The undeniable need to increase the depth and breadth of educational achievement in the United States has raised the interest in educational standards, student-level data, and accountability systems. It has also raised concerns and created understandable resistance as educators and policymakers, as well as parents and other stakeholders, energetically debate what kinds of standards, data, and accountability systems are needed to help improve educational achievement.

While there is legitimate debate over many details, it is clear that the data systems in many states were never designed to meet the challenges envisioned by new accountability requirements. These systems were originally constructed to provide data for routine reports or to audit expenditures; they are inadequate to meet the assessment and accountability challenges of the twenty-first century. Data systems designed for the new century will need to provide a comprehensive foundation for documenting the achievement of students, schools, and colleges, support evolving educational initiatives, and improve the ability to respond to questions about student achievement and a state’s investment in education.

What is emerging is a need for information that is comprehensive and focused – capable of enabling educators to improve instruction, as well as describe student achievement across multiple sectors and report on performance in particular areas. Ideally, an integrated data system across all levels of education will meet those combined needs. In reality, two systems currently exist: one for K-12 education and another for postsecondary education. Neither system is adequate by itself, and, because they often are poorly aligned, they can be even weaker when linked together.

The purpose of this essay is to help advance the discussions occurring in most states by describing the kinds of data and accountability systems needed to help more students prepare for and succeed in postsecondary education. Included is (1) a description of an effective K-16 data and accountability system.

An earlier version of this chapter, published in 2003, was co-written by Hans P. L’Orange and Richard A. Voorhees.
system; (2) an overview of the general status of K-12 and postsecondary data systems; (3) examples of promising state practices; and (4) some concluding recommendations.

**An Effective K-16 Data and Accountability System**

Effective and comprehensive systems share several common characteristics. They inform all stakeholders of the condition of education at various levels. They enable states to identify effective educational practices and diagnose problems. They have the potential to increase the commitment among stakeholders to collect, analyze, and use information on student performance. Effective systems also have the ability to identify students, programs, and schools that are successful, in addition to those that need attention and assistance to become more successful. Finally, aligned systems help K-12 students and teachers focus on the curricula and content that must be mastered to be successful in postsecondary education. As state systems for data and accountability evolve – in particular, as they gain the ability to analyze student progress over time and capture a wide range of educational influences – they hold the promise of providing the tools needed to monitor and improve performance.

Successful accountability systems become more than simply a reporting mechanism. They focus on student performance in relationship to established criteria, provide common rubrics for evaluating student and school performance, and improve instructional and educational attainment. Successful accountability systems focus on student performance in relationship to established criteria, provide common rubrics for evaluating student and school performance, and improve instructional and educational attainment.
standards. Others use a growth model, focusing on the progress of students over time. The choice between a performance or growth model dictates the timing for collecting assessment data and the nature of the assessment methodology. States typically choose to collect standard test data at predefined grade levels and most often by a survey test. This point-in-time assessment scheme is most often used to compare performance across schools, not to make judgments about the academic growth of individual students. Performance models generally assess students periodically to obtain a portrait of student achievement at that time. A growth model, on the other hand, implies pre- and post-assessment, either within a given grade level or across grade levels.

States face other critical decisions when creating an assessment system. Each state needs to determine whether off-the-shelf survey tests meet its assessment needs and whether the content of these commercially produced assessments aligns with the state's own standards. Failing this alignment, a state needs to decide whether a survey test created specifically for its curricular standards is a prudent investment. States also need to consider whether the results of alternative assessments – e.g., portfolios, demonstrations, and other non-test documentation of learning – should be included in data systems. Each of these techniques requires that responsible parties make firm judgments about the validity of assessments and their reliability, especially in high-stakes environments.

Alternatives to point-in-time aggregate data and assessments do exist. Complex longitudinal systems are designed to track the progress of individual students and require collecting individual student data over time. Such systems, typically called “unit record” systems, collect a wide range of demographic and performance data at regular, systematic intervals to support analysis. Unit record systems have several other advantages over aggregate systems. They require that consistent definitions be used for individual variables in order to make valid comparisons possible. Statewide unit record systems also provide a mechanism to ensure the data submitted by providers are accurate, especially when they are used to compare schools. Finally, in addition to generating routine reports, unit record systems can produce answers to “what if” questions that frequently take accountability discussions to higher levels. Unit record systems are characterized by the presence of a unique identification number that allows an individual student’s data to be linked across grades and schools. A system of this sort also makes possible the linkage of assessment data to demographic and program records.

A statewide unit record system makes possible the linkage of assessment data to demographic and program records.

Interest in systems with these characteristics continues to grow. Both K-12 and postsecondary data systems are being designed and redesigned to address accountability and instructional improvement concerns. National interest in accountability and improvement has also focused conversations on the kinds of systems required. The National Commission on Accountability, co-chaired by former Secretary of Education, Richard W.
Riley, and former Governor of Oklahoma, Frank Keating, was formed to review ways that states have improved performance in higher education and their experience in using accountability systems toward that end. Their report, *Accountability for Better Results: A National Imperative for Higher Education*, recommends an ongoing and vigorous dialogue targeted on the educational needs of the American people and includes a series of recommendations designed to improve student preparation, the public investment in educational priorities, teaching and research, cost-effectiveness, and the availability of key data. The 2005 report notes “[w]e need accountability to give us dependable, valid information to monitor results, target problems, and mobilize the will, resources, and creativity to improve performance.” The report also states that “[b]etter accountability requires substantial improvements in the quality, cost-effectiveness, and utilization of data.” One of the Committee’s recommendations is for “statewide data systems across all levels of education to help inform policy and budgetary decisions that will close achievement gaps and promote greater equity in allocating resources.”

One recommendation from the National Commission on Accountability is for “statewide data systems across all levels of education to help inform policy and budgetary decisions that will close achievement gaps and promote greater equity in allocating resources.”

The Commission on the Future of Higher Education, convened by Secretary of Education Margaret Spellings, raised similar concerns and issued similar recommendations in their 2006 report, *A Test of Leadership: Charting the Future of U.S. Higher Education*, which states, “the lack of useful data and accountability hinders policymakers and the public from making informed decisions and prevents higher education from demonstrating its contribution to the public good.” The Secretary’s Commission calls for higher education to change from a system primarily based on reputation to one based on performance. They recommended the creation of “a robust culture of accountability and transparency” and “a consumer-friendly information database on higher education with useful, reliable information.” The Commission also supports “the development of a privacy-protected higher education information system that collects, analyzes and uses student-level data as a vital tool for accountability, policy-making, and consumer choice.”

These discussions and reports, along with numerous others, continue to draw attention to K-12 and postsecondary accountability and the data – both available and required – to answer the questions being asked.
The General Status of K-12 and Postsecondary Data Systems

For most of the 20th century, states were content to let patterns of student achievement follow their own course – students who performed well in the primary and secondary grades moved on to higher education, while those who performed at a lower level found lower-skilled but reasonably well-paying jobs. With the increasing skill requirements of work and heightened competition in a global economy, states have come to understand more clearly the link between an educated workforce and their own ability to sustain economic growth. The Commission on the Future of Higher Education, among others, have noted not everyone needs to go to college, but everyone needs some postsecondary education. That need brings a different focus to student learning and the benefits gained in secondary schools. As the educational aspirations of the states and the needs of the country have grown, the K-12 standards movement, concerns with educational inequities, and questions about the performance of postsecondary students have also expanded. States are also implementing the accountability standards of the “No Child Left Behind Act” of 2001 (NCLB), which requires assessments in all schools in reading, mathematics, and, eventually, science, in grades three through eight. NCLB requires that every state develop an accountability system; that all students are included; and that standards apply to all schools and students. These requirements have resulted in substantial data collection efforts.

Prior to NCLB, most states addressed accountability concerns by collecting aggregate data about the average performance of students or groups of students in particular schools. While this effort represented a groundbreaking step, it can be quite limited for two main reasons. First, aggregate data provide “snapshots” of average student performance within individual schools but no information about individual students. This flaw means that individual student data cannot be linked with other elements – such as courses taken and socioeconomic factors – that might influence individual performance. Second, aggregate data shed little light on the performance of students and schools across time. The effects of educational reform cannot be captured in a single slice. Aggregate data cannot be combined adequately to assess progress, or lack thereof, since those students whose performance measures were combined to create aggregate statistics in one year may not be the same students whose performances are combined in the next year.

With the increasing skill requirements of work and heightened competition in a global economy, states have come to understand more clearly the link between an educated workforce and their own ability to sustain economic growth.
The good news is that data that can be used for accountability and improvement are, for the most part, plentiful. The data elements for a strong accountability system are in place in many states, even though no single state yet possesses a system sufficient to answer all the questions that are asked. The bad news is that these frequently disparate data are seldom assembled into comprehensive information systems. Many systems have collected student achievement data for many years, but only a handful of states have begun to combine these data with those of other schools and colleges to guide decisions.

In many states, the challenge is to identify and collect the most relevant data available, align the data from disparate systems, and then use that data effectively. The Data Quality Campaign (DQC)\(^4\) was developed as a national collaborative effort to address these challenges by encouraging and supporting state policymakers to:

- Improve the collection, availability and use of high quality K-12 education data; and
- Implement state longitudinal data systems to improve student achievement.

While acknowledging that each state's education system is unique, the DQC has identified ten essential elements that are critical to a longitudinal data system:

- A unique statewide student identifier that connects student data across key databases across years
- Student-level enrollment, demographic and program participation information
- The ability to match individual students’ test records from year to year to measure academic growth
- Information on untested students and the reasons they were not tested
- A teacher identifier system with the ability to match teachers to students
- Student-level transcript information, including information on courses completed and grades earned
- Student-level college readiness test scores
- Student-level graduation and dropout data
- The ability to match student records between the P–12 and higher education systems
- A state data audit system assessing data quality, validity and reliability
A September 2006 survey of state K-12 education agencies, developed by the DQC and the National Center for Educational Accountability (NCEA), assessed each state education agency’s information systems in the context of these ten essential elements. The survey noted only one state, Florida, has all ten elements and only ten states have at least eight elements. States as a whole are making progress, however; the survey also notes that only five states have three or fewer elements.5

Colleges and universities also require accountability systems, although the purposes of such systems may be somewhat different. Particularly since 1990, state policymakers have become increasingly interested in the productivity and efficiency of public post-secondary systems. Their concern stems from the fact that state resources are declining at the same time that costs and demands for improved access have increased. Repeated surveys by the State Higher Education Executive Officers (SHEEO) confirm that accountability and effectiveness remain one of the top issues for state decision makers; this issue has been close to the top of the list for each of the surveys done over the past decade. The most recent survey confirmed the results from an earlier SHEEO report on performance measures, which noted that state policy agendas for accountability continue to emphasize the dual purposes of improvement and accountability. It also noted that the most commonly used measures for performance reporting are quantitative indicators of “outcome” or “output” including graduation rates (Ruppert, 1998).

Giving answers to many of the questions policymakers now ask will require definitional consistency and comprehensiveness which are frequently missing across institutional systems.

Although most people do not question the overall value of a college education, higher education must make the case to the public and to political leaders that this value is real and that postsecondary education deserves financial support. Demonstrating this value requires robust data and information systems for postsecondary education, as it does for K-12 systems. Over time, data systems have been developed at the institutional level that allow staff to analyze data, generate reports, respond to both internal and external demands, and demonstrate the value of the education that institutions provide. These systems have become quite adept at addressing institutional issues, but they can be limited when used collectively to address state concerns. Giving answers to many of the questions policymakers now ask will require definitional consistency and comprehensiveness which are frequently missing across institutional systems. Many complex issues require coordinated analysis beyond those studies produced by one or more institutions, especially when statewide responses are required to questions about student transfer, occupational placement, and inter-state migration.

Over the past decades, statewide higher education agencies and the federal government have assumed greater roles in the area of data gathering and production and information
management. This process began with the collection, analysis, and reporting of information gathered from the institutions and based on their individual data systems. The information frequently included data on applicants, student enrollments, faculty and staff, finances, and facilities. Over time, data on completions, financial aid, and student courses were added. Like K-12 systems, state higher education organizations and federal agencies began to establish common definitions and reporting formats allowing them to generate meaningful information at the state and federal levels. Eventually many states developed their own statewide databases, which gave them even more analytical capacity, including the ability to compile the information needed for federal reporting.

As noted in the recent report *Critical Connections: Linking States’ Unit Record Systems to Track Student Progress* (Ewell and Boeke, 2007) from the National Center for Higher Education Management Systems (NCHEMS) and sponsored by the Lumina Foundation for Education, these systems have some common characteristics. Among the most important of these is the inclusion of electronic unit records unique to each student. In addition, these records frequently are based on data gathered from institutions at specific points of time and maintained centrally. In some ways, these systems are similar to the K-12 unit record systems discussed earlier. As the NCHEMS report notes, 40 states currently have state unit record databases. The ten states that do not have unit record databases are relatively small, and as a result, 81 percent of all headcount enrollments are in states with one or more state-level databases. Eighteen of the databases contain data from the 1970s or 1980s, and half of the databases built in the last decade contain data collected prior to 1995. Federal reporting standards in the Integrated Postsecondary Education Data System (IPEDS) and other required federal reporting have encouraged some consistency of definitions across systems.

Although they have shortcomings, unit record systems are valuable for accountability reporting and performance funding initiatives.

Despite these efforts, the range of data systems varies considerably. Some are very basic, while others are much more complex and contain a wide range of data on students, courses, and grades. In a few states, where state-level financial aid programs are the responsibility of the state agency, data are also included from private institutions. Some states have data links to labor databases; most do not. Other challenges include the fact that not all states collect data at the same point in time and, as noted above, not all states collect the same data elements. Most states don’t use the Social Security number as a student identifier because of privacy concerns. Many are taking steps to create new identifiers to meet these concerns. However, the assignment of unique identifiers limits the possibilities for tracking students outside of data systems that do not or cannot share these identifiers.
Although they have shortcomings, unit record systems are valuable for accountability reporting and performance funding initiatives. The level of information available about students and the states’ postsecondary systems is substantially greater than it was 20 years ago. These systems have been a large part of the foundation for comparative peer data, and the state averages that are now in wide circulation can address critical policy questions about student migration and progress within a given state. The largest shortcoming of these systems, however, is their isolation; the systems for K-12 students and postsecondary students are rarely linked together. The value of a K-16 system can only be analyzed when data are available across all components of that system. Enabling states to verify that their investments in education have, in fact, been fruitful will require that very cross-system linkage.

The ability to analyze what a student has learned in high school and what he or she is attempting to learn in college is a promising development in the evolution of unit record data systems.

**Promising State Practices**

While states are in different stages of implementing their various systems, linking together information from different sources becomes the next major step for many state-level data systems. Some data are already being shared even without direct links. Some of the postsecondary unit record systems contain admissions information, including a student’s high school and final secondary school grade-point average. Student work undertaken prior to admission to a particular school, in the form of transfer credits or prior college-level work, is also available in certain systems. Extracting this information has permitted many states to develop feedback systems that allow high schools to receive information about their graduates’ postsecondary performances. Communication and data sharing of this sort enable greater cooperation among school districts and state colleges and universities regarding academic preparation and expected high school coursework. Though limited in scope, the value of these partnership efforts should not be minimized. Such data sharing can have a direct impact on the decisions being made in a K-16 system. The ability to analyze what a student has learned in high school and what he or she is attempting to learn in college is a promising development in the evolution of unit record data systems.

Even more value will come from the direct and formal coordination of data systems, though it will be challenging to achieve this task on a broad scale. Viewing student data as a valuable resource regardless of student level will require substantial cooperation between multiple agencies and state-level education organizations. Jonathan Tafel and Nancy Eberhart (1999), writing in “Stateside School-College (K-16) Partnerships to Improve Student Performance,” very aptly note that a state’s ability to collect quality
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data and conduct appropriate analysis is necessary for an effective K-16 education system. Robust student databases are required to monitor student progress across the K-16 continuum, enable early assessment for remediation, assess possible intervention activities, and locate barriers within systems.

Many of the issues that were previously addressed through separate systems will now need to be addressed cooperatively. Common definitions and data collection methodologies, issues of privacy and confidentiality, and ownership and control of the data will all need attention. These challenges are great, but the return will also be substantial. Good data and information across all sectors and levels of education will provide a state with a system-wide perspective on its K-16 efforts.

Several states have programs in place that demonstrate the power of partnerships. Maryland has an alliance of the Maryland State Department of Education, the Maryland Higher Education Commission, and the University System of Maryland. This collaboration, known as the Maryland Partnership for Teaching and Learning PreK-16, has identified core learning goals and academic content standards designed to help students transition from high school to college and the workplace. The K-16 partners have worked together to make sure high school exit requirements are better aligned with college admissions requirements. In particular, the Partnership has programs designed to encourage students to consider and prepare for college, and works at both the K-12 and college levels to improve teacher quality. The Partnership is supported by a Leadership Council consisting of corporate, civic, and public and private education leaders who provide advice and support an agenda to improve student achievement. To facilitate the direction of the Leadership Council, a PreK-16 Workgroup comprised of members of the constituencies meets regularly to share information, seek solutions to articulation issues, and collaborate on promising practices that improve student success. Their strategies for achieving these goals include:

- Engaging higher education faculty with PreK-12 teachers in designing assessments of core learning goals for high school graduation, aligned with college admission;
- Engaging faculty across 2-and 4-year institutions in developing clear and consistent expectations for undergraduate education; and
- Extending the current capacity to share and use the data on student achievement, from preschool through college.

Maryland’s Partnership is recognized nationally for its voluntary, inclusive organizational structure. It was one of the first states to establish a PreK-16 partnership, and it remains one of the more active partnerships in the entire nation.

Florida is nationally recognized for its K-20 education data warehouse that addresses many of the identified issues. This database pulls together resources from existing systems, including a robust P-12 data system that has been in place for more than ten years, data from the well-established community college and university systems, and financial aid data. It provides a single repository of data on students in the K-20 public education
system as well as educational facilities, curriculum and staff involved in instructional activities. Student data are available on demographics, enrollments, courses, test scores, financial aid, and employment.

Florida is in the relatively unique situation of having a single agency, the Florida Department of Education, overseeing all public education activity in the state. This obviously makes data sharing much more feasible, and the data warehouse allows the Department to analyze information from several sectors. The Department has ambitious goals for their warehouse: to gather complete, timely, and accurate data; to obtain a statewide view; to develop an integrated technical environment that incorporates data from multiple sources and organizations; to merge historical data with current data in a structured repository; to create comprehensive data definitions; and to provide easy access and manipulation. The warehouse is a repository that integrates existing, restructured data, provides state-of-the-art analytical capabilities, and – not least – respects confidentiality. Its mission statement is clear: “The mission of the Florida K-20 Education Data Warehouse (EDW) is to provide stakeholders in public education – including, but not limited to, administrators, educators, parents, students, state leadership, and professional organizations – with the capability of receiving timely, efficient, consistent responses to inquiries into Florida's Kindergarten through University education.”

The Texas PK-16 Public Education Information Resource (TPEIR) is a project designed to provide stakeholders in public education – including, but not limited to, administrators, educators, state leadership, researchers, and professional organizations – with ready access to public primary, secondary, and higher education information for purposes of research, planning, policy, and decision-making. The project is a cross-agency effort building on the data and expertise of the Texas Higher Education Coordinating Board (THECB), the Texas Education Agency (TEA) and the State Board for Educator Certification (SBEC). The system includes an integrated interagency data store containing "raw" data currently collected through several different operational systems and stored in multiple distinct databases. Data in the TPEIR data store are a combination of aggregated and raw data. Several specific objectives of the project include:

- Enhancing the analysis and reporting capabilities of both agency staff and external stakeholders;
- Supporting trend analysis with some data from as early as 1989;
- Providing access to consistent results (everyone gets the same answers); and
- Reducing the agency time needed to fulfill requests for data.
Data for the Texas repository come from the three partner agencies. The data most readily linked are data on students, staff, and teacher certification. Texas has almost 1,200 school districts and those districts, along with the state’s postsecondary institutions, generate massive amounts of data. There are over 700 million records currently loaded in this very large warehouse with the expectation of adding another 300 million records annually. Specific reports provide information about graduates at all levels along with higher education admissions and enrollments. Cross-agency reports detail PK-16 linkages including high school to postsecondary progression and the sources of certified teachers.

Cal-PASS (California Partnership for Achieving Student Success) is a series of data-sharing consortia that collect, analyze and share data on students as they progress from elementary school through college. Cal-PASS started as a regional project in San Diego and Imperial counties. It has expanded to a consortium that includes numerous community colleges, several high school districts, three public universities and two private universities, all in California. Typically, the community college in a particular region serves as the catalyst for new data-sharing agreements.

The system enables data sharing between K-12 schools, community colleges and universities. The core data include student demographic and transition information, course enrollment data including student grades, and an award file with achievement data. Consortium members receive access to a password-protected site with information on the progress and performance of students within their specific consortium as well as aggregate information across all consortia.

The goal is to help educators understand performance and transitions, improve instruction, and increase student success by addressing questions such as:

- How do our students do when they move on?
- Were they well prepared? Are changes in curriculum necessary to help others?
- How many got degrees at the next level? How long did it take?

Potential uses of the data include program review, cohort tracking, and identifying successful course-taking patterns. Information on student cohorts is provided to cross-sector, discipline-based faculty to examine curricula and instructional practices. Recommendations for improvement are provided to the appropriate agency with a goal of developing more seamless curriculum and improved instructional strategies.

Effective data systems have a shared goal of informing stakeholders of the condition of education, thereby helping states identify effective educational practices and diagnose problems at various levels.
Conclusion

Good decisions require good data. Regardless of design or format, effective systems have a shared goal of informing stakeholders of the condition of education, thereby helping states identify effective educational practices and diagnose problems at various levels. The data and data systems that exist in current K-16 systems attempt, with varying results, to support the decisions made by educators and policymakers that affect current and future students. There certainly are lessons to be learned from each state, but it would be a mistake to think there is a single model or “magic fix” that will work in every situation. Regardless of the strategy employed, a supportive state environment is critical to any successful effort and each environment has its own unique challenges.

State systems were originally designed to count or verify student enrollments and periodically to produce demographic profiles; they are now moving steadily beyond those basic tasks. Data systems of the future will be required to do more: they must provide a comprehensive foundation for documenting the achievement of all students, schools, and colleges. Coordinated efforts will be required to address the challenges inherent in each individual system, as well as those that result from working across systems. As the purposes of information continue to evolve, exemplary data and accountability systems will become more efficient. They will be designed and implemented in ways that increase the ability of policymakers and practitioners to focus on data that are useful for decision-making – within a particular level of the system, and ultimately, across the entire spectrum of K-16 education.

Endnotes

1 An earlier version of this chapter, published in 2003, was co-written by Hans P. L’Orange and Richard A. Voorhees.

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4 www.dataqualitycampaign.org

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6 www.marylandpublicschools.org/MSDE/divisions/leadership/programs/K-16partnership

7 http://edwapp.doe.state.fl.us/doe

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