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In This Issue

SEDL investigated state education data in four states to determine whether research can be conducted to find answers to education resource and student performance policy questions. This issue highlights study findings that policymakers will find informative in their efforts to meet standards and use data effectively.

Enhancing Data Use and Quality to Shape Education Policy

What should we spend on students to ensure they succeed? Who should teach our children to help them achieve? How should we allocate these monetary and staffing resources to be effective?

These questions are basic to providing children a good education. Answering them, however, is not that easy, especially as education policymakers rely more on data to make instructional changes needed to improve student performance. The data must be accessible, of high quality, and easily understood. They must also be broad enough in scope to respond to the diversity of instructional policy issues, yet have ample detail to accurately answer specific questions.

Can policymakers rely on existing state education databases to find the answers they need? This was the focus of a new study conducted by Southwest Educational Development Laboratory (SEDL).

Our results reveal an important message for state policymakers: state education databases are critical but underutilized to inform and support policy decision making and research. Further, the quality of the data necessitates that states make ongoing improvements.

This issue of *Insights* features what we discovered about existing state education data, guidance for policy

audiences about the instructional resource allocation questions that can and cannot be answered with existing data, and our recommendations for state data system reform.



Data must be accessible, of high quality, and easily understood.

State Education Data System Development

Looking back at the roots of state data system development shows us much has changed. Yet we have to recognize it has been a slow process and one that will be ongoing. The first evidence that education data were collected dates back to the early 1800s when school administrative records contained enrollment, attendance, and literacy figures (Goldin, 1999). The data were unreliable, but served as a springboard for future data collection.

In 1867, Congress legislated a Department of Education to “collect such statistics and facts as shall show the condition and progress of education in the several states and territories” (see An Act to Establish a Department of Education, Ch. 158. 39th Congress., 2nd Sess., 14 Stat. 434 of 1867). States now needed to provide the federal government with public school data on students, teachers, and schools, as well as basic finances. At the time, you could get the number of students and staff in a township and compare it to another, but little else was possible. Not only did these data have little detail, they were not connected. For example, you could not compute students by grade until around 1910 or relate a teacher’s education level to income until three decades later.

Database, Data System, Data Warehouse What’s the Difference?

Database: an organized collection of information or data elements, typically stored in a computer, that can be searched, sorted, reorganized, and analyzed rapidly. The following are database models:

- *Flat file:* data in one record that cannot be linked to other records (a single table format)
- *Hierarchical:* data in separate records that are attached to one root (one-to-one relationship)
- *Network:* data in separate records that can be attached to multiple other records (many-to-many relationship)
- *Relational:* data in a collection of tables without any hierarchy and that are physically independent
- *Object-oriented:* data in separate records that can be linked to a variety of data objects like text, graphics, photos, video, and sound

Data system: a collection of computer programs that enable you to store, modify, and extract information from a database. One such data system is the Texas Public Education Information Resource.

Data warehouse: a combination of many different databases across an entire system to present an entire picture. Data are added but never removed. An example of a data warehouse is the Louisiana Educational Accountability Data System.

Sources:

Date, C. J. (2003). *An Introduction to Database Systems, 8th Ed.* Boston, MA: Addison-Wesley. http://www.frick-cpa.com/ss7/Theory_Models.asp

In the early twentieth century, when data collection was becoming more sophisticated, states were also growing more interested in student proficiency. A number of states began testing students using state or national standardized tests and collecting the results. This was an important first step toward having data to assess student performance; however, student demographic data, such as race/ethnicity, gender, and age, were not collected until much later (Dorn, 2003).

These early attempts to collect data served as a basis for creating many current statewide education data systems. However, it was not until the 1970s or 1980s that most of these data systems were actually established, some a decade later. They were designed to collect data for specific purposes, most often in response to federal reporting requirements, budget management, and district compliance tracking. As state accountability priorities took precedence in education decision making, new data collection and management became necessary.

The majority of state data systems established were composed of distinct databases focused on one level of data, i.e., fiscal, student, teacher, or school data. This still holds true in many education data systems today. In addition, not all of the databases are necessarily housed or managed by the same department in the state education agency (SEA) or even within the agency itself. These separate databases are full of useful information, but many challenges exist to link the data. Linking the data is essential if we want to answer current education policy questions, as well as meet state and federal standards.

As the type of SEA data and data management have changed, so has our use for the data. Not only are boards of education, legislatures, and funding sources requesting quality data-based answers to important policy questions, but school personnel, courts, and the general public are relying on data

more in their decision making. Some of this upsurge in data use reflects federal No Child Left Behind (NCLB) legislation related to measuring adequate yearly progress, choosing academic programs, setting student improvement goals, and keeping parents informed. For example, states are providing publicly available report cards that include data on school and district accountability and limited fiscal and/or staff resources.

School finance lawsuits have also necessitated increased use of state data. Nationally, 45 states, including all in our region, have been, or are currently, engaged in court cases. The courts have asked pointed questions that require data-based answers. One pervasive question is, What resources, fiscal and staffing, are needed to improve performance in all students? This question, as well as questions on how to effectively allocate those resources, would be best answered with SEA data that links individual student data to staff, school, district, fiscal, and assessment data.

Do state databases allow the investigation of the relationship between fiscal and staff instructional resources and student performance?



States have been consistent over time in their categorization and collection of instructional expenditures.

SEDL Study on State Data Systems

Findings from our 2003 policy study, *Examination of Resource Allocation in Education: Connecting Spending to Student Performance*, served as the basis for our current study on state education databases. These findings for Arkansas, Louisiana, New Mexico, and Texas are below:

- High-performing school districts put more fiscal and staff resources into instructional areas than do low-performing districts.
- Districts with increasing student achievement use data-driven decision making to support resource allocation.

In discussions with policymakers about these results, they asked for greater detail on instructional resources linked to student performance. To pursue this, our latest study, *Investigation of Education Databases in Four States to Support Policy Research on Resource Allocation*, examined Arkansas, Louisiana, New Mexico, and Texas education data collected and managed by the four state education agencies to determine whether research can be conducted to find these links.

Our goal was to understand the scope, quality, and availability of each state's data to support its instructional resource decisions. Specifically, we addressed the question, Do state databases allow the investigation of the relationship between fiscal and staff instructional resources and student performance?

Four years of state instructional expenditure; staff characteristic; student performance; and student, school, and district characteristic data were the focus of our study. We assessed how the four states utilize their data and determined

state-specific policy concerns by the following:

- Examining public reports, summaries, and research
- Discussing data management with state education staff and other state policymakers
- Reviewing state policy

After identifying key variables, we assembled and examined the data for usability on five criteria:

- Availability and accessibility
- Completeness
- Accuracy
- Consistency
- Alignment

Next, we gauged commonalities across the state data and performed descriptive statistics to assess data quality. An important last step was to meet with state policymakers to discuss our findings and formulate ideas for data system reform specific to their state.

The State of State Education Data

We focused on instructional expenditure data, instructional and administrative staffing data, school and district demographic data, and student demographic and performance data. The four state data systems generally have separate databases for these different data. However, none were set up to link individual student data directly to teacher and fiscal data. Since our initial investigation in 2003, Arkansas and Louisiana have moved toward connecting each student's data with his or her teacher's data.

Instructional Expenditure Data

Instructional expenditures are funds spent to support teaching and

learning that occur in the classroom, with the majority going to teacher compensation. All four study states, similar to states across the nation, have detailed instructional expenditures for school districts. Texas also has school expenditure data.

Arkansas has just begun to collect school-level fiscal data, and Louisiana uses a statistical method to estimate school expenditures based on district data.

Each of the instructional expenditure databases are set up with a limited number of functions, e.g., instruction and student support. In general, each state has similar instruction function categories; however, they are not necessarily named or defined exactly the same way. The functions are divided into object categories, such as salaries, benefits, and

supplies. Often additional subfunctions and subobjects are also designated. As shown in Table 1, several of the states also have instructional expenditure data by programs, such as special education and Title I. We found that the states have been consistent over time in their categorization and collection of instructional expenditures, contributing to greater data reliability, accuracy, and completeness.

Salary data was of particular interest, and in all four states are documented in both the state’s fiscal and teacher databases. The fiscal database has district or school salary averages, while the staff database records salaries for individuals. Using the individual data allows greater flexibility in looking at particular subgroups of staff, which may be beneficial in making policy decisions. Generally, the

salary data is reliable; however, it is often impossible to discern some incentives, bonuses, or other reimbursements staff may receive. This makes it difficult to get a complete compensation picture. To this same end, we also investigated staff benefits. As seen in Table 2, unlike salaries, actual benefit costs per individual are not recorded by three states. Rather they are prorated using district benefit data. This further complicates decision making regarding total teacher compensation.

Instructional and Administrative Staffing Data

Data on teachers are more extensive than other staff data. In addition to the individual salary data in the staffing databases, the following data are available on individual teachers:

Table 1
SEA Instructional Expenditure Data in Four Study States

	Arkansas ^a	Louisiana ^a	New Mexico	Texas
Instruction-related function categories	<ul style="list-style-type: none"> • Instruction • Student support • Instructional staff services 	<ul style="list-style-type: none"> • Instruction • Student support • Instructional staff services 	<ul style="list-style-type: none"> • Direct instruction • Instructional support 	<ul style="list-style-type: none"> • Instruction and instruction-related services • Instructional and school leadership • Support services–student
Object categories	<ul style="list-style-type: none"> • Salaries • Benefits • Professional purchased services • Supplies and materials • Other objects 	<ul style="list-style-type: none"> • Salaries • Benefits • Professional purchased services • Supplies and materials • Other objects 	<ul style="list-style-type: none"> • Personnel services • Employee benefits • Purchased services • Supplies and materials • Travel and training • Capital outlay 	<ul style="list-style-type: none"> • Payroll costs • Professional and payroll costs • Supplies and materials • Other operating costs • Debt service • Capital outlay
Unit of analysis	<ul style="list-style-type: none"> • Program (for instruction only) • District 	<ul style="list-style-type: none"> • Program • District 	<ul style="list-style-type: none"> • District 	<ul style="list-style-type: none"> • Program • School • District

^a Function and object categories align with federally defined functions and objects (Census form F-33).

Data on teachers are more extensive than other staff data.

- Basic demographics, such as gender and race/ethnicity
- Educational attainment
- Years of experience
- Certification
- Teacher test scores
- Position, e.g. role, school, district
- Full-time equivalent (FTE) or percent time

When relying on these staffing data for decision making, we faced several challenges. First, data managers across all four states report limited reliability with teacher experience data since they often depend on unverified self-reports from individual teachers or school districts. Cross-checking the data over a span of years would be beneficial. Second, certification databases, often housed and managed separate from other staffing databases, are cumulative and not always easily aligned with other data. And last, not all states reliably document FTE or percent time data for each position a staff person holds.

School and District Demographic Data

All four states have extensive school and district demographic databases. Much of the data in these databases are averages; therefore, some caution must be taken when using school versus district data to look at a particular characteristic. For example, if we wanted to know the percent of low-income students in XYZ district, we could go directly to the district database and find the answer. We could also go to the school database, find all the schools in XYZ district, then average their student income data for the answer. The problem is that the two answers may be different. Still, the school and district databases offer information useful for school or district report cards, annual state education reports, descriptive research, and required funding reports.

School databases in the four states included the following data:

- School characteristics, e.g., type school and grade range

Table 2 SEA Individual Salary Data in Four Study States

	Arkansas	Louisiana	New Mexico	Texas
What salary measure(s) are available?	<ul style="list-style-type: none"> • Total salary 	<ul style="list-style-type: none"> • Base pay • Additional compensation (3 types) 	<ul style="list-style-type: none"> • Base pay 	<ul style="list-style-type: none"> • Base pay • Supplemental pay
Can partial salaries be determined for part-time staff?	Yes (since 2003)	Yes	Yes	Yes
Do salary data align with actual expenditures?	Yes (since 2003)	Yes	No	Yes
Are individual benefit expenditures available?	Yes	No	No	No

- Student population, e.g., number of low-income and minority-status students
- Attendance, graduation or completion, and dropout rates
- Special program participation
- Per-pupil expenditures
- Accountability ranking

The district databases often included additional information about district wealth. It was relatively easy to access school and district databases since many are available and downloadable on SEA Web sites.

We also went to the school and district SEA data to get a broader picture of the educational environment of students and staff. However, it was necessary to get additional data that states do not collect through federal databases, such as the U.S. Census Bureau and the National Center for Education Statistics. For example, federal databases designate locale information for a school or district, e.g., urban, suburban, or rural, that most of the states do not include in their databases. Also, the federal databases contain information about household characteristics of families in the school or district's vicinity, such as household income or parent level of education. In order to use these data with our SEA data, we had to find common identifiers on which they could be merged. It takes a bit of effort but provides more detail for specific groupings or geographic areas.

Student Demographic and Performance Data

Each state has different ways of complying with federal and state restrictions to ensure confidentiality of student information. Some have computerized methods to scramble student identities before providing the data. Others provide only aggregated student data at the grade or school level.

In each state a student's data record includes characteristics, such as race/ethnicity, gender, and age. The

SEA Staffing, School, District, and Student Data

The four states in SEDL's study have a variety of useful staff, school, district, and student data. Much of the data are available on SEA Web sites, and some must be directly obtained from the SEA to ensure confidentiality is maintained. The SEA data include the following:

Staffing data: data for individual teachers as well as other staff, such as basic demographics, education, experience, and certification

School and district data: data for individual schools and districts, such as student population, per-pupil expenditures, and accountability rankings

Student data: data for individual students, such as race/ethnicity, special program participation, grade, and student achievement scores

student's participation in programs, such as free and/or reduced price lunch, preschool, afterschool, and special education, is also available. Some states include family information, such as whether the student is in foster care or homeless. All states connect the student to his or her grade level, school, and district.

Data on each student also include performance measures. For our study, we sought only student achievement data. Other measures of student performance, such as attendance, graduation, and dropout rates, are also available. All four states have been improving their capacity to measure student performance through standardized tests. While this process has improved the quantity of these data with regard to the number of tests offered and the grades tested, it also has resulted in inconsistency in the test scores available from year to year. In each of the four study states, changes were made to the tests administered, grades tested, or scoring standards during the study period. These changes hampered getting a complete picture of student achievement over time.

Using the State Instructional Resource Data

After getting a better understanding of the data in the four states and assessing the relative quality of those data, we wanted to know if the data could be used to answer policy questions so prevalent today. What should be spent on students to ensure they succeed? Who should teach children to help them achieve? How should these monetary and staffing resources be allocated to be effective?

The state data are both available and accessible to answer basic, but important, questions about the adequacy and equity of state funding formulas and compensation for teachers and other staff. Searching the data to find out about teacher characteristics can be done relatively easy. This can be followed by an investigation into what impact these characteristics may have on student success. It's possible to get a good grasp of what type of teachers might be allocated to

Merging data from state databases, you can understand whether allocating more teachers, administrators, or aides impacts student achievement.

different schools to impact student outcomes. That is, teachers with certain qualifications may be better placed at schools with high-need student populations or schools in particular locales.

About Spending

How instructional dollars are spent and how the spending varies across districts can be studied using state fiscal data. These data are available to learn about district spending in all four states and school spending in Texas. To see if funds allocated are in any way connected to student achievement, the fiscal data needs to be merged with performance data. Specific questions that can be answered with the state data include the following:

- What are the differences in instructional spending across districts in the state?
- Do districts that perform well allocate more instructional dollars to salaries and benefits?
- How do districts of varying levels of performance allocate administrative versus instructional dollars?

More detailed questions about school and district spending on salaries can also be answered if individual staff data are merged with student performance data. For instance, determine how teacher pay can impact student performance with the merged data or find if salaries are distributed equitably between schools and districts. Also, using these data, see what effect salary has on the retention of qualified teachers. To answer this particular question, it would be necessary to have data on teacher mobility, which most of our states do not collect. However, it is not difficult to calculate mobility using existing state data on school and district teacher assignment over multiple years. Unfortunately, no current data in the state databases can tell us why teachers stay or leave.

Although answers to a number of important policy questions about instructional spending can be found with existing state data, additional data would increase our learning, especially in regard to teacher compensation. It would be helpful to have better measures for all funds paid to staff, such as individual data on the cost of benefits, bonuses, and incentives. With this more accurate depiction of total compensation, it's feasible to ask about the influence of benefits and incentives on

teacher recruitment or retention, particularly in shortage areas such as bilingual and special education.

Another instructional area where additional data would be helpful is professional development. States have little data on professional development, so it is impossible to know if their investments produce results. Each state collects data on the hours of professional development completed, but not data on actual or dollar-equivalent measures for teacher time, stipends, travel expenses, and costs for teacher substitutes. Information on the content would also be beneficial for addressing questions about the effectiveness of professional development, its relative costs, and the distribution of professional development resources across schools and districts.

About Teacher Quality

Teacher quality has always been an important policy issue, but NCLB has heightened our need to use good data



to determine the quality of our teaching staff. We found only certain questions about teacher quality can be answered using the existing state data, i.e., data on teacher experience, education, and certification. Questions about other measures of quality, such as application of pedagogical techniques, teacher motivation, and classroom management skills require information not collected in state databases. Changes are being made, however. For example, New Mexico has begun to collect data on evaluations of teachers as one measure of teacher quality. Using all of the available teacher data and merging them with other databases, finding answers to questions about teacher quality, its relationship to teacher salary, and its impact on student performance are possible.

Specific questions to ask using the data are as follows:

- How does teacher experience, education, and/or certification relate to student achievement?
- Do higher teacher salaries buy teachers with more experience, higher education levels, and advanced certification?
- How are teachers who are educated at different teacher education institutions distributed across the state?
- Do rural areas have a higher rate of uncertified teachers?
- What is the connection between teacher retention and route to certification?

Although you can use current teacher quality data to find answers to many policy questions, improving these data are important to ensure accurate answers. For instance, we found it would be important to help districts better understand definitions for reporting experience, especially for teachers who transfer between districts or from other states. Also, if data on teacher degree major were

collected, questions on how many in-field teachers you have and how these teachers are distributed across the state could be answered. Combining these data with performance data, it is also possible to seek information on the impact of these teachers, especially in comparison to those not teaching in their field of study.

About Staffing Patterns

We found that using the existing state data, you can determine what staff resources comprise each school and how those resources differ across schools with varying levels of student performance. These staffing pattern profiles can be detailed for specific types of schools or teachers. For example, it's easy to see how beginning teachers or administrators in small, medium, or large schools are distributed across the state. Or maybe find out about what teaching patterns exist for rural and urban schools, especially those that are low performing.

Another important education policy issue is class size, not only its relative cost but its connection to student performance. Merging data from state databases, you can understand whether allocating more teachers, administrators, or aides impacts student achievement. Be aware, however, that using a ratio of the number of students in a school to the number of teachers in that school is the least accurate measure of class size. It would be better to use data that directly links students to teachers and teachers to specific classes.

Data System Reform: What Can Be Done

Policymakers, state data managers, and researchers need to work together to expand the use and quality of state education data to learn more about instructional resource allocation and its impact on student performance.

States have little data on professional development, so it is impossible to know if their investments produce results.

Reforming state education data systems takes careful planning and collaboration between those who manage the data and those who use the data.

Specifically, policymakers and researchers should become more familiar with state data and regularly discuss, with SEA data managers, how the data could be improved to better answer policy questions. This would allow SEAs to expand the use of their data beyond traditional reports and monitoring purposes. Also, states should increasingly work with national data centers, such as the National Center for Education Statistics, to further establish and adopt national data standards that would enhance commonalities across states for a more complete picture of instructional resource allocation.

Some targeted improvements we recommend SEAs and other education policymakers consider are below:

- Add school-level detail for instructional expenditures.
- Institute more accurate ways to get teacher years of experience data.
- Ensure teacher certification data can be easily aligned to teachers' subject areas and grade levels.
- Create databases that link individual teachers to their students and classrooms.
- Enhance collection of data on the costs, content, and quality of professional development.

Our research also highlighted varying SEA data accessibility issues across the states. As a result we recommend SEAs consider the following:

- Combine separate databases in a centralized data warehouse housed and managed by one department.
- Establish clear procedures for data requests, including the time and cost to provide the data.
- Find ways to share individual-level data while maintaining confidentiality.
- Have ample and knowledgeable staff in place to assist data users.

- Provide documentation explaining details of the data, i.e., definitions, calculations, and year-to-year changes. Post this documentation on agency Web sites.

We recognize that SEA data are collected for competing needs, such as federal reporting, tracking state accountability goals, and supporting state funding formulas. Consequently, reforming state education data systems takes careful planning and collaboration between those who manage the data and those who use the data. Critical to this process is for SEAs to balance the time and resource burdens that changes to their data systems create for schools, districts, and their own agency staff. Continued work remains to be done to ensure high-quality, user-friendly data are accessible that can be used to answer important policy questions about education resources and student achievement. Such efforts would support the creation of more reliable information needed for more effective decision making on the resources needed to help children succeed.

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For a copy of SEDL's research report, go to <http://www.sedl.org/rel/IES-report.html>.

What Can the SEA Data Tell Us?

Using the SEA data collected from Arkansas, Louisiana, and Texas, we at SEDL are currently conducting a study to investigate teacher resources and student achievement. Teacher resources includes teacher salary, level of education, and years of experience. We are particularly interested in looking closely at these teacher resources in high-need schools, i.e., schools in rural or urban areas and schools with high student minority and poverty enrollments.

The goals for this study are as follows:

- To learn about the extent to which districts pay teachers based on years of experience and degree level
- To determine whether teacher resources are distributed differently across schools depending upon their levels of need
- To see if funds expended on teacher resources are connected to student achievement

Our study includes 191,813 core teachers and 6,618 public elementary and middle schools. We are using a variety of analysis tools and the array of data collected to achieve these goals.

In our final study report, we will discuss the states' use of a single salary schedule based on teacher education and experience and patterns of teacher resource allocations in schools. Our focus will be on helping policymakers in the three states better understand the relationships between teacher salaries, teacher experience, teacher education, and student achievement.

For more information about this study, contact SEDL policy staff at 1-800-476-6861.

Additional information about SEDL's policy work can be found on our Web site at http://www.sedl.org/rel/pr_overview.html.

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AT A GLANCE

INSIGHTS

Efforts to base education policy and practice on reliable data are increasing. The heightened need for answers about the allocation of resources to improve student performance have prompted policymakers and researchers to ask, Can existing state education data support research that will provide this information?

This edition of *Insights on Education Policy, Practice, and Research* summarizes a recent SEDL study that explored what can be learned from state education data systems about the allocation of instructional resources and how this may impact student achievement. Specifically, this brief gives policymakers a clearer picture of the capacity and quality of the state data to answer questions about instructional spending and teacher quality based on four states in the SEDL region.

Instructional resource data is available and accessible in separate state databases.

- Detailed instructional expenditures for school districts are in a fiscal database.
- Average staff salary data are in a fiscal database and individual salary data in a staffing database.
- Teacher quality data, e.g., teacher experience and education, and teacher characteristic data, e.g., position and race/ethnicity, are in a staffing database.
- Teacher certification data are in a distinct database not generally linked to other teacher data.

- School and district databases with demographics and other descriptive data are often on state agency Web sites.
- Student databases include characteristics, program participation, and performance measures for each student and are highly confidential.

State data is highly useful for policy making and research.

- See how instructional dollars are spent and how the spending varies across districts.
- Find answers to questions about teacher quality, its relationship to teacher salary, and its impact on student performance.
- Determine what staff resources comprise each school and how those resources differ across schools with varying levels of student performance.

Ongoing reform of state education data systems is needed.

Collect new and improved data, including school expenditures; more accurate staff years of experience; teacher certification alignment to subject and grade being taught; and professional development costs, content, and quality.

- Link data on individual teachers to their students.
- Combine fiscal, staff, school, and student databases.
- Improve data access, including clear procedures for data requests and detailed data documentation.



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