC), which includes Indiana, has taken steps to enable the other 10 Midwestern states to implement a similar system.[8] The MHEC e-Transcript Initiative will offer a mechanism to facilitate the transfer of student information between the Midwest's public and private high schools and to the Midwest's public and private colleges and universities in a consistent format, as well as enable transfer among all

[7] Postsecondary Electronic Standards Council, *The Value of Standards in Indiana and the Midwest Higher Education Compact*, September 2006. www.pesc.org/about/The%20Value%20of%20Standards%20in%20Indiana%20and%20MHEC.pdf

[8] The Midwestern Higher Education Compact's membership includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio and Wisconsin (www.mhec.org).

Hallmarks of an Interoperable System

Common Data Standards

High-quality data must originate from data elements with strict, universally agreed-upon and understood definitions. To ensure accuracy, the definitions must be as specific as possible, providing the exact name of each data element; its exact allowable length; whether it can be letters only, numbers only or alphanumeric; whether or not special characters can be included; and any additional validation information required. The National Center for Education Statistics and Office of Federal Student Aid — both within the U.S. Department of Education — work with stakeholders and trading partners through SIFA and PESC to develop these common data standards for P–12 and postsecondary needs, respectively. Standards are developed in an open, consistent, collaborative and community-based approach, with stakeholders and trading partners providing input.

Unique Identifiers and Standardized Code Sets

Is the "John Smith" who transferred into Sioux City the same "John Smith" who transferred out of Rockville? The use of standardized unique identifiers and standardized code sets also are two significant factors that support interoperability. Standardized unique identifiers are needed for students and teachers to allow the tracking and monitoring of student achievement across grades, state lines and educational systems. Similarly, standardized code sets are used for a specific data element when that data element could be one of many from a predetermined list of variable data elements. For instance, a "state" code originates from a standardized list of abbreviations that the state agrees upon and uses. There are many standardized code sets, including county, state, country, grade, course, test name and so on.

Quality Control Measures

Data originate from many different sources. In most cases, a number of data elements are used together to calculate more data. It is therefore important that systems and processes have deliberate and consistent quality control measures. Sometimes these quality control measures are manual, and sometimes they are automated. (Note that many quality control measures rely on the presence of unique identifiers and standardized codes.)

Business-to-Business Compatibility

Effective technical synchronization and standardization of data require an understanding of how the receiver uses and processes those data. For instance, one organization may allow real-time updates to its data throughout the day and may send two, three, four or more updated files each day. If that trading partner only processes once nightly in a batch cycle, then that trading partner is receiving more files than it really needs. Creating data exchange mechanisms that fit the needs of both sender and receiver will save time and money.

Controlled Access and Security

For a system to be truly useful and meet the needs of its many users, it must provide continuous, uninterrupted access. In today's world, though, we are faced with the need to have very stringent guidelines for access so that the security of our systems and the privacy of our data are protected. To mitigate the risk of unauthorized access, many organizations and industries are adopting ID management systems or modules that control user access. With an ID management system, access by a user into the network is cleared or "authenticated" once, and then the user is able to access the systems included in that ID management network without having to be authenticated again. Unified ID management also coordinates access permissions across systems so that users are allowed access only to the data that they are authorized to view.

Comprehensive Management Support

Data systems work effectively only if they serve the mission of the organization that implements them. This requires a clear, coherent, managerial vision of how technology fits into the organization. Similarly, building a system is quite different from operating it, so a comprehensive management plan must include policies and procedures related to maintenance of the system, training on how to use the system for both internal and external users, human resource support as the number of resources needed may fluctuate as the technology is implemented, and change management to ensure adoption and sustainability.

Flexibility and Scalability

In the world of technology, change is a constant. The only way to plan for the future is to build with flexibility so that changes can be made quickly, easily and with scalability, so as the organization grows and more users are added, the system can easily handle the additional volume.

participating Midwest postsecondary institutions. Because it is standards based, nothing prevents this system from interoperating with additional states and regions or even internationally.

Students no longer need to make appointments to meet with counselors just to make a request for transcripts, nor do they need to follow up by phone with high school counselors or college admissions offices to see if the transcripts were received. Before this system was in place, parties at all levels spent a significant amount of time just tracking the delivery and receipt of transcripts; the process also generated significant stress on students and parents. Now, high school counselors can spend their time providing guidance instead of filling out transcript forms and licking envelopes, and college admissions offices can spend less time fielding calls from distraught high school seniors about transcript receipt and more time working to ensure a smooth admissions process.

An important derivative of the Indiana e-Transcript Initiative, which the state would like to implement, is the Diploma Audit System. This system would enable high school students to monitor progress toward the state's mandated, minimum high school diploma, Core 40. This diploma is designed to ensure college readiness, and it consists of 40 units of high school credit that are aligned with what is needed to be successful in college. At the end of each semester, the software would analyze a student's progress and notify him or her of whether or not he or she is on track for fulfilling the Core 40 requirements. The notification not only helps the student, but it also can be used to alert high school faculty, parents, etc., if the student needs help to stay on track for completing the Core 40 diploma.

The new, interoperable system produces the obvious efficiencies of time and effort, but equally important, it creates substantial new opportunities for research and data analysis. As previously mentioned, the transcript information can be downloaded as raw data, which then can be incorporated into a college's student information system or a specialized database. Once the information is available in the database, it facilitates advanced analysis. For example, policymakers now can see how high school students who received certain grades in a particular sequence of math classes perform in subsequent college math and science coursework, disaggregating that information by geographic location or gender. Given the current policy conversations about ensuring all students are college ready, Indiana can more precisely analyze the factors that ultimately influence and improve a student's postsecondary success.

Conclusion

Longitudinal data are imperative for improved instructional, management and policy decisions, but the data only become information once they are used to make better decisions — and they can be used only when they are assembled together in a useful form. Although pockets of interoperability exist in certain states and regions, the education community has not achieved interoperability on a broad scale.

As state policymakers focus on building and using statewide longitudinal data systems, they must ensure that they also address the interoperability of those systems. When state and local data systems are interoperable, there are cost savings, increased staff capacity, improved data quality, and most important, timely and useful information to inform and improve the educational process.

Selected Further Reading

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DATAQUALITY CAMPAIGN
Using Data To Improve Student Achievement
www.DataQualityCampaign.org

The Data Quality Campaign is a national, collaborative effort to encourage and support state policymakers to improve the collection, availability and use of high-quality education data and to implement state longitudinal data systems to improve student achievement. The campaign aims to provide tools and resources that will assist state development of quality longitudinal data systems, while providing a national forum for reducing duplication of effort and promoting greater coordination and consensus among the organizations focusing on improving data quality, access and use.

The Data Quality Campaign has 14 managing partners and numerous endorsing partners. For the list of partners and more information, please visit www.DataQualityCampaign.org.

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