The ESP Journal

Extraordinary insight into today's education information topics

National Education Data Standardization Efforts

The Role of Data Standards in Data Driven Decision Support

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Foreword

I envision a single data standard that every organization adopts, making data interoperability universal. Then, I get real and understand that data standards come in many models with multiple purposes. Too often these days, we just focus on interoperability. Indeed, exchanging data with the least burden, in a timely manner, and without error is significant. However, the prime objective is always using data to answer questions, make decisions, and take action. To that end, there are other dimensions to data standards.

Figure 1 is a new poster depicting the full ecosystem around data standards. The six steps in the data-driven decision-making process are aligned with the four types of data standards. Figure 2 breaks out these steps and aligns them with the standards types.

We've also depicted the history of education data standards in Figure 3. From the founding of the Office of Education in 1867 to the establishment of the leading standards organizations of today, this timeline positions the events that influenced our standards with the standards themselves.

In the January 2023 The EYE Newsletter, we summarized these events in two figures.

> Figure 3A: Automating USED's Data Collections Evolved Quickly in a Two-Decade Span
>
> Figure 3B: Ancestry of Common Education Data Standards (CEDS)

If you're in an education agency. Do you need to adopt a data standard? Let's be more specific. Do you need to adopt a <u>single</u> data standard? Maybe we need to be even more precise. Can you limit yourself to a single data standard?

Clearly, today, the answer is yes, you CAN limit yourself to a single data standard. However, your answer is probably NO, you in practicality can't. After all, your agency exchanges data with many other agencies, applications, vendors, organizations, and systems that adopt their own standards. Even if you adopt a single standard internally, you'll need to exchange your data with others' data in their standards.

Standards are adopted within a community. That community is defined as the entities among whom data are shared. For example, if you're a school district, you can adopt Ed-Fi or A4L/SIF and declare every

application/solution in your school system must be compatible. This is your community. However, if your state education agency's reporting system uses the other standard you didn't adopt, you'll use the other for state reporting to comply because that larger community has a different governance and decision-making authority.

If you're in a state education agency, you control state reporting from your districts as a closed system. Adopting a national standard is not required because you don't have to be interoperable beyond your state borders—your community. However, being aligned with the CEDS standard either directly or through one of the primary national standards organizations can save burden when your federal reporting begins.

Standards today support interoperability. Interoperability is the magic that exchanges data across locations without reentering them, thus saving, time, burden, and errors.

There are three types of interoperability. (Think of each type being defined by a community.)

- **Horizontal** interoperability is exchanging data within an organization. Here it's more possible/practical to adopt a single standard.
- **Vertical** interoperability is from one level of organization to another, e.g., school to district to region to state to federal. The horizontal interoperability standard adopted within each level may differ from the vertical interoperability standard adopted to manage exchanging data upward and downward among the levels.
- **External** interoperability is from the organization to and from another entity such as an association, a university, another branch of government, a cooperative, a vendor, etc. External interoperability is typically governed by memoranda of understanding or contracts among entities with their own standards.

Therefore, interoperability among standards is an essential and significant issue. No single data standard has been adopted universally in the education marketplace. An education agency can't yet simplify its life by adopting a single standard and avoid all contact with other standards.

This imposes an exceptional challenge to national vendors. For example, a SIS vendor operating in multiple states must not only comply with each state's unique business rules, but also each state's adopted standard.

As a contractor, ESP listens to determine what standard the client desires, then our expert technology team delivers a solution based upon it. We implemented the first statewide SIF data collection, then a decade later were the prime contractor for one of the first state-level Ed-Fi solutions. Even before that, we participated in the development of the SPEEDE/ExPRESS standard for exchanging electronic transcripts. Most recently, ESP worked with the Military Child Education Coalition (MCEC) to define and establish in CEDS the Military Child Indicator, which is now a part of ESSA.

The key to success for the education agency is to commit to their adopted standard. That commitment must include a champion, leadership support, adequate funding, competent staffing, and continuity of each of these for a sufficient time for implementation. I dare say that all of the above are more significant for success than which standard is chosen. That's not to say there isn't a better standard for your agency. We can help you make the right choice.

Choosing Ed-Fi in 2018 might bring a grant from the Michael and Susan Dell Foundation and support from a growing community of contributing developing partner agencies. Choosing A4L/SIF might require self-funding, but would bring a broad domestic and international user group with a long history and proven technology. Choosing a custom build using CEDS and ED*Facts*/IPEDS makes for a system compatible with federal reporting and state rules. Choices abound.

> *"The nice thing about standards is that there are so many to choose from."*
>
> *--Stan Jordan, ESP Solutions Group, May 31, 2018*

A data standard encompasses how our data are explained, gathered, and laid to rest; and also how they are protected and then mobilized for action. Excuse the use of nonstandard terms.

Did anyone anticipate a decade ago that multiple standards organizations would be actively competing for your business? Even within standards organizations, there's competition for versions. When should you upgrade from one version to the next? What are the advantages? Are you so far out of sync with the updates that you

virtually have your own standard now? If that version/standard is working within your community, do you need to re-align with the national standard?

This publication steps back and brings the history of education data standards up to date. Barbara Clements wrote a remarkable review in 2005. Two major changes have occurred since that date.

- New standards have joined the effort.
    - They must have seen a gap in what existed and believed they knew how to fill it.
- New staff have joined the local and state education agencies, the government agencies supporting them, and the vendors providing products and services to them.
    - They may not have read Barbara's paper or kept up-to-date on events since 2005.

I, for one, believe strongly that historical context is crucial to understanding current issues and making wise decisions. This paper will be dated as soon as it is published. However, its content will always be significant background for anyone working with standards. This publication is written to provide merely a brief introduction to each of the historical data standards and events.

With that perspective, please spend some time thinking about Figure 1. One might have expected a review of standards to focus mostly on interoperability. Not so here as metadata, access, and usage receive equal attention. All this is always within the context of providing data to answer questions decision makers have.

By Glynn D. Ligon, Ph.D.

President and CEO, ESP Solutions Group

This *Journal* article is a "work in progress." We will continually update entries. Please check our websites for the latest editions. Your comments and contributions are appreciated.

- **www.P20WForum.info**
- **www.ARNIEdocs.info**

The Role of Data Standards in Data-Driven Decision Support

What distinguishes ESP's perspective on this topic is a focus on decisions—the use of data to improve the learning process for students. When No Child Left Behind was passed, the U.S. Secretary of Education asked ESP to write a paper on how states could meet their new challenge for collecting and reporting data. The poster Secretary to Secretary: The Path from Data to Decisions (see Attachment A) illustrated the vision for not only collecting data, but also making the data available all the way back to the original providers. A quote from the poster shows that standards were a key then as well, "Linking software applications for data sharing is the role of technology standards…interoperability, as illustrated here, reduces the burden on school staff, strengthens data quality, and improves timeliness of data collection/reporting efforts."

Toward that end, the data exchanged must not just be right there. The data must be right. The standard for quality data was described in a 2004 poster, A Technology Framework for No Child Left Behind (see Attachment B).

- Get the right data.
- Get the data right.
- Get the data right away.
- Get the data the right way.
- Get the right data management.

Standards and definitions were to be published in a systemwide data dictionary. NCES's Performance Based Data Management Initiative (PBDMI), the predecessor of ED*Facts*, was cited for federal reporting.

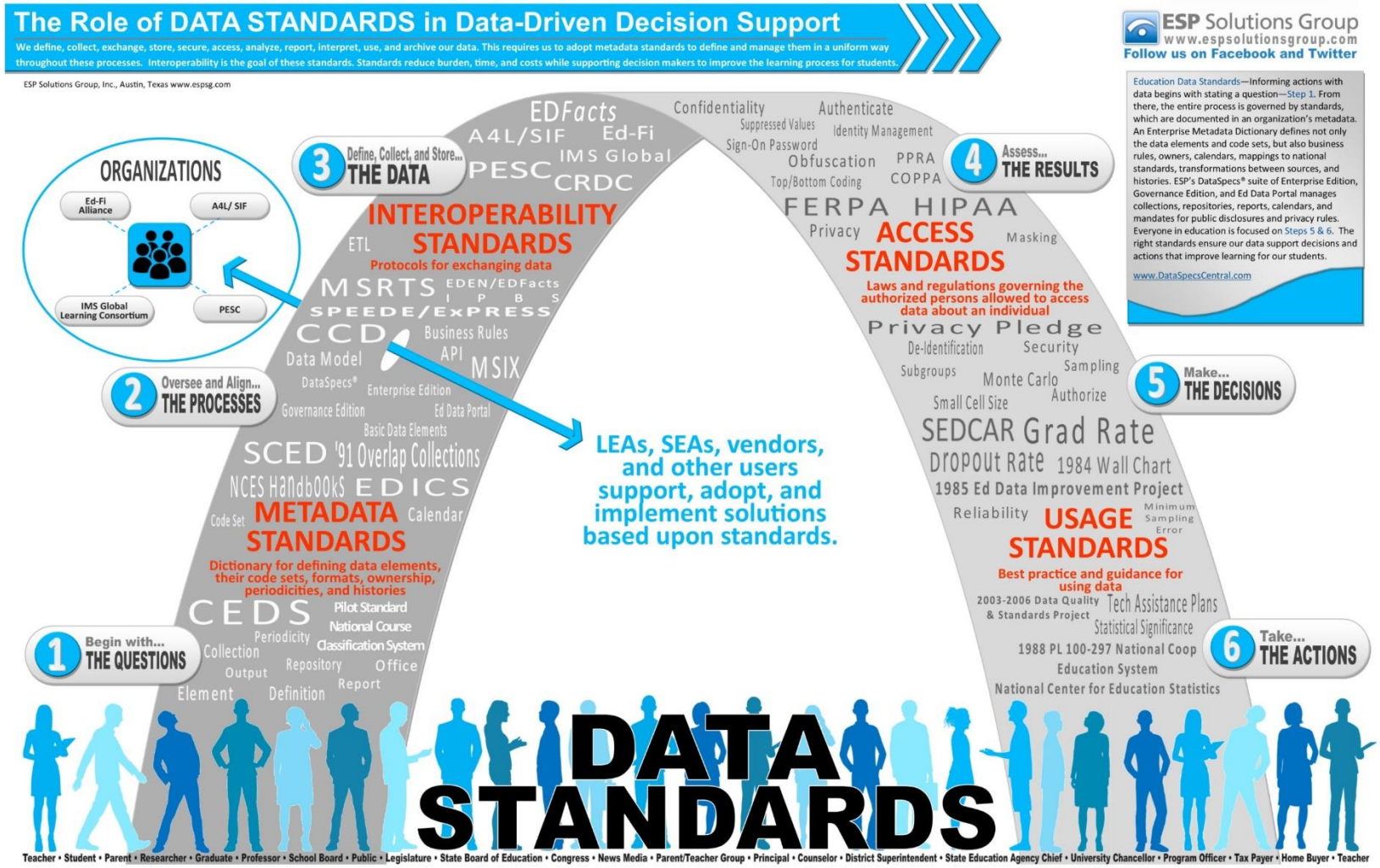

Figure 1: The Role of Data Standards in Data-Driven Decision Support

Today, we have a new poster, The Role of Data Standards in Data-Driven Decision Support (see Figure 1). More than a couple of minutes are needed to take in all the concepts presented on this one. Along the bottom, we have the range of decision makers who impact the learning of students (e.g., teachers, parents, the state board of education, district superintendent, program officer, etc.). These people pose the questions that begin the six-step data-driven decision- support process. At every step, data standards are relied upon to ensure getting the right data, getting the data right, getting the data the right way, getting the data right away, and—in modern terms—getting the right data governance.

The Four Types of Standards Although we think about data standards most often as supporting interoperability, there are four types.

- **Metadata Standards**
  - A dictionary for defining data elements, their code sets, formats, ownership, periodicities, histories, transformations, business rules, collections, repositories, outputs, mandates, mappings to standards, and other descriptions
    - An example is DataSpecs® Enterprise Edition www.DataSpecsCentral.com.
- **Interoperability Standards**
  - Protocols for exchanging data
    - Examples are Ed-Fi and A4L/SIF.
- **Access Standards**
  - Laws and regulations governing the authorized persons allowed to access data about an individual
    - Examples are FERPA, HIPAA, and state privacy laws.
- **Usage Standards**
  - Best practice and guidance for using data
    - Examples are the NCES Forum on Education Statistics Guides.

The six steps in the data-driven decision support process align with these four types of standards as shown in Figure 2.

Data Standard Type	Data-Driven Decision Making Process
Metadata Standards	Step 1: Begin with the Questions
	Step 2: Oversee & Align the Processes
Interoperability Standards	Step 3: Define, Collect, & Store the Data
Access Standards	Step 4: Assess the Results
Usage Standards	Step 5: Make the Decisions
	Step 6: Take the Actions

Figure 2: Alignment of Data Standard Types and Steps in the Data-Driven Decision-Making Process

Understanding and appreciating education data standards is aided by a knowledge of the history of the events that have contributed to them.

Figure 3 is The History of Standards Activities in Education.

This publication is intended to provide merely a brief introduction to each of the standards and events cited.

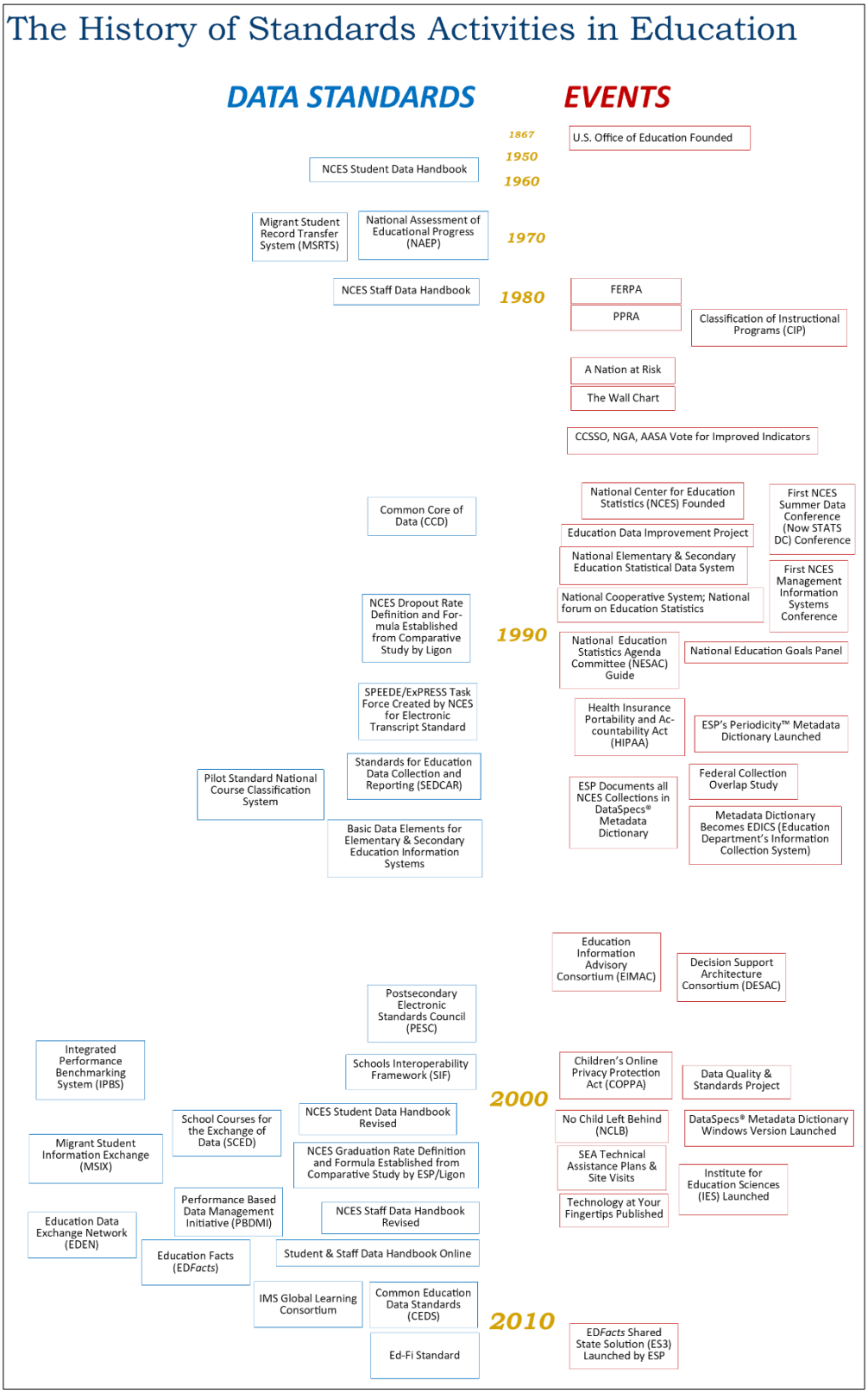

Figure 3: The History of Standards Activities in Education

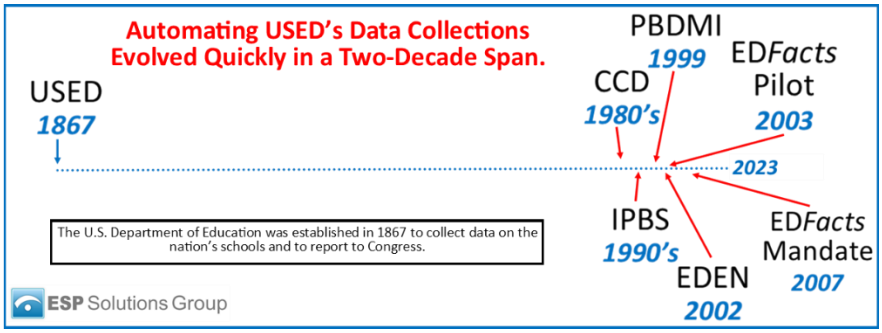

Figure 3A: Automating USED's Data Collections Evolved Quickly in a Two-Decade Span.

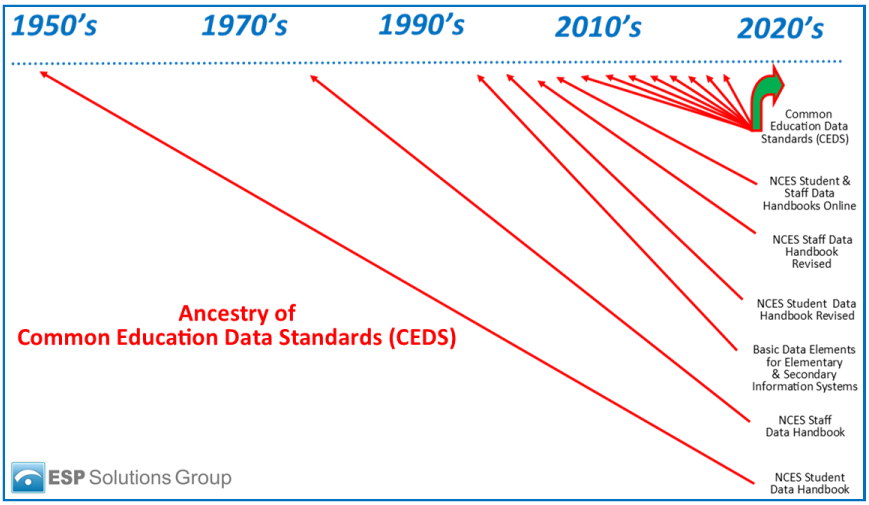

Figure 3B: Ancestry of Common Education Data Standards (CEDS)

Historical Perspective by Barbara Clements Prior to 2005

This first section was originally written by Barbara Clements prior to 2005 for NCES. The content was expanded for an ESP publication titled National Education Data Standardization Efforts in 2005. The history is completed through around 2005 here and slightly updated.

Background & Purpose

Since its birth in 1867, the U.S. Office of Education, and its successor in 1980 the U.S. Department of Education (USED), has had responsibility for the collection and dissemination of national statistics on education. This responsibility has mostly been implemented by the National Center for Education Statistics (1988) and the Institute of Education Sciences (2002). In recent years, Congress has funded through USED numerous grant programs for education entities such as schools and districts to meet the needs of special groups of students. Each of these programs needs information to assess whether federal grant recipients are using the money for the program's stated purpose and according to Congressional intent, and whether there appears to be an impact of the program in the schools.

In 1983, when A Nation at Risk was released by the National Commission on Excellence in Education, our nation became aware of how little it actually knew about the status and functioning of our public schools. When the Secretary of Education's "wall chart" was first published in 1984, there were very few comparable data available that could be used to evaluate state education systems. Indeed, prior to that time, very few state-by-state comparisons were made because of the differences in the characteristics of student populations, the levels of resources available for education, and the curriculum taught in the schools.

Comparing student outcomes was particularly problematic as there was no single test taken by representative samples of students in every state. The resulting focus on education reforms by federal, state, and local leaders led to an even greater need for information about the schools.

The data that were published in the wall chart over the next five years were data that were available, and not necessarily the most appropriate data for comparison purposes. When the Council of Chief State School Officers voted in November of 1984 to work with the USED on the development of more appropriate indicators, it represented a national focus on the need for high quality data that could be used to make reasonable and useful comparisons to improve education in the states

and to look at progress over time. Other organizations, such as the National Governors' Association, the Education Commission of the States, and the American Association of School Administrators also called for the collection and use of high quality data.

ESP Insight
Although USED has collected data about public schools for many years, little was known about the outcomes of public education.

The No Child Left Behind Act (NCLB), passed into law in 2001, presented still another focus on the woeful state of education data. But the focus in NCLB was changed from compliance to accountability. All of a sudden, state education agencies were responsible for ensuring that all students are proficient on state assessments by 2014, and that sufficient progress toward that goal was made in the intervening years. Schools, districts and state education agencies are identified as making "adequate yearly progress" toward the goal for all subgroups of students, including every major racial/ethnic group, economically disadvantaged children, special education students, and students with limited English proficiency. State assessments are required to be given in grades 3-8 and at least once in high school in English/reading/language arts, mathematics, and science (beginning in 2007).

School and district ratings must be reported to the public, especially to parents who may transfer their children from schools that are not meeting state requirements for performance.

ESP Insight
The capacity of USED and states to collect better quality and useful data about public education is greater now because of the ground work that has been done.

These stringent NCLB requirements for reporting on student performance resulted in greater amounts of data being collected about individual students. School districts were required to maintain data in such a way that they can be reported consistently and accurately to state education agencies in a timely manner. The growth of new information systems was immense. As a result, standards for collecting and reporting data became more important than ever.

Fortunately, many activities were conducted in the following years to build SEA and LEA capacity to make comparable, complete, and timely data available for assessing the performance of America's students and the success of schools. This paper summarizes many of those efforts, and points to where additional information may be obtained.

Federally Supported Education Data Related Activities

NCES/CCSSO Data Improvement Projects

Beginning in 1985, the National Center for Education Statistics (NCES) funded a series of projects with the Council of Chief State School Officers (CCSSO) focusing on improving education data. The first of these

projects, the Education Data Improvement Project, was a three-year project looking at improving the comprehensiveness, comparability, and timeliness of data collected, analyzed, and reported by NCES. The beginning of this project coincided with the Department of Education's extensive redesign of the national elementary/secondary education statistical data system. The major focus of this project was the NCES Common Core of Data, a universe collection of data about schools, local education agencies, and state education agencies.

The goals of this project were to describe state collection of data elements included in the Common Core of Data, to describe elements that might be added to make the collection more complete and useful for reporting on the condition of the nation's schools, and to make recommendations to NCES and the states about how to make the Common Core of Data more comprehensive, comparable, and timely. While the tasks varied slightly in subsequent projects, the goals were basically the same. NCES wanted to ensure that all states were reporting timely data using comparable definitions and periodicities. In addition to making recommendations to NCES about how to define certain data elements, the various projects included extensive review of state data collection systems so that recommendations could be made to states for how they could revise their data collections. A list of reports generated through the early projects is included in Appendix A. Many of the reports written in recent years have been published by NCES or the National Forum on Education Statistics. The publications produced by the NCES/CCSSO projects for these organizations are included in the Bibliography at the end of this paper.

The names of the projects are not important. Often the names did not well- describe the activities included. The current NCES/CCSSO project (2003-2006) is called the Data Quality and Standards Project, and represents a continuation of the joint work of CCSSO and NCES to improve the contents and usage of education data systems. The most important activities from these projects are described in the following sections.

Recommendations for Improving the Common Core of Data

As mentioned above, a major focus of the NCES/CCSSO projects has been to help NCES improve the quality of data included in the Common Core of Data (CCD). There are five surveys that make up the CCD:

Public School Universe Survey

Local Education Agency (School District) Universe Survey State Aggregate Nonfiscal Survey

State Aggregate Fiscal Survey School District Fiscal Survey

The purposes of the CCD are to provide:

- The official listing of public elementary and secondary schools and school districts,
- General descriptive statistics on schools and schooling,
- General data on the financing of public education, and
- A sampling frame for major national studies.

The surveys are voluntary. However, certain data collected in these surveys are required in order for states to receive federal funds. Originally NCES paid states a token amount to provide the data. Over the years, many states reported that the funds were merged into the SEAs' general funds; hence the funds did little to assist the state education agency staff in producing the data. As a result, these payments were ceased in the late 1980's.

ESP Insight
For years, NCES has seen the value of working with state education agencies to build consensus around what constitutes high quality data.

Some of the activities related to the Common Core of Data conducted over the next 20 years included the following:

1. Comparison of state definitions and collection procedures to the definitions and procedures provided by NCES to identify similarities and differences. In part this was done by reviewing actual data collection documents. In addition, state education agency personnel were interviewed.
2. Documentation of differences observed and problems with providing data elements.
3. Convening advisory groups of state education agency staff to make recommendations about changes to the contents, definitions, or procedures to make data collection more effective and efficient.
4. Development of state data plans specifying what the states need to do to adhere to the standard definitions and procedures of the CCD.
5. Review of other sources of data or suggestions made by policy makers or researchers.
6. Convening an advisory group of state education agency staff and others to develop recommendations for the inclusion of new data elements in the surveys.

7. Support for personnel exchanges for staff of state education agencies to obtain assistance on data collection issues.

Recommendations were made to add data elements to the CCD, and suggestions were made that would make it easier for state education agencies to comply with data definitions. For instance, it was discovered that states varied on the reporting of students in state-run schools and other institutions such as prisons. Other variations had to do with how dropout and graduate counts were reported. The NCES/CCSSO projects helped to develop a consensus on how the data should be reported so that states could provide more accurate and complete data.

Among the recommendations made were suggestions on areas needing revision in the financial handbook used by most states as the foundation of state accounting procedures, Financial Accounting for Local and State School Systems. Discussions with many persons knowledgeable about school finance and government accounting led an advisory group to suggest that the handbook be revised after the generally accepted accounting principles were revised by the Governmental Accounting Standards Board. The document was eventually revised and republished in 2003.

Technical Assistance for State Education Agencies

In the third of the series of projects, CCSSO project staff turned their attention toward giving clearer guidance to the individual state education agencies about what could be done to improve the comparability and completeness of their data reported in the CCD. Technical Assistance Plans were developed for each state that included information about how long the state believed it would take to come into compliance with the NCES definitions and procedures and what types of assistance would be useful.

Another activity conducted through the NCES/CCSSO projects was the sponsorship of teams of technology and data collection experts to make site visits to state education agencies to provide specific recommendations on how data could be collected and reported more easily. States were invited to apply for site visits.

Eventually, some states requested return visits.

Before each site visit, the team of two-three experts would review documentation sent by the state education agency concerning its data systems, data collections, and future plans. On-site meetings were planned to allow the team to observe the SEA's online data systems and to discuss data collection activities with SEA staff.

Each SEA generally had a particular area in which it wanted to receive recommendations, but the team tried to do a comprehensive review of all data collection and reporting systems in the SEA. Sometimes the team asked to talk with other state agencies with whom it might be productive for the state education agency to work. Since many of the states were building an infrastructure for electronic information exchange within the state, intranets and the Internet were important areas discussed. The result of these site visits was a set of recommendations pertaining to the state's specific needs and problems. Some states used these documents as a blue print for what the SEA should do next.

ESP Insight

State education agencies often did not know where problems existed with their data, or if they knew, did not know how to make effective changes.

Data Handbook Revisions and Development

One of the most interesting and relevant activities conducted by the NCES/CCSSO projects began with the revision of the student and staff handbooks. NCES had a series of data handbooks originally published around 65 years ago. The last time the handbooks had been revised was during the mid-1970's. Most of the people employed in state education agencies in the 1990's had never heard of the handbooks, but thought

they would be useful. Beginning in 1992, the NCES/CCSSO project began work on revising the student data handbook. This revised handbook, the Student Data Handbook for Elementary, Secondary, and Early Childhood Education, was published in 1994, followed a year later by the Staff Data Handbook for Elementary, Secondary, and Early Childhood Education. The Student Data Handbook was revised again under the NCES/CCSSO project and published in 2000, while the revised Staff Data Handbook was published in 2001.

ESP Insight
Critical to the improvement of data quality is the development of clear definitions of data elements.

For each of the revised handbooks in 1994 and 1995, a national task force was convened consisting of federal, state, and local education agency staff, researchers, education organization staff, and others with a vested interest in the content of the handbooks. Using the existing handbooks as a starting point, staff did extensive research into the types of information that might be maintained about students and staff at the school and district levels. A major goal was to include data elements that could be used to produce all federal and state reporting requirements. Each task force met several times over the course of two years to consider new data elements and to provide guidance to the NCES/CCSSO project staff. After the handbooks were drafted, they were each distributed widely for evaluation and recommendations. Many state and local education agencies volunteered to compare their data systems to the contents of the handbooks to see if anything was missing. Other state and local education agencies "piloted" the handbooks, or used them as they made decisions about data elements for their information systems. Information from all these activities was incorporated into the final contents and designs for the handbooks.

The development of the 1994 Student Data Handbook attracted the attention of some groups who thought that the handbook represented the data that the federal government was planning to collect about all students. As a result of this attention, care was taken in describing the uses of the handbook and the restrictions that should be placed on the collection and use of student data. This concern about student privacy led to the convening of a group that developed guidelines for maintaining the privacy of student records, Protecting the Privacy of Student Records: Guidelines for Education Agencies, later revised and called Forum Guide for Protecting the Privacy of Student Information. (For more information on this document, see Appendix B.) A similar document was completed focusing on staffing data, called Privacy Issues for Education Staff Records.

In 1999, the NCES/CCSSO project began work on revisions to the Student Data Handbook. One focus of these revisions was on the types of data collected and maintained by state education agencies in unit records systems. This was an additional focus of the handbook not included in earlier versions, since previously data were generally collected by state education agencies in aggregate form.

With the 2000 edition of the Student Data Handbook, NCES instituted a mechanism for updating the student and staff handbooks on an annual basis as needed. This procedure assumed that major revisions would be needed every five years or so.

Another change was in the distribution of the handbooks. Both handbooks were made available online on the NCES web site as well as in paper format.

There have been two recent profound changes to the handbooks. First, a task force was convened to help the NCES/CCSSO project develop an "institution" handbook that contains data elements about schools, districts, state and intermediate education agencies and programs. These data elements reflect state and federal reporting on schools and districts such as is needed for NCLB.

The second change is the merging of the student, staff and institution data handbooks into a combined online handbook that offers extensive search capability, called the NCES Nonfiscal Data Handbook for Early Childhood, Elementary, and Secondary Education. This new format eliminates much of the redundancy across the handbooks and standardizes the code sets. The intent is to add data elements from subsequent handbooks developed by NCES and the National Forum on Education Statistics into this online database, such as data elements on crime and violence, technology, and food services. NCES has instituted an annual review of the handbooks because it is much easier to add new data elements into the online database than it was the paper document.

(The Web addresses for paper handbooks and the online handbook are available in Appendix B.)

NCES Data Dictionary

One project conducted as a part of the NCES/CCSSO project was the development of a prototype for a data dictionary for NCES by Evaluation Software Publishing, Inc. (now ESP Solutions Group, Inc.). All of the NCES data collections were entered into a product called Periodicity™ (now named DataSpecs®) along with all of the questions included in each

data collection. This product shows where the same data are requested, and highlights any differences in how the questions are asked. Full implementation of this data dictionary was not accomplished during the project, although the contents were posted on the ESP Web site. This work served as the groundwork for the development of a data dictionary for the Education Department's Information Collection System (EDICS).

SPEEDE/ExPRESS

The idea to develop a standard national format for student records was suggested by representatives of the Florida Department of Education in the late 1980's.

Florida had just completed work on a proprietary student record format to be used for record exchanges by the elementary/secondary and postsecondary education institutions within Florida. The challenge from the Florida Department of Education was to see if a national format could be developed and implemented.

In 1989, NCES appointed a task force consisting of state and local education agency staff, postsecondary institution registrars, and education organization leaders to work on the development of a standard format for a K-12 student record. At the same time, another group, sponsored by the American Association of Collegiate Registrars and Admissions Officers, was working on the design of a postsecondary transcript format. While originally separate, the two groups agreed to work together toward the goal of having a format that would contain information needed when a student transferred from one school district to another, from a school district to a postsecondary institution, and from one postsecondary institution to another. The name of the format represents the postsecondary and elementary/secondary task force names. SPEEDE stands for Standardization of Postsecondary Education Electronic Data Exchange, and ExPRESS stands for Exchange of Permanent Records Electronically for Students and Schools.

The two task forces were managed by the Council of Chief State School Officers and the American Association of Collegiate Registrars and Admissions Officers with funding from NCES. These groups coordinated their efforts to ensure that the standard format was maintained through the ANSI X12 Subcommittee (Electronic Data Interchange), and they provided guidance, training, and assistance to implementers. Stewardship for the postsecondary community's efforts was incorporated into the Postsecondary Electronic Standards Council (PESC),

which oversees further development of the standards and provides workshops for the postsecondary community.

ESP Insight
The development of a format for electronic student records occurred long before the national K-12 community was ready or able to take advantage of it.

The two task forces jointly developed a standard format that is in compliance with the requirements of the American National Standards Institute's X12 Subcommittee, Electronic Data Interchange. Actually, there are four related formats for transaction sets, one of which is the student transcript. The other transaction sets are for a request for a transcript, a response to the request if a transcript is not sent, and an acknowledgment of receipt of the transcript. An important document coming out of this project is A Guide to the Implementation of the SPEEDE/ExPRESS Electronic Transcript, which contains information about how to implement all four transaction sets.

The formats for data elements in SPEEDE/ExPRESS (taken from X12 requirements) have served as a basis for many of the data elements included in the student and staff handbooks. The formats were not always used, however, because they were not commonly used in schools and districts or they were not the most efficient data elements to be used. The X12 process requires a process of coordination and consensus among vastly different industries such as transportation, manufacturing, communications, insurance, mortgage, and health, as well as education. The student transcript was the first transaction set with information about individual persons.

Many postsecondary institutions have implemented the electronic transcript process using a free exchange service hosted by The University of Texas at Austin.

Implementation by elementary/secondary schools and districts has been slow to occur. In part, the problems with implementation by universities, schools and districts have been due to the cost of entry into EDI exchanges. Although the UT Server is free, software must be purchased to translate data from student information systems into the EDI transcript format. Some large universities have been able to afford and staff such implementations, but it still requires a major dollar and time commitment from an institution to get started.

Dropout Rate Definition

Beginning in 1987, the NCES/CCSSO project focused on making recommendations about the collection of standard dropout data from all state education agencies. A task force was convened to look at the possibility of collecting dropout data according to standard definitions,

after comparing the methodologies used at the time by states. The task force also considered the appropriateness of trying to report standard dropout rates for all states. Prior to the NCES/CCSSO projects, CCSSO was committed to not supporting state-by-state comparisons. The recommendations from this activity were considered quite progressive, if not controversial.

NCES began working with states to move toward the collection of dropout counts from state education agencies and the production of dropout rates at the state level. An important basis for this discussion was a paper written by Dr. Glynn D. Ligon and colleagues at the Austin (Texas) Independent School District, called "Making Dropout Rates Comparable: An Analysis of Definitions and Formulas." Further meetings were held to discuss issues related to comparable data collection and reporting. Pilot activities were conducted to see what was the feasibility of getting comparable dropout data from all states. Also, careful attention was given to the comparison of the recommended formulae for computing rates to the formulae used by states at the time. Some states were not willing to move to the standard formula that would show their dropout rates to be higher than rates used locally. In a recent NCES report on dropouts, 45 of the states provided dropout counts that complied with NCES definitions and procedures.

Graduation Rate Definition

ESP Insight
The scope of the dropout problem could not be assessed until there was agreement on the appropriate measure of the problem.

Similar work has been done by the NCES/CCSSO project to focus on standardizing the way that graduation rates are reported. CCSSO convened a task force to look at making recommendations about how to collect data on graduates and other completers and on how best to compute graduation or completer rates. The basis for much of the discussion was a comparison of how states report completer data in the Common Core of Data. For instance, the inclusion of special education students in the regular graduate counts varied from state to state. In addition, states varied as to whether they gave Certificates of Completion or Certificates of Attendance to those students not meeting graduation requirements such as graduation tests. Another issue raised was whether or not to include high school equivalency recipients (e.g., completers of the General Educational Development test requirements) in the graduation rate.

The recommendations called for the development of a quasi-longitudinal completer or a graduation rate that had as its inverse the dropout rate. The basic formula has as its numerator the count of all completers and as its denominator the count of completers plus the grade 9-12 dropouts for the four relevant years. The completers count might only include regular high school graduates or it could include high school graduates plus high school equivalency recipients and other completers. Each would tell a different story. This formula could easily be done by NCES using data from the CCD to the extent that states were providing data in compliance with NCES definitions and procedures. Subsequent work done by NCES showed the effect of using various rates. Recommendations were released in January 2000.

ESP Insight
The public generally considers the dropout rate to be the inverse of the graduation rate; however, the accurate measure of either makes such a comparison problematic.

New work has focused on developing a comprehensive and logical set of exit codes for tracking what happens to students who leave a school.

Study of Overlap in Federal Collections

In 1991, the NCES/CCSSO project produced a paper titled, "A Study of Availability and Overlap of Education Data in Federal Collections." This paper was developed at the request of two committees of the National Forum on Education Statistics: the Implementation Task Force and the Policies, Practices, and Implementation Committee. The goal was to see if redundancy existed among the different collections done by Federal agencies in order that duplication might be eliminated or reduced.

Two main categories of data were identified to be studied: participation and progress variables and student membership variables. ED data

collections focusing on elementary and secondary education were reviewed from NCES, the Office for Civil Rights, the Office of Special Education Programs, Chapter 1, the Office of Bilingual Education and Minority Languages Affairs, and the Office of Vocational and Adult Education. In addition, some collections were reviewed from other federal agencies, such as Department of Health and Human Services, the Department of Agriculture, and the Equal Employment Opportunity Commission.

ESP Insight
The perception is that there is much redundancy in federal data collections; however, it appears the problem is the same types of data are collected about various subgroups of students.

The findings of this study indicated that there was only one data element where there was no difference in universe or definition. Most of the other data elements (22 data elements) had different universes being measured (i.e., groups of students participating in different programs), but the definitions were the same. There were also 12 data elements where there were different definitions used and/or different collection times. To assist states in providing comparable data, there is a need to standardize data definitions and collection periods.

National Forum on Education Statistics

The Hawkins-Stafford Education Improvement Amendments of 1988 (Public Law 100-297) established the National Cooperative Education Statistics System to "produce and maintain, with the cooperation of the States, comparable and uniform education statistics." To assist in meeting this goal, the National Center for Education Statistics (NCES) created the National Forum on Education Statistics (the Forum). The Forum is an advisory group to the Commissioner of Education Statistics. From the beginning, it has consisted of representatives of each state education agency (including the District of Columbia, the five extra-state jurisdictions, and the Department of Defense Education Activity) and federal offices that collect and use education data as full members, and representatives of education associations as associate members. The Forum has now expanded to include one school district person from each state as a full member as well. Forum activities are generally conducted by three committees:

- National Education Statistics Agenda Committee
- Policies, Practices, and Implementation Committee
- Technology, Dissemination, and Communication Committee

In addition to doing work on its own, each committee can recommend the convening of a task force to address issues of particular interest. While some of the task forces have focused more on Forum policies or

procedures, many have concentrated on making recommendations related to improving the national education statistics system.

The Forum has served as an important means for state and local education agency staff to share information about what is happening in their offices. Through support of the annual Summer Data Conferences and the Management Information Systems Conferences, the Forum has given education agencies the opportunity to learn what is considered "best practice" in education information and how to avoid many of the pitfalls experienced by others.

ESP Insight
The Forum provides for much needed state and local participation in data quality development.

Following are descriptions of some of the Forum activities and products that relate to the issue of data standardization and timely reporting.

NESAC Guide

The first major product of the Forum was the document, A Guide to Improving the National Education Data System. This guide contains an evaluation of the quality and availability of data about elementary and secondary education.

Recommendations for improving the system's usefulness are included in the following areas:

- Background/demographics
- Education resources
- School processes
- Student outcomes

Many of the recommendations represent data not currently collected by the National Center for Education Statistics or others within the U.S. Department of Education. What is important about this document is that it reflects a consensus of what data would be useful to make effective decisions about education, recognizing that there would be significant effort needed to collect much of the recommended data. However, the Guide did not call for all data to be collected immediately nor on a universe basis.

The Guide provides a blueprint for thinking about useful data for decision making. NESAC recognized that the Guide could not be static; as needs for more and better data arise, changes will be needed in the contents. Still, the structure would stand and provide guidance to those seeking other types of useful data.

Basic Data Elements

The Forum decided that it would be useful to have a document that specified the most important data elements for inclusion in an administrative record system, primarily at the local level. In part, this idea came about because many people who reviewed the student and staff handbooks felt overwhelmed by the number and breadth of data elements. Many asked that the most important data elements be marked so that they would receive the consideration they deserved.

This task turned out to be a difficult one, and the task force charged with identifying the basic data elements felt the need to break the task into manageable chunks. The first chunks addressed were data on students and staff. The task force used three different means of identifying data elements for inclusion in the basic set. They felt that data elements needed for basic administrative needs should be included. In addition, they wanted to include data elements needed to complete federal, state, and local reporting requirements. Finally, the group developed a list of important questions that should be answered to evaluate the quality and success of education systems. They included in the list of Basic Data Elements the data elements needed to answer those questions, to the extent possible.

ESP Insight
Identifying crucial data elements is not an easy task; there are many different perspectives on which data should be maintained at the various levels of the education system.

The result of this work was a document, Basic Data Elements for Elementary and Secondary Education Information Systems. This initial document contained only recommended student and staff data elements, most of which related to the areas of background/demographics, school processes, and student outcomes specified in the Guide. The task force felt that the next phase should include data elements on resources as well as any specialty areas such as crime and violence, facilities, and special programs.

In addition to specifying the data elements and including the data element definitions from the student and staff handbooks, this document contains a description of the process used to identify basic data elements. It was felt that this process would be useful to any school, district, or state education agency faced with the task of identifying what data elements to include in a data system.

Crime and Violence

Responding to the need for information about drug-free schools and incidents of crime and violence in schools, the Forum established a Crime, Violence and Discipline Task Force in the spring of 1995. The result of their work was a set of recommendations detailing additional work needed. Subsequent task force work resulted in a document called Safety in Numbers: Collecting and Using Crime, Violence, and Discipline Incident Data to Make a Difference in Schools. This document addresses the need for incident information as well as the type of information needed in a student record. The task force developed recommended data elements and definitions for different types of incidents and recordkeeping. Information from this document was added to the NCES Nonfiscal Data Handbook for Early Childhood, Elementary, and Secondary Education.

Facilities and Facilities Management

One area identified as necessary by the Basic Data Elements task force was the area of facilities information. NCES previously had a handbook on facilities, and in recent years, had worked with the postsecondary community to create a postsecondary facilities handbook. Publicity about the crumbling infrastructure of public schools also contributed to this perceived need.

NCES handbooks tend to be comprehensive collections of data elements. The task force quickly found that coming up with a complete listing of facilities data elements would be a much larger task than they were willing to tackle. Several states had put together surveys to obtain

information from their schools about the age and status of their buildings. These surveys were used to help define basic data elements for use in "understanding the condition, adequacy, and capacity of education facilities." As a result, the document, titled Facilities Information Management: A Guide for State and Local Education Agencies (2003), is meant to represent best practice in maintaining essential information about school facilities so that important decisions can be made. Subsequent work resulted in a document called, Planning Guide for Maintaining School Facilities (2003).

ESP Insight
Good record-keeping and effective decision making require data on more than just students and staff.

Technology

Technology has become an important focus of the National Forum on Education Statistics. Much of the work that has been done to standardize data elements has been based on the ability to exchange data electronically without the need for re- entering the information. In addition, crosswalks between different formats have helped to promote data standardization. Three documents were produced by the Forum that provide guidance on implementing electronic data systems. They are Technology @ Your Fingertips, Safeguarding Your Technology, and Weaving a Secure Web Around Education: A Guide to Technology Standards and Security (2003).

Technology in Schools: Suggestions, Tools and Guidelines for Assessing Technology in Elementary and Secondary Education (2002) contains information about data collection related to education technology, including information about hardware, software, and networks within schools and other education agencies. This represents an increased national focus on the use of technology effectively in schools and as a leveler of the playing field for rural and poor areas. (Information about these documents is included in Appendix B.) The State Education Technology Directors Association used this last document in helping to define what they considered to be essential data elements on education technology.

All of these documents have now been combined into what is called the Forum Unified Education Technology Suite (2005).

Automated Student Record Systems

The National Education Statistics Agenda Committee recommended that a separate document be created describing how to build an automated student record system. The basis for this document, Building an Automated Student Record System (2000), was a chapter in the Student Data Handbook for Elementary, Secondary, and Early Childhood Education. In addition to the chapter information, this document contains checklists and case studies presented in an easy to use format for state and local education agencies.

ESP Insight

Technology is the key to collecting, maintaining, and using data effectively. While technology changes over time, decisions about selecting appropriate technological solutions require tried and true procedures.

Finance

The Finance Data Task Force was established after the first phase of the Basic Data Elements activity was completed. There were two areas of concern relating to financial data. One area had to do with revising the handbook, Financial Accounting for Local and State School Systems, discussed earlier. Another had to do with the selection of basic data elements related to financial accounting. In the initial stages, much work was done to identify shortcomings of the existing financial handbook. Then the revision awaited changes to the generally accepted accounting practices. The revision of the NCES Financial Accounting for Local and State School Systems: 2003 Edition was completed in 2003. However, the Forum has not yet moved to identify basic data elements related to finance.

Confidentiality of Student and Staff Records

ESP Insight

Appropriate maintenance and sharing of student and staff information is not simple; with these guidelines, education agencies can make decisions that are consistent with law and best practice.

Beginning in 1997, Forum members expressed a concern about the confidentiality of data maintained in student information systems to meet the requirements of the Family Educational Rights and Privacy Act (FERPA). A task force was created to develop a document that would be useful for all levels of the education system.

The resulting document, since revised and updated, is the Forum Guide to Protecting the Privacy of Student Information: State and Local Education Agencies (2004).

Though FERPA is not relevant to staff data, and most states have Open Records Laws, there are areas where sensitivity is needed in maintaining staff records. Therefore, the task force went on to produce another document called Privacy Issues in Education Staff Records (2000).

Focus on Obtaining Quality Data

The Forum Guide to Building a Culture of Data Quality: A School and District Resource was developed by the Forum's Data Quality Task Force to help schools and school districts improve the quality of data they collect and to provide processes for developing a "culture of quality data" by focusing on data entry. The task force believed that the quality of data would improve if all staff members understand how the data will be used and how data become information. Individual check lists are provided for different types of local staff. Additional work is now being conducted by a task force to develop a "data quality curriculum."

Other NCES Activities

NCES has conducted numerous other activities focused on improving the quality and comparability of education data. Three examples are listed below.

Course Classification System

In 1995, NCES published A Pilot Standard National Course Classification System for Secondary Education. This handbook was produced at the request of many educators who desire to study and evaluate the course-taking patterns of American students. It was felt that an important role of this type of coding system would be to help ensure that students are appropriately placed when they move from one district to another. In addition, colleges and universities would like to have standard information about what courses students have taken in order to evaluate and place them when they enter college. The document was called a "pilot" because of the evolving nature of secondary courses. It was hoped that the adoption and usage by state and local education agencies beyond the original 11 pilot school systems would help to identify where adjustments are needed in the coding system. This coding system was an important ingredient of the SPEEDE/ExPRESS effort to exchange standard student data electronically. As of Fall 2005, this course classification system is undergoing review and revision.

ESP Insight

Tracking student progress and exchanging student records can benefit greatly from standard course codes, such as these.

Postsecondary Higher Education Handbook on Human Resources

This document, Handbook on Human Resources: Recordkeeping and Analysis, was developed by NCES in response to the need of the postsecondary education community for common data categories and definitions in the area of human resources. In addition to listing data elements, this handbook contains suggestions for strategic analyses that higher education institutions might want to conduct to explore issues related to effective human asset management.

Higher Education Facilities Handbook

This document, Postsecondary Education Facilities Inventory and Classification Manual, provides a comprehensive description of data elements related to facilities found at institutions of higher education. NCES looked closely at this handbook to see if it could be generalized to elementary/secondary facilities. While not directly useful, it has been used as input into the activities of the Forum's Facilities Task Force.

Standards for Education Data Collection and Reporting

In 1991, NCES published a document called Standards for Education Data Collection and Reporting (SEDCAR). This document was the result of the work of a task force consisting of data providers, producers, and users at the local, state, and federal levels. The goal of the project was to improve the comparability, comprehensiveness, and timeliness of data collected through the National Cooperative Education Statistics System. These standards deal mostly with procedures that should be used. However, an important point made in the document is the criticality of commonly used, standard definitions for data elements.

ESP Insight

The implementation of a system for collecting and reporting of data requires the planning for many stages in the process.

National Education Goals Panel

In September 1989, President George H.W. Bush and the nation's governors met in Charlottesville, Virginia, where they adopted a set of national goals for improving the quality of US schools. As a result of this Education Summit, the National Education Goals Panel (NEGP) was formed. The NEGP began with six goals for student performance that required standard data with which states' performance could be compared from year to year. The goals were later expanded to eight, and added a focus on life-long learning, not just school-based education. Each goal had a resource group that was charged with coming up with appropriate comparable data to be used to evaluate states' performance. Most of the resource groups recognized the lack of appropriate data and struggled to come up with data that could be collected from all states that were comparable and complete. Data from a variety of sources, not just the federal government, were used in evaluating the goals.

The second goal focused on increasing the graduation rate. The resource group for the second goal found that the most comparable data available were from the Current Population Survey conducted by the U.S. Bureau of the Census. These data were not, however, useful for evaluating the efforts of public schools. The resource group was warned that unless states could follow what happens to every student when they change

schools or leave school, there would never be a truly accurate graduation rate or dropout rate for a state.

The greatest hope for comparable data about public schools was the use of administrative records that could be updated to reflect changes in student status as well as other information of interest to the NEGP. To assist the Goal 2 Resource Group, a document was developed, titled "Statewide Student Record Systems: Current Status and Future Trends." In addition, a technical planning subgroup on core data elements was convened to look at making recommendations about what data elements could be obtained through local administrative records systems to address all of the goals. The result of this activity was a document called, "Core Data Elements for Monitoring Progress Toward the National Education Goals." Much of the information in this document was based on work done in the revision of the Student Data Handbook.

ESP Insight

The National Education Goals Panel succeeded in promoting the development of better quality assessments and the implementation of more standard data collection.

In the ten or so years of the NEGP existence, there were annual reports comparing state performance from year to year with data coming from a variety of sources. One result of the goals effort was the support for additional information to be collected through the NCES Common Core of Data, as well as the use of other sources of data to assess performance and school improvement.

Other Department of Education Data Standardization Efforts

Over the years, many of the ED program offices have made attempts to bring together their data providers and promote the reporting of standard data.

However, some of the reporting formats used by program offices do not lend themselves to standard sets of data; rather they tend to be more open-ended. In part, this is because the various ways that federal dollars are used at the local level differ so much as to be impossible to categorize according to a few categories.

Data quality training provided by the ED Office of Planning and Evaluation Services in 1999 urged program offices to look at ways they could promote data quality, including working with the state and local data providers.

Some program offices have hosted annual meetings of data providers to promote data comparability. The Office of Special Education Programs (OSEP) is one such office. This has been especially important for OSEP as

the legislation related to special education programs changes frequently. It is interesting to note that many states do not use the same categories of special education needs as OSEP requires in its reporting. This has meant that some states have duplicate data systems, do crosswalks, or estimate numbers based on samples in order to meet OSEP reporting requirements. The OSEP meetings include speakers from other education data areas, a practice that helps to promote data sharing and standardization.

The Office of Vocational and Adult Education has also hosted meetings with a focus on data standardization. A task force was convened to look at what data could be standardized across states for federal reporting. Unfortunately, the structure and record-keeping of vocational education varies so much across states that little agreement was possible. As a result, there is little standard data to show the impact of these programs on students.

Below are descriptions of several ED activities that have promoted or are promoting standardization of education data.

Migrant Student Records

For many years, ED funded the Migrant Student Records Transfer System (MSRTS). This data system, housed at the University of Arkansas, was meant to contain information about all of the students who moved around the nation during the school year because they or their parents were involved in the farming or fishing industries. A major purpose of this system was to contain information about courses completed and other relevant information schools needed to ensure that entering migrant students would get the educational and support services they need. A standard set of data elements was identified and maintained on students. In developing the Student Data Handbook and the SPEEDE/ExPRESS format, data elements from this system were included. Unfortunately, sending schools and districts often did not update information about the students who left in time for the receiving schools and districts to use it. As a result, funding for this system was eliminated in the mid-1990's.

Congress mandated USED in Section 1308 (b) of the *Elementary and Secondary Education Act*, as amended by the *No Child Left Behind Act of 2001* (NCLB), to assist states in developing effective methods for the electronic transfer of student records and in determining the number of migratory children in each state; and in Section 1308 (b)(2)(A) to link migrant student record systems. The Migrant Student Information

Exchange (MSIX) exchanges education and health information on migrant children.

The primary goals and objectives of the Migrant Records Exchange Initiative are to:

Goal 1: Create an electronic exchange for the transfer of migrant student education and health data amongst the States.

Objective 1.1: Design, develop, and build the Migrant Student Information Exchange.
Objective 1.2: Efficiently collect and maintain complete and accurate migrant student education and health data needed for the purpose of record exchange.
Objective 1.3: Provide users with a consolidated migrant student record in a timely manner in order to facilitate enrollment, placement, and accrual of credits for migrant students.
Objective 1.4: Reduce the burden of collecting, maintaining, and exchanging migrant student records.

Goal 2: Promote the use of MSIX.
Objective 2.1: Conduct consultation with States in the design, development and implementation of the MSIX.
Objective 2.2: Disseminate information on the requirements, Availability and benefits of the MSIX to prospective Users.
Objective 2.3: Provide training and help desk support to data users and providers.

Goal 3: Ensure the use of the consolidated migrant student record for the purposes of enrollment, placement, and accrual of credit of migrant students in school and migrant education projects.
Objective 3.1: Monitor compliance with records exchange requirements for the production of the consolidated migrant student records.
Objective 3.2: Monitor the use of the consolidated student record for the intended purposes of school enrollment, placement and accrual of credits.
Objective 3.3: Provide best practices, incentives, and penalties to continuously encourage and expand the use of the consolidated record.

Goal 4: Produce national data on the migrant population.
Objective 4.1: Provide the stakeholders with census data and statistics on unduplicated national migrant population.
Objective 4.2: Use unduplicated data for the generation of accurate, consistent child counts.

ESP Insight
The need for a more efficient electronic exchange of migrant student records is crucial and ongoing.

Since the funding was eliminated for the MSRTS, groups of state education agencies have joined together to use various systems or methods to make sure important information goes with the migrant students. Presumably the same data elements used in the MSRTS are still being used. Some of these systems have benefited from the use of the student handbook in choosing important data elements and definitions.

A new national migrant student system is slated to be developed during 2005- 2006. With the support of the USED Office of Migrant Education, a revised set of data elements has been identified for maintenance of information about Migrant Students, both in state systems and in the new central record system. It is hoped that this new system will better serve the students' and schools' needs as well as providing more accurate summary data about the students.

Joint OCR/OSEP Pilot Data Collection

In the 1990's, the Office of Special Education Programs (OSEP) and the Office for Civil Rights (OCR) began collaboration on a project to reduce overlap in data collections and promote the quality of data. Working with five state education agencies on a pilot, OSEP and OCR obtained information from state special education data systems concerning special education programs at the local school district and school building level. The goal of this activity was to reduce the overall amount of information local education agencies must provide to OCR. However, the benefit of such an activity was that the data for OSEP and OCR were from the same data system. The end result was expected to be better data for OCR and the potential for using OSEP and OCR data together for analytical purposes.

ESP Insight
USED Program Managers have become increasingly aware of the need for better quality data, that is, data that are needed and used at the local levels and are not collected solely for reporting to the federal government.

Data Quality Training

In the fall of 1999, the Office of Planning and Evaluation Services conducted a series of data quality workshops for program managers in ED. ESP Solutions Group conducted the workshops using a guidebook developed with ED. The training guide provided standards for data quality illustrated by examples from real life. An important focus of these workshops was on preparing program managers to attest to the quality of the data used as performance indicators for the programs. Much of this training stressed the processes that could be used to help clients provide high quality data, including the standardization of data definitions and data collection procedures. The document Guidelines for Evaluating the Quality of Program Performance Data was provided as a resource for use by all program personnel.

Metadata Dictionary Efforts

NCES had conducted a prior study of the redundancy of data collections by ED offices, so in 1995, when ESP Solutions Group's founder, Glynn Ligon, proposed a more formal documentation, the states in the Mid-West Consortium agreed to participate. Using ESP's software named Periodicity™ and later upgraded to DataSpecs®, this project documented each state's and ED's collections and data elements. This effort led into later activities including the Integrated Performance Benchmarking System (pilot), Performance-Based Data Management Initiative and the Education Data Exchange Network metadata dictionary standards.

ESP Insight

Once fully implemented, EDEN will ensure that there are useful accountability data available at all levels of the education system.

Education Data Exchange Network (EDEN)

Throughout the 1990's, ED's Evaluation Review Panel commented on the disparate data collection methods and standards across ED's major evaluations. The overlap of data collection activities placed a burden on the schools, districts, and states to participate in studies that required extensive and sophisticated samples. Beginning in 1999, state education agencies joined with ED to conceptualize a truly integrated data system. Originally called the Integrated Performance and Benchmarking System (IPBS), ED sponsored a pilot activity looking at ways to harvest standard sets of data elements from state education agencies' data systems about federal programs. One of the major components of this effort was the identification of a set of data elements with standard definitions that would be used by many federal programs to help in evaluating the success of the programs. This activity promised to make data more useful and more readily available to the various programs and decision-makers, as well as reducing data reporting burden to the states.

In 2002, ED moved ahead on the promise of IPBS into the full development of the Education Data Exchange Network (EDEN) as a part of the Performance-Based Data Management Initiative. EDEN was designed to collect statistical data needed for accountability reporting on federally funded programs. From the beginning, the focus was on collecting standardized high quality data about state formula grant programs, based on ED Program Office information needs. Data elements were identified to meet the information needs using the NCES handbooks, current data collection documentation and review of data currently available in state education agencies.

As a part of this effort, each state was visited by a team of two people knowledgeable about state data systems in 2003 and 2004. The team documented the availability of state data and adherence to standard

definitions needed to meet the EDEN reporting requirements. ESP Solutions Group managed the recruitment, training, and supervision of these teams and the documentation of each state's status.

The EDEN collection is expected to meet the reporting requirements for many of the ED programs; however, there are special data needs that are not statistical or are needed from only a sample of education organizations. For these needs, an electronic survey has been developed.

The EDEN collection represents a major turning point for USED. In partnership with state education agencies, this collection will mean better and more timely data for the Secretary of Education and others within the education community.

Information on EDEN is available online at www.ed.gov/EDEN

Education Data Activities Supported by Other Organizations

CCSSO Data Related Activities

The Council of Chief State School Officers has conducted data standardization activities in addition to the work done through the NCES/CCSSO project. Each time they are surveyed, chief state school officers note that one of their greatest needs is a data system that can provide essential answers to questions about the success of schools in helping students to meet high standards, as well as other questions about school resources, teacher supply and demand, and the financing of public schools.

Following are descriptions of several activities undertaken by CCSSO to meet data needs identified by chief state school officers. These efforts tended to promote the collection of the same data by all, rather than specifying how the data should be collected (and defined). Information about these projects and copies of many of the documents are available online at www.ccsso.org.

Measuring Results: Overview of Performance Indicators

The State Education Improvement Partnership (consisting of CCSSO, Education Commission of the States, National Associate of State Boards of Education, National Conference of State Legislatures, and National Governors' Association) convened a task force to identify performance indicators that could be used to assess states' progress in meeting state goals. The final document, "Measuring Results: Overview of

Performance Indicators," contains a list of suggested indicators that could be used to assess state progress. While they did not specify what data elements would be needed to create the indicators, there were fairly specific definitions of the indicators included.

Limited English Proficient Student Data Recommendations

Funded by a grant from the Andrew Mellon Foundation of New York, this project was a joint effort of CCSSO's State Education Assessment Center and the Resource Center on Educational Equity. Based on research about what was being done by states, a task force made recommendations about what data should be collected to assess the language proficiency of English language learners and to monitor their progress through the educational system. The final document from this project is titled, Recommendations for Improving the Assessment and Monitoring of Students with Limited English Proficiency.

State Education Indicators with a Focus on Title I

This publication was produced by the CCSSO State Education Assessment Center with funding from the Planning and Evaluation Service of the U.S. Department of Education. The report, State Education Indicators with a Focus on Title I, was an annual publication that contains state-by-state information on the characteristics and performance of schools and students in each state. While this activity does not work to develop standard definitions, it reported data in a standard format across states, something that is critical to understanding and interpreting data.

ESP Insight

Areas where new or better data are needed benefit from the focused attention of those who have the greatest need for the data, such as state education agencies.

State Indicators of Science and Mathematics Education

This publication contains information about science and mathematics instruction in the states. Funded by the National Science Foundation, the project has worked with representatives of state education agencies to collect standard data about student achievement, content and instruction, teacher preparation and supply and conditions for teaching. Many of the states are now using the data elements in this model to evaluate the provision of instruction at the school and district levels in science and mathematics as well as in other subjects.

EIMAC

The Education Information Management Advisory Consortium of CCSSO provides a valuable service to the chief state school officers. This committee, made up of representatives of state education agencies, represents SEA chiefs and staff on national data issues, collaborates in

the planning of national data initiatives, provides guidance on national data collections and assessments, and provides networking and professional development opportunities for SEA data and assessment staff. This group meets twice a year, and two task forces funded by ED meet an additional two times a year to advise on NAEP issues and PBDMI/EDEN.

Decision Support Architecture Consortium (DSAC)

The Decision Support Architecture Consortium (DSAC) was a collaborative effort to help states develop data systems that make information available and easily accessible for more effective decision making. Included are decisions that affect all state constituencies--student/parent, classroom, school, district, state and federal. Included in their work are topics related to curriculum management, education certification, formative assessments, internal logistic management, portals, and student IDs. DSAC activities were co-sponsored by CELT Corporation and CCSSO.

Schools Interoperability Framework

Beginning in 1999, a group under the leadership of the Software and Information Industry Association began developing a set of standards for software applications to use when sharing data. The Schools Interoperability Framework (SIF) is the name that has been given to the technical interoperability specifications for K-12 instructional and administrative software, now managed by the Schools Interoperability Framework Association (SIFA). SIFA is made up of representatives of K-12 software vendors and users from the education community. The goal of this activity is to reduce administrative burdens based on differences in the way information is stored, accessed, updated and transferred. The NCES handbooks are being used to help with the selection of data elements and definitions.

ESP Insight
SIF can help all participants in education get access by ensuring data are consistently shared among data systems.

An important activity underway in SIFA is the development of specifications for vertical reporting. Two types of vertical reporting are of interest: individual student or staff records and aggregate information that move from district to state education agencies. As mentioned above, SIFA is developing a format for exchanging transcript data. SIFA is also working closely with ED to facilitate the exchange of data in EDEN.

Most educators will not be aware of the implementation of these standards, as they are embedded in the software. However, it is important for educators to insist that the software they purchase be

compliant with these standards so that the various applications can interact and share data efficiently and securely.

Information on SIF is available online at www.sifinfo.org.

IMS Global Learning Consortium

The IMS Global Learning Consortium is a non-profit organization whose mission is to support the adoption and use of learning technology worldwide. IMS members come from every sector of the global e-learning community, including hardware and software vendors, educational institutions, publishers, government agencies, systems integrators, multimedia content providers, and other consortia. IMS develops and promotes the adoption of open technical specifications for interoperable learning technology. Several IMS specifications have become worldwide de facto standards for delivering learning products and services. Among the areas where standards have been developed is for assessment. Information about IMS Global is available online at http://www.imsproject.org/.

Summary

ESP Insight

While much as been done to develop more consistent ways of collecting and reporting data, there remains the challenge to best use the data to affect student learning.

The need for high quality education data has increased significantly in the past 20 years. Where previously states preferred to avoid state-by-state comparisons and stress the uniqueness of each state's educational program, now states and others in the nation see the value of monitoring educational progress by looking at states where there are programs succeeding with students of all types. Education data systems are now seen as critical elements for effective decision making, not just for distribution of funds, but also for identifying where improvement is needed.

Many of the data standardization activities that have occurred since the mid-1980's have been consensus building activities, where representatives of federal, state, and local education agencies have come together with researchers and others to agree upon "best practice" in collecting and maintaining data about the education system. This methodology has been time consuming and expensive, but there have been payoffs in the adoption of standard data definitions and more consistent data collection. With the availability of more sophisticated computer technology and the increasing need to use data for decision-making, this appears to be a propitious time for moving data standardization efforts ahead.

Recent and Additional National Education Data Standardization

Since Dr. Clements' work, two major new players have joined the data standards scene. Subsequently, changes have been mainly in versioning of existing standards.

- In 2009, NCES's Common Education Data Standards (CEDS)
- In 2011, the Ed-Fi Alliance, sponsored by the Michael and Susan Dell Foundation (MSDF)

There are several additional standards that are being added here as well.

- School Courses for the Exchange of Data (SCED)
- ED*Facts*
- Dublin Core Metadata
- Student Data Privacy Pledge
- Project Unicorn
- Section 508
- WCAG 2.0

SCED - 2003

School Courses for the Exchange of Data (SCED) by the National Center for Education Statistics (NCES), was launched in 2003. SCED is a common classification system for prior-to-secondary and secondary school courses that provides a basic structure for categorizing courses. The primary purpose of SCED is to provide a standard for districts and states to exchange and compare course information, longitudinal data about student coursework, and course-performance records. In support of the adoption of SPEEDE/ExPRESS and the Pilot Standard National Course Classification System (SNCCS), SCED was developed to also facilitate the use of electronic student transcripts and reduce cost and burden of transcript studies. SCED is formatted with each course having a five-digit course code and including additional descriptive information. This free and voluntary resource for federal, state, and local education agencies is maintained by a working group of SEA and LEA representatives and is designed to be flexible for modifications. The working group typically releases new versions of SCED each year with new courses added and updates to courses like title changes, description changes, or archiving of courses. ESP Solutions Group has adopted SCED within CourseWalk™, a tool that creates a course catalog by facilitating the matching of local course codes to state or SCED codes for standardization.

SCED Version 5 resources include the most up-to-date version of the SCED codes in a downloadable, sortable file; a best practice guide for using the codes; a one-page SCED overview, and the SCED Finder. This file includes the following:

- A comprehensive list of all 5-digit SCED Course Codes included in SCED Version 5.0. This list includes the Course Title, SCED Course Code, Course Description, and Change Status.
- A list of SCED Version 1.0, 2.0, 3.0, and 4.0 Course Codes that have been archived, as well as suggested alternative Course Codes.
- Names and definitions of the SCED Elements that make up the 12–character SCED Identifier and optional attributes that can be applied to the Identifier to provide a more robust description of courses.
- A list of SCED Course Codes commonly included in one of the sixteen Career Clusters® or as part of a Family and Consumer Sciences plan of study. This spreadsheet is an example of how the Career Cluster attribute and the Family and Consumer Sciences Indicator can be used to identify courses from different Course Subject Areas that are part of a plan of study.

EDFacts - 2003

In 2003, the U.S. Department of Education (USED) began ED*Facts*, a data system that states use for reporting, and promoting high quality K-12 performance data as the next generation of the Education Data Exchange Network (EDEN), which followed the Performance Based Data Management Initiative (PBDMI). ED*Facts* is a multidimensional data system that consolidates collections of K-12 education data for SEAs, LEAs, and schools. The data are aggregated with no personally identifiable information (PII) and are submitted electronically, typically by the state education agency's assigned ED*Facts* Coordinator. The system includes analytical and reporting tools to ensure data quality. This initiative was driven by the need to put performance data as the focus of policy, management, and budget decisions for all K-12 education programs. In 2007, annual ED*Facts* submissions became required for all SEAs. ESP Solutions Group created ED*Facts* Shared State Solution (ES3), a common architecture for any SEA to successfully complete the file submission process with minimal duplicate efforts while fulfilling the requirements of USED. See www.ES3Facts.info.

CEDS - 2009

NCES began development of the Common Education Data Standards (CEDS) in 2009 with assistance from a CEDS Stakeholder Group made up of a wide range of education agencies and organizations including federal, state, and local participation. Initially a common data dictionary, CEDS has grown to be a broad data model to be used by education entities to align definitions and support interoperability. A primary focus is on the meaning of data stored in longitudinal data systems for education agencies and organizations to improve data quality. In the 1970s, NCES created the Handbooks Online which had evolved and are now incorporated into CEDS with some overlapping elements included in the core CEDS list or as extended elements. Most standards organizations have adopted CEDS as their foundation for data element definitions to ensure education agencies can map and align. (See https://nces.ed.gov/programs/ceds/) ESP Solutions Group has been a supporter of CEDS by aligning SEA and LEA data dictionaries to the CEDS elements within DataSpecs®, a metadata management tool. See www.DataSpecsCentral.com.

Student Privacy Pledge - 2015

The Future of Privacy Forum (FPF) and the Software & Information Industry Association (SIIA) with guidance from other education organizations and stakeholders developed the Student Privacy Pledge to safeguard student privacy, ensure proper use of student data, and commit school service providers to handle data responsibly. The Pledge took effect on January 1, 2015 and has since gained over 300 signatories from various ED Tech companies. The commitments of these signatories are intended to abide by federal law and regulations regarding the collection and handling of student data and to clearly articulate these practices. This Pledge stems from the Family Educational Rights and Privacy Act (FERPA) which is a federal law that protects the confidentiality of student education data. See https://studentprivacypledge.org/.

Project Unicorn - 2017

The national project, run by the Brooklyn-based nonprofit InnovateEDU, began in 2017 by getting 26 school districts to agree to its pledge to improve school data interoperability across software programs. The aim is to create a community of innovators who make the broader case for secure interoperability by determining shared priorities, working in partnership with school systems and vendors to understand its importance and benefits, creating a demand side push for

interoperability through partnerships, and educating buyers to consider the total cost of ownership through informed comparison of vendors.

Project Unicorn does not endorse a specific product or data standard but instead is an educational advocacy initiative dedicated to the secure, controlled interchange of data. See https://www.projunicorn.org/ .

School systems and vendors are asked to sign a pledge to work toward the highest level of interoperability for their software products. See https://www.projunicorn.org/vendor-pledge .

Ed-Fi – 2011

Ed-Fi technology was developed by the Ed-Fi Alliance with funding from the Michael & Susan Dell Foundation. The Ed-Fi Alliance owns and issues free, non-transferable licenses which provide perpetual, unrestricted access and usage rights to its components to use Ed-Fi technology. The U.S. Department of Education's Common Education Data Standards (CEDS) were used as the foundation of the data model and dictionary for the Ed-Fi technology. Input from state education agencies, local education agencies, vendors, and teachers was sought for the development of Ed-Fi technology features. The Ed-Fi Alliance Advisory Council is composed of education agency representatives from states and school districts that are implementing Ed-Fi technology. They and the Ed-Fi Alliance guide future technical developments. (See https://www.ed-fi.org/)

Ed-Fi educational dashboards are secure, browser-based collections of interactive charts, gauges, reports, and other visual indicators that give educators and parents on-demand access to timely, relevant, and actionable information about student performance. ESP and other licensees have implemented the Ed-Fi Core dashboards and enhanced them with additional functionality. See www.espsg.com for more information.

Dublin Core Metadata

The Dublin Core Metadata Initiative, or "DCMI", is an open organization supporting innovation in metadata design and best practices. DCMI's activities include work on architecture and modeling, discussions and

collaborative work in DCMI Communities and DCMI Task Groups, global conferences, meetings and workshops, and educational efforts to promote widespread acceptance of metadata standards and best practices. DCMI maintains a number of formal and informal liaisons and relationships with standards bodies and other metadata organizations. The Dublin Core Metadata Initiative (DCMI) is an open organization managed as a project of ASIS&T, a U.S. 501(c)(3) nonprofit under the U.S. Internal Revenue Code.

An international standard has been created for metadata that can be applied to data resources. The Simple Dublin Core Metadata Element Set (DCMES, http://wiki.dublincore.org/index.php/User_Guide) consists of 15 metadata elements from the Dublin Core metadata terms, which can be used to describe a full range of web resources (e.g., video, images, and web pages), and physical resources such as books and objects like artworks. These metadata elements are endorsed in the following standards documents:

- IETF RFC 5013
- ISO Standard 15836-2009
- NISO Standard Z39.85

Dublin Core Metadata can be used for describing resources, combining metadata definitions across different metadata standards, providing interoperability for metadata standards in the linked data cloud, and semantic web implementations.

The author mapped the DCMES to the common metadata fields found in the metadata dictionaries of education agencies used to describe their collections, repositories, and output/reports. See Figure 4.

Dublin Core Metadata Element Name	Common Metadata Dictionary Mapping		
	Collection Metadata Field	**Repository Metadata Field**	**Output/Report Metadata Field**
Title	Collection Name	Repository Name	Output/Report Name
Creator	Contact/Owner	Contact/Owner	Contact/Owner
Subject	Tag(s), Descriptor	Tag(s), Descriptor	Tag(s), Descriptor
Description	Description (Text)	Description (Text)	Description (Text)
Publisher	Organization Name	Organization Name	Organization Name
Contributor	Office Name	Office Name	Office Name

Date	Period Covered	Effective Dates (through)	Period Covered
Type	Formats	Type	Formats
Format	Collection Methods	Technology	Formats
Identifier	Short Name	Short Name	Short Name
Source	Required Submitters	Collections	Collections, Repositories
Language	Formats	N/A	Collection Methods
Relation	Repositories, Outputs/Reports, Mandates, Offices/People	Collections, Outputs/Reports, Mandates, Offices/People	Collections, Repositories, Mandates, Offices/People
Coverage	Effective Date(s)	Effective Date(s)	Effective Date(s)
Rights	Privacy Restriction	Privacy Restriction	Privacy Restriction

Figure 4: Dublin Core Metadata Elements Mapped to Common Metadata Dictionary Elements

Web Content Accessibility Guidelines (WCAG)

The Web Content Accessibility Guidelines (WCAG) are published by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C). The guidelines make web content accessible for disabled users and those using mobile devices. WCAG 2.0, was published in 2008 (ISO standard, ISO/IEC 40500:2012). WCAG 2.1 is a "Proposed Recommendation" as of 2018.

WCAG 1.0 was published in 1999 with 14 guidelines.

- Guideline 1: Provide equivalent alternatives to auditory and visual content
- Guideline 2: Don’t rely on color alone
- Guideline 3: Use markup and style sheets, and do so properly
- Guideline 4: Clarify natural language usage
- Guideline 5: Create tables that transform gracefully
- Guideline 6: Ensure that pages featuring new technologies transform gracefully
- Guideline 7: Ensure user control of time sensitive content changes
- Guideline 8: Ensure direct accessibility of embedded user interfaces
- Guideline 9: Design for device independence
- Guideline 10: User interim solutions
- Guideline 11: Use W3C technologies and guidelines

- Guideline 12: Provide context and orientation information
- Guideline 13: Provide clear navigation mechanisms
- Guideline 14: Ensure that documents are clear and simple

Each of the 65 WCAG 1.0 checkpoints has an assigned *priority level* based on the checkpoint's impact on accessibility.

- Priority 1: Web developers **must** satisfy these requirements, otherwise it will be impossible for one or more groups to access the Web content. Conformance = *A.*
- Priority 2: Web developers **should** satisfy these requirements, otherwise some groups will find it difficult to access the Web content. Conformance = *Double-A.*
- Priority 3: Web developers **may** satisfy these requirements to make it easier for some groups to access the Web content. Conformance = *AAA* or *Triple-A.*

WCAG 2.0 was published in 2008 with 12 guidelines.

Information and user interface components must be presentable to users in ways they can perceive.

- Guideline 1.1: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
- Guideline 1.2: Time-based media: Provide alternatives for time-based media.
- Guideline 1.3: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
- Guideline 1.4: Make it easier for users to see and hear content including separating foreground from background.

User interface components and navigation must be operable.

- Guideline 2.1: Make all functionality available from a keyboard.
- Guideline 2.2: Provide users enough time to read and use content.
- Guideline 2.3: Do not design content in a way that is known to cause seizures.
- Guideline 2.4: Provide ways to help users navigate, find content, and determine where they are.

Information and the operation of user interface must be understandable.

- Guideline 3.1: Make text content readable and understandable.
- Guideline 3.2: Make web pages appear and operate in predictable ways.
- Guideline 3.3: Help users avoid and correct mistakes.

Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

- Guideline 4.1.: Maximize compatibility with current and future user agents, including assistive technologies.

In October 2012, WCAG 2.0 was accepted by the International Organization for Standardization as an ISO International Standard, ISO/IEC 40500:2012.

Section 508

Section 508 was originally added as an amendment to the *Rehabilitation Act of 1973* in 1986 to require Federal agencies to make their electronic and information technology accessible to people with disabilities. **Section 508** was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under Section 508 (29 U.S.C. § 794d), agencies must give employees with disabilities and members of the public access to information that is comparable to the access available to others.

In 1997, The Federal Electronic and Information Technology Accessibility and Compliance Act was proposed in the U.S. legislature to correct the shortcomings of the original section 508; the original Section 508 had turned out to be mostly ineffective, in part due to the lack of enforcement mechanisms. In the end, this Federal Electronic and Information Technology Accessibility and Compliance Act, with revisions, was enacted as the *new* Section 508 of the Rehabilitation Act of 1973, in 1998.

Section 508 addresses legal compliance through the process of market research and government procurement and also has technical standards against which products can be evaluated to determine if they meet the technical compliance. Because technology can meet the legal provisions and be legally compliant (e.g., no such product exists at time of purchase) but may not meet the United States Access Board's technical accessibility standards, users are often confused between these two issues. Additionally, evaluation of compliance can be done only when reviewing the procurement process and documentation used when

making a purchase or contracting for development, the changes in technologies and standards themselves, it requires a more detailed understanding of the law and technology than at first seems necessary.

There is nothing in Section 508 that requires private web sites to comply unless they are receiving federal funds or under contract with a federal agency. Commercial best practices include voluntary standards and guidelines as the World Wide Web Consortium's (W3C) Web Accessibility Initiative (WAI). Automatic accessibility checkers (engines) such as "IBM Rational Policy Tester" and AccVerify, refer to Section 508 guidelines but have difficulty in accurately testing content for accessibility.[2]

In 2006, the United States Access Board organized the Telecommunications and Electronic and Information Technology Advisory Committee (TEITAC) to review and recommend updates to its Section 508 standards and Telecommunications Act Accessibility Guidelines. TEITAC issued its report to the Board in April 2008. The Board released drafts of proposed rules based on the committee's recommendations in 2010 and 2011 for public comment.[3] In February 2015, the Board released a notice of proposed rulemaking for the Section 508 standards.[4]

- Federal agencies can be in legal compliance and still not meet the technical standards. Section 508 §1194.3 General exceptions describe exceptions for national security (e.g., most of the primary systems used by the National Security Agency (NSA)), incidental items not procured as work products, individual requests for non-public access, fundamental alteration of a product's key requirements, or maintenance access.
- In the case that implementation of such standards causes undue hardship to the Federal agency or department involved, such Federal agencies or departments are required to supply the data and information to covered disabled persons by alternative means that allow them to make use of such information and data.
- Section 508 requires that all Federal information that is accessible electronically must be accessible for those with disabilities. This information must be accessible in a variety of ways, which are specific to each disability.
- The Rehabilitation Act of 1973 requires that all federal agencies provide individuals with disabilities with reasonable accommodation, which falls into three categories: (1) modifications and adjustments must be made for a person with a disability to be considered for a job, (2) modifications and adjustments must be made in order for an

individual to execute essential functions of the job, and (3) modifications or adjustments must be made in order to enable employees to have equal benefits and privileges

- Some users may need certain software in order to be able to access certain information.
- People with disabilities are not required to use specific wording when putting in a reasonable accommodation request when applying for a job. An agency must be flexible in processing all requests. This means that agencies cannot adopt a "one-size fits all" approach. Each process should be handled on a case-by-case basis.

The original legislation mandated that the Architectural and Transportation Barriers Compliance Board, known as the Access Board,[5] establish a draft for their Final Standards[6] for accessibility for such electronic and information technologies in December 2001. The final standards were approved in April 2001 and became enforceable on June 25, 2001.

The latest information about these standards and about support available from the Access Board in implementing them, as well as the results of surveys conducted to assess compliance, is available from the Board's newsletter Access Currents. The Section 508 standards, tools, and resources are available from the Center for Information Technology Accommodation (CITA), in the U.S. General Services Administration's Office of Government-wide Policy.[8]

Summary of Section 508 technical standards

- **Software Applications and Operating Systems:** includes accessibility to software, e.g. keyboard navigation & focus is supplied by a web browser.
- **Web-based Intranet and Internet Information and Applications:** assures accessibility to web content, e.g., text description for any visuals such that users of with a disability or users that need assistive technology such as screen readers and refreshable Braille displays, can access the content.
- **Telecommunications Products:** addresses accessibility for telecommunications products such as cell phones or voice mail systems. It includes addressing technology compatibility with hearing aids, assistive listening devices, and telecommunications devices for the deaf (TTYs).

- **Videos or Multimedia Products:** includes requirements for captioning and audio description of multimedia products such as training or informational multimedia productions.
- **Self Contained, Closed Products:** products where end users cannot typically add or connect their own assistive technologies, such as information kiosks, copiers, and fax machines. This standard links to the other standards and generally requires that access features be built into these systems.
- **Desktop and Portable Computers:** discusses accessibility related to standardized ports, and mechanically operated controls such as keyboards and touch screens.

When evaluating a computer hardware or software product which could be used in a U.S. government agency, information technology managers now look to see if the vendor has provided a Voluntary Product Accessibility Template® (VPAT®), created by the Information Technology Industry Council (ITI). A VPAT lists potential attributes of the product that affect the degree to which it is accessible. One issue is whether a software's functions can be executed from the keyboard, or whether they require the use of a mouse, because keyboards are usable by a wider spectrum of people. Because colorblindness is common, another issue is whether the device or software communicates necessary information only by differences in displayed color. Because not all users can hear, another issue is whether the device or software communicates necessary information in an auditory way. If the product can be configured to the user's preferences on these dimensions, that is usually considered a satisfactory adaptation to the Section 508 requirements. One challenge to the adoption of open-source software in the U.S. government has been that there is no vendor to provide support or write a VPAT, but a VPAT can be written by volunteers if they can find the necessary information.

Web accessibility refers to the inclusive practice of removing barriers that prevent interaction with, or access to websites, by people with disabilities. When sites are correctly designed, developed and edited, all users have equal access to information and functionality.

For example, when a site is coded with semantically meaningful HTML, with textual equivalents provided for images and with links named meaningfully, this helps blind users using text-to-speech software and/or text-to-Braille hardware. When text and images are large and/or enlargeable, it is easier for users with poor sight to read and understand the content. When links are underlined (or otherwise differentiated) as well as colored, this ensures that color blind users will be able to notice them. When clickable links and areas are large, this helps users who

cannot control a mouse with precision. When pages are coded so that users can navigate by means of the keyboard alone, or a single switch access device alone, this helps users who cannot use a mouse or even a standard keyboard. When videos are closed captioned or a sign language version is available, deaf and hard-of-hearing users can understand the video. When flashing effects are avoided or made optional, users prone to seizures caused by these effects are not put at risk. And when content is written in plain language and illustrated with instructional diagrams and animations, users with dyslexia and learning difficulties are better able to understand the content. When sites are correctly built and maintained, all of these users can be accommodated without decreasing the usability of the site for non-disabled users.

The needs that Web accessibility aims to address include:

- **Visual:** Visual impairments including blindness, various common types of low vision and poor eyesight, various types of color blindness;
- **Motor/mobility:** e.g., difficulty or inability to use the hands, including tremors, muscle slowness, loss of fine muscle control, etc., due to conditions such as Parkinson's Disease, muscular dystrophy, cerebral palsy, stroke;
- **Auditory:** Deafness or hearing impairments, including individuals who are hard of hearing;
- **Seizures:** Photo epileptic seizures caused by visual strobe or flashing effects.
- **Cognitive/Intellectual:** Developmental disabilities, learning disabilities (dyslexia, dyscalculia, etc.), and cognitive disabilities of various origins, affecting memory, attention, developmental "maturity," problem-solving and logic skills, etc.

Assistive technologies used for web browsing

Individuals living with a disability use assistive technologies such as the following to enable and assist web browsing:

- Screen reader software, which can read out, using synthesized speech, either selected elements of what is being displayed on the monitor (helpful for users with reading or learning difficulties), or which can read out everything that is happening on the computer (used by blind and vision impaired users).
- Braille terminals, consisting of a refreshable braille display which renders text as braille characters (usually by means of raising pegs

through holes in a flat surface) and either a mainstream keyboard or a braille keyboard.

- Screen magnification software, which enlarges what is displayed on the computer monitor, making it easier to read for vision impaired users.
- Speech recognition software that can accept spoken commands to the computer, or turn dictation into grammatically correct text - useful for those who have difficulty using a mouse or a keyboard.
- Keyboard overlays, which can make typing easier or more accurate for those who have motor control difficulties.
- Access to subtitled or sign language videos for deaf people.

About the Authors

From 1987-1997 Dr. Barbara Clements directed all of the NCES/CCSSO data improvement projects. Some of the major data improvement projects in which she was involved included; the NCES handbook revisions, the SPEEDE/ExPRESS project, dropout and graduation rate deliberations, and the overlap in Federal collections.

Dr. Clements had a major role in the development of the operating procedures for the National Forum on Education Statistics, and represented CCSSO in the Forum. She staffed and authored the "Basic Data Elements," participated in the development of and authored the final draft of "Technology @ Your Fingertips," authored "Building an Automated Student Records System," and oversaw the development of the original "Protecting the Privacy of Student Records."

Drs. Glynn Ligon and Barbara Clements worked on several projects together including; the task force that developed "Standards for Education Data Collection and Reporting," data quality training through the ED Office of Planning and Evaluation Services, the metadata dictionary efforts, and the Performance Based Data Management Initiative (PBDMI), now called the Education Data Exchange Network (EDEN. Dr. Clements' role in EDEN was crucial as she identified the original set of data elements for EDEN.

In addition, Dr. Clements worked on the CCSSO activities of Measuring Results, directed and co-wrote the Limited English Proficiency recommendations, and was involved in the Title I Indicators.

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Appendix A

Council of Chief State School Officers Papers and Reports

Submitted Under contract to the National Center for Education Statistics 1986-1992

The Technical Report: Conceptual Framework (December 1986) 33 pages. This report presents a description of the Education Data Improvement Project and the conceptual framework that guided its implementation.

School and School District Data

A Compendium: State Profiles of School and School District Universe Data (September 1986) 619 pages. This report describes development of individual state profiles on definitions used for 17 terms, on specifications developed for 17 data elements, and on collection practices for those data elements.

Summary: State Data Collection Practices on Universe Data Files (September 1986) 19 pages. This report compares school and school district data collection by and across states, and by specific data elements.

School and Student Classifications for Universe Data Files (September 1986) 45 pages. This report examines how states defined terms related to schools and students, assesses the comparability of definitions across states, and proposes updated definitions to resolve the differences.

Collecting National Statistics on Dropouts (September 1986) 38 pages. The purpose of this report is to present, in detail, a model which overcomes problems creating meaningful and comparable dropout and school leaver statistics. State dropout data collection practices in 1985-86 are described.

Federal Program Information on School and School District Universe Files (September 1986) 39 pages. This report identifies and discusses specific issues to be resolved, prior to including federal programs (such as Chapter 1, Bilingual Education, Migrant Education, and Food and Nutrition Services) on school and school district universe files. It also provides a summary of data availability by states and a review of state-level definitions of federal program terms.

Finally, it presents specific recommendations for standardizing definitions for the programs, and for including specific data elements in the universe files.

Variations in Definitions and Procedures for Student Counts: Enrollment, Fall Enrollment, Membership and Average Daily Attendance (December 1986) 34 pages.

The purposes of this report are (1) to describe types of data generally available from states on student counts, (2) to discuss specific findings on terms, definitions, and procedures used by individual states and nationally for student counts, and (3) to recommend ways in which specific student counts can be made comparable across states.

Summary: Recommendations for Improving the National Education Statistical Database (September 1986) 14 pages. This report summarizes the major recommendations made to the National Center for Education Statistics and states for improving the national statistical database for elementary and secondary education. Information in this report is extracted from previously listed reports. Included are general recommendations for improving the Center's Common Core of Data, recommendations specific to the universe file, recommendations for redefining several terms critical for establishing comparable data, and a list of data elements recommended by the Project for the school universe file.

Fiscal Data

A Comparison of Handbooks 2R and 2R2: Implications for Data Comparability (March 1987) 41 pages. This report details the differences in the ledgers and definitions of the constituent elements in two federal school accounting handbooks, which might account for differences in states' reporting of fiscal data.

Recommendations for Improving the National Education Fiscal Database (November 1987) 34 pages. This report presents the recommendations for improving the fiscal data portion of the Common Core of Data.

Summary: State Collection of Fiscal Data Elements (May 1988) 53 pages. This report compares how states collect information on revenues and expenditures from local education agencies (LEA's). Information is included on funds, revenues, and expenditures by programs.

Recommendations for Revising the Current Federal Education Financial Accounting Handbook (August 1988) 16 pages. Included in this paper is a description of the efforts made by the project to arrive at specific recommendations for improving the contents of the handbook. Also included are a discussion of problems with the handbook which have been identified by the project and a specific recommendation concerning the process and timelines for revising the handbook.

Recommendations for Improving the Reporting of Education Expenditures and Attendance (August 1988) 34 pages. This report discusses problems with current definitions of the terms Current Expenditures, Average Daily Attendance, and Per Pupil Expenditures and describes recommendations for reporting more comparable information.

Staffing Data

Results of the Shuttle to Verify Staffing Data Elements (August 1988) 154 pages.

This report presents the results of analyses of states' present collection of staffing data, including states' agreement with National Center for Education Statistics' definitions and the extent to which states collect information on the various staffing categories.

State-by-State Profiles of Staffing Data Collected by State Education Agencies (August 1988). This report contains states' definitions for staffing categories and data elements (e.g., demographic characteristics, certification data, and salary data.

Recommendations for Improving the Federal Collection of Education Staffing Data (August 1988) 50 pages. This report presents the recommendations for improving the staffing portion of the Common Core of Data. The recommendations include the selection of key staffing categories on which to collect state-aggregate information, the types of information needed on each staffing category, and definitions for each staffing category and data element.

State Collection of Staffing Data Elements (October 1988) 43 pages. This report contains a listing of which data elements are currently collected by states for the different staffing categories.

Other Project Reports

The EDIP Model Data Collection System (March 1989) 14 pages. This report describes a model for automating the collection of data from school districts by state education agencies.

Summary of the Types of Schools States Report in the Common Core of Data (March 1990) 11 pages. This report summarizes what the project found concerning the types of schools included by states in the Common Core of Data.

Summary of Staffing Data Collected in Federal and National Surveys (July 1990) 39 pages. This report summarizes the types of data collected about public school staff by NCES, Census, Department of Labor, and other organizations.

Recommendations for Redesigning the CCD Survey of Staff (July 1990) 33 pages.

This report summarizes the recommendations made by the Task Force on the Implementation of the Redesign of the CCD Nonfiscal Survey of Staff. Included is a discussion of issues related to staff data raised by task force members.

A Study of Availability and Overlap of Education Data in Federal Collections (September 1991) 33 pages. This report describes various federal data collections that collect data on student participation, progress and membership. An attempt was made to discover the extent to which there was overlap in the data collected in the various collections and differences in definitions used that could cause reporting burden to state education agencies.

The Directory of Data Management and Related Technology Personnel in State Education Agencies (September 1992) 194 pages. This directory contains information about the technology used by state education agencies (SEA's) to maintain education data. In addition, there is contact information about the SEA personnel having responsibility for the contents and maintenance of data.

Appendix B

NCES Handbooks and Related Documents

Student Data Handbook for Elementary, Secondary, and Early Childhood Education: 2000 Edition. [NCES #2000-343] The Student Data Handbook was developed to provide guidance concerning the consistent maintenance of student information. This handbook defines data elements and definitions describing personal information, enrollment, school participation and activities, out of school experience, assessment, transportation, health, special program participation and discipline for pupils in early childhood, elementary, and secondary education. This handbook contains no data. Available online at: http://www.nces.ed.gov/pubs2000/studenthb.

Staff Data Handbook for Elementary, Secondary, and Early Childhood Education: 2001 Edition. [NCES #2001-305] The Staff Data Handbook was developed to provide guidance concerning the consistent maintenance of staff information. This handbook defines data elements and definitions describing personal information, educational experiences, qualification information, current employment, assignments, and evaluation and career development for personnel in early childhood, elementary, and secondary education. This handbook contains no data. Available online at: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2001305.

Handbooks Online – Version 2. [NCES #2005-345] Handbooks Online - Version 2 is a searchable web tool that provides access to the NCES Data Handbooks for elementary, secondary, and early childhood education. These Handbooks offer guidance on consistency in data definitions and in maintaining data so that they can be accurately aggregated and analyzed. The updated database includes data elements for students, staff, and education institutions; added data elements for food service, technology and discipline; and a link to the current NCES Accounting Handbook. Available online at: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2005345.

SPEEDE/ExPRESS (SPEEDE stands for Standardization of Postsecondary Education Electronic Data Exchange, and ExPRESS stands for Exchange of Permanent Records Electronically for Students and Schools.) is an ANSI X12 (Electronic Data Interchange) format. For information on SPEEDE/ExPRESS look under Standards on the website of the Postsecondary Standards Council at: http://www.standardscouncil.org

Basic Data Elements for Elementary and Secondary Education Information Systems. [NCES #97-531] This document contains a set of basic student and staff data elements recommended by the Core Data Task Force of the National Forum on Education Statistics. The purpose of these basic data elements is to provide a common language to promote the collection and reporting of comparable education data to guide policy and assist in the administration of state and local education systems. The report also contains a recommended process for identifying and periodically updating the set of data elements to be maintained by a school, school district, state education agency, or other education unit with a need for student and staff information. Available online at: http://www.nces.ed.gov/pubs97/97531.pdf

Safety in Numbers: Collecting and Using Crime, Violence, and Discipline Incident Data to Make a Difference in Schools. [NCES #2002-312] This document is designed for use by school, district, and state staff to improve the effectiveness of their efforts to collect and use disciplinary incident data. It provides recommendations on what types of data to collect, why it is critical to collect such data, and how the data can be used to improve school safety and answer policy questions relating to school improvement and the safety of students. Available online at: http://nces.ed.gov/forum/pub_2002312.asp.

Facilities Information Management: A Guide for State and Local Education Agencies [NCES 2003-400] This Guide provides a framework for identifying a basic set of school facilities data elements and definitions that will meet the information needs of school and community decision makers, school facility managers, and the general public. It presents recommendations for designing and maintaining an information system about the condition, design, use, management, and financing of elementary/secondary education facilities. It also includes commonly used measures, data elements, and a list of additional resources for the practitioner. Available online at: http://nces.ed.gov/forum/pub_2003400.asp.

Planning Guide for Maintaining School Facilities. [NCES #2003-347] This Guide was prepared by members of the National Forum on Education Statistics to help school facilities managers plan for efficient and effective operations. It provides practical advice on a range of topics, including how to do a facilities audit to know what you have, planning for maintenance that will ensure smooth operations and avoid costly surprises, managing staff and contractors, and evaluating maintenance

efforts. Available online at:
http://nces.ed.gov/forum/pub_2003347.asp.

NCES Technology @Y our Fingertips: A Guide to Implementing Technology Solutions for Education Agencies and Institutions. [NCES #98-293] These guidelines describe a process for getting the best possible technology solution for your organization. It also describes the steps necessary to identify technology needs, acquire the technology, and implement a technology solution that provides a foundation for an organization's future technology wellbeing. Available online at:
http://www.nces.ed.gov/Forum?pub_98293.asp.

Safeguarding Your Technology: Practical Guidelines for Electronic Education Information Security. [NCES #98-297] These guidelines are written to help education administrators and staff at the buildings, campus, district, and state levels better understand why and how to effectively secure their organization's sensitive information, critical systems, computer equipment, and network access. Available online at:
http://www.nces.ed.gov/Forum/pub_98297.asp.

Weaving a Secure Web Around Education: A Guide to Technology Standards and Security. [NCES #2003-381] This Guide was written to provide guidance to local and state education agencies about the development, maintenance, and standardization of effective websites. The Guide offers a detailed examination of the steps that can be taken to secure an education organization's Internet node (connection point) and the network that sends information from computer to computer within the organization. It describes appropriate publishing standards and content for websites at various levels of the education environment. It also addresses usability guidelines as they relate to federal and state regulations for accessibility, privacy rights, and copyright regulations. Appendices include a description of a local area network, sample policies that could be used by districts or state departments of education, access options for education organizations, and a glossary of relevant terms and definitions. Available online at:
http://nces.ed.gov/forum/pub_2003381.asp.

Technology in Schools: Suggestions, Tools and Guidelines for Assessing Technology in Elementary and Secondary Education. [NCES #2003-313] This document was developed to help inform decisions concerning the various types of technology data that can be collected, reported, and used. It offers guidance for determining which issues are truly "key" to understanding technology needs and capabilities in an education

organization. The document is structured around seven primary topics, each of which constitutes a chapter: technology planning and policies; finance; equipment and infrastructure; technology applications (software and systems); maintenance and support; professional development and training; and technology integration. The document also includes an extensive glossary of education technology terms and definitions. Available online at: http://nces.ed.gov/forum/pub_2003313.asp.

Forum Unified Technology Suite. [NCES #2005-342] The Forum Unified Education Technology Suite presents a practical, comprehensive, and tested approach to assessing, acquiring, instituting, managing, securing, and using technology in education settings. It will also help individuals who lack extensive experience with technology to develop a better understanding of the terminology, concepts, and fundamental issues influencing technology acquisition and implementation decisions. This online resource combines and updates four previously existing NCES/Forum publications: Safeguarding Your Technology (1998), Technology @ Your Fingertips (2001), Technology in Schools (2002), and Weaving a Secure Web around Education (2003). Available online at: http://nces.ed.gov/forum/pub_tech_suite.asp.

NCES Financial Accounting for Local and State School Systems: 2003 Edition. [NCES #2004-318] This NCES Handbook is designed to be the national standard for state departments of education when reporting financial data and for school districts when preparing comprehensive annual financial reports (CAFRs). The 2003 Edition contains guidance reflecting the Governmental Accounting Standards Board Statements (through Statement 39). There are chapters on budgeting, governmental accounting, and financial reporting. Moreover, account codes have been updated to reflect changes in the new reporting requirements and developments in technology and security. There is also a chapter on student activity fund accounting and a model for school level program cost accounting. Use of Financial Accounting for State and Local School Systems, 2003 Edition will help to ensure that education fiscal data is reported across the nation in a comprehensive manner. Available online at: http://nces.ed.gov/forum/pub_2004318.asp.

Building an Automated Student Record System. [NCES 2000-324] Based on a chapter in the Student Data Handbook for Elementary, Secondary, and Early Childhood Education, this document provides a standalone guide for local and state education agencies faced with the task of designing or upgrading an existing automated student information

system. In addition to the chapter information, this document contains checklists and real life examples, as well as references to other resources that could be useful. Available online at: http://www.nces.ed.gov/Forum/pub_2000324.asp.

Forum Guide to Protecting the Privacy of Student Records: State and Local Education Agencies. [NCES #04-527] These guidelines were developed to help state and local education agencies and schools to develop adequate policies and procedures to protect information about students and their families from improper release, while still satisfying the need for school officials to make sound management, instructional, and service decisions.

Suggested audiences include state education agency staff, state and local policy-makers, school district staff, school administrators and staff, program and support services staff, technical staff, and teachers and other school-based support professionals. Available online at: http://www.nces.ed.gov/Forum/pub_2004330.asp.

Privacy Issues in Staff Records. [NCES #2000-363] This report discusses key concepts in protecting and managing information in staff records. It does not provide legal guidelines, but does address the federal Freedom of Information and Privacy Acts and offers principles of best practice. Available online at: http://nces.ed.gov/forum/pub_2000363.asp.

Forum Guide to Building a Culture of Quality Data: A School and District Resource. [NCES 2005801] There has been a growing awareness that effective teaching, efficient schools, and quality data are linked. A "Culture of Quality Data" is the belief that good data are an integral part of teaching, learning and managing the school enterprise. This guide was developed by the Forum's Data Quality Task Force to help schools and school districts improve the quality of data they collect and to provide processes for developing a “Culture of Quality Data” by focusing on data entry—getting things right at the source. The quality of data will improve when all staff understand how the data will be used and how data become information. This guide will show how quality data can be achieved in a school or district through the collaborative efforts of all staff. Available online at: http://www.nces.ed.gov/Forum/pub_2005801.asp.

A Pilot Standard National Course Classification System for Secondary Education. [NCES #95-480] This document was developed to promote the use of a standard vocabulary and to encourage the maintenance of

accurate and complete data about students. It is intended to serve as a reference document to public and private school agencies and researchers interested in course information at the secondary level. This publication contains no data. Available online at: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=95480.

Handbook on Human Resources. [NCES #98-302] This handbook is intended as a basic guide that can assist postsecondary institutions in developing an analytically useful database on their faculty and staff. It reflects the perspectives and judgment of a broad-based group of professionals with expertise in postsecondary institutional analysis and a deep understanding of the issues concerning postsecondary education faculty and staff. Available online at: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98302.

Postsecondary Education Facilities Inventory and Classification Manual. [NCES #92- 165] This document contains a major update of types of postsecondary institutions' physical facilities and re-established current and consistent definition and classification codes to collect, report, and exchange comparable data on institutional facilities. Available online at: http://nces.ed.gov/pubs92/92165.pdf.

Standards for Education Data Collection and Reporting. [NCES #92-022] Guidelines are available that describe "best practice" in collecting and reporting education data including student information. Called the Standards for Education Data Collection and Reporting (SEDCAR), these guidelines were developed pursuant to the Hawkins-Stafford Amendments of 1988, which authorized an effort to improve the comparability, quality, and usefulness of education data. SEDCAR is a helpful guide to basic principles for ensuring good quality in the key phases of data collection, storage, and reporting. Anyone developing, redesigning, or taking charge of a student record system can benefit from the collective experience of the large team of professionals brought together to develop SEDCAR. To order SEDCAR, please visit the NCES web site at: http://www.nces.ed.gov/Forum/pub_92022.asp.

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