Using State Databases For Research and Policy on Instructional Resources and Student Performance

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Introduction

In this era of standards-based reform, researchers, policymakers, and practitioners must better understand how educational inputs (such as salaries, class size, and the supply of quality teachers) can most effectively support student learning. Education researchers and decision makers must consider critical issues related to the effective allocation of instructional resources. For this study, researchers from the Southwest Educational Development Laboratory and the Charles A. Dana Center at the University of Texas at Austin investigated whether existing state databases can be used to answer questions about allocating instructional resources, by examining the quality, availability, and appropriateness of data collected by state education agencies for such purposes.

This study was motivated by a resource allocation study we recently completed that examined fiscal and staffing information from the NCES Common Core Data.[1] While disseminating study findings to state policy audiences, we learned that analysis of federal data provided state and local decision makers with less useful and less applicable support for their decisions than an analysis using state level data might provide. In Texas, for example, state databases report expenditures for instruction across multiple functions depending on the purpose of the spending, while federal data aggregate spending in instruction into one function category to create a common standard for all states. We recognize that federal databases provide reliable standardized data that allow comparisons across states, and state data vary considerably in terms of quality and utility. However, for state and local education decision makers, investigations

[1] Pan, D., Rudo, Z., Schneider, C. L., & Smith-Hansen, L. (2003). Examination of resource allocation in education: Connecting spending to student performance. Austin, TX: Southwest Educational Development Laboratory.

using state data offer more specific information on spending and staffing patterns within instructional areas than do federal data. State data sources also have increased currency and rely on measures of resources and performance that are more familiar to state audiences. In response to the needs of education decision makers, this study assesses state data to understand whether critical questions regarding instructional resources and performance can be answered using these data.

We address the question: "Do state databases allow the investigation of the relationship between fiscal and staff instructional resources and student performance?" We are conducting examinations of state databases in participating study states (Arkansas, Louisiana, New Mexico, and Texas) to discern whether the data can support new, rigorous research about the following questions.

1. Is there a relationship between fiscal expenditures within instructional areas and student performance?
2. Is there a relationship between teacher characteristics and student performance?
3. Is there a relationship between instructional staffing patterns and assignment and student performance?
4. Do these relationships change for varying demographic contexts?

The results of this study benefit education researchers, policymakers, and practitioners. Researchers at SEDL and nationally will understand the feasibility and potential scope of using existing state databases to conduct research on the allocation of instructional resources. Specifically, the results of this study provide the background information we need to plan a regional study of the relationship between resources and student performance within each state's policy context.

Approach

To assess the capacity of existing state databases for addressing the four resource allocation questions, we planned a 3-step approach: 1) identify the key variables needed to

analyze each relationship; 2) develop criteria to assess data quality; and 3) apply these criteria to determine the capacity of existing data to answer the questions (see Appendix A). We also solicited input from state policy audiences in the states to identify the state-specific policy concerns that would benefit from new research.

In August 2003 we began conducting a systematic investigation of relevant state databases in the study states. We collected background information on existing data sets and identified variables relevant to our four areas of interest (instructional expenditures, teacher characteristics, staffing patterns, and demographic characteristics). We traveled to the states and conducted interviews about these variables with financial and staff data managers, accountability system experts, teacher licensure unit staff, and others. Concurrently, we reviewed recent research that used state databases, and engaged state policy audiences in discussions about the policy information needs of their particular states.

Findings

This paper describes preliminary findings from our investigation based on the activities we have completed to date. We are in the final phase of collecting and verifying sample data gathered from each state. Using the information we have compiled to date, this paper lays out two data quality elements that we considered in this investigation: 1) the availability of relevant data variables in state databases that would contribute to resource allocation studies, and 2) the potential to align different data elements for use in quantitative analysis. We also discuss some strengths and limitations of the data and how it could be put into practice for informing a policy issue based on its potential use for research. For this paper, we focus on one of the variables in our study, teacher compensation, and address the availability and alignment of state data measures in this area in the four states.

Availability of Teacher Compensation Data. For this study we considered four possible measures of teacher compensation. First we sought a measure for the base pay of classroom teachers. Second, we looked at the total expenditures for teacher salaries recorded in financial data. Third, we explored whether benefits for classroom teachers were available. And fourth, we investigated supplemental salaries for teachers. Table 1 provides a summary of information regarding the availability of data for these four teacher compensation measures in each state. The table also indicates whether the lowest level of disaggregation of the data lies at the individual, school, or district level. Base pay information is available at the lowest level of aggregation for all four states. In three states, however, spending on benefits is only recorded at the district level in the form of a fiscal expenditure "object". Also, this object contains benefits for teachers and non-teachers, making the determination of benefits paid only to teachers impossible (e.g., in New Mexico teachers, substitutes, and aides are in the same fiscal category). We discovered through conversations with state data managers that supplemental salaries are used almost exclusively for non-instructional tasks that teachers perform (e.g. athletics, student clubs, band).

Table 1.
Data available to measure teacher compensation at the individual, school, or district level for year 2002-2003.

Teacher Compensation Measures	AR	LA	NM	TX
Base pay	I	I	I	I
Salary expenditures	D*	D*	D*	S*
Benefits	I	D*	D*	S*
Supplemental salary	I	I	I	I

I=individual; S=school; D=district
*These data do not reflect compensation for teachers only, but also include spending for other instructional staff.

Alignment of Teacher Compensation Data. A critical quality criterion that we used to gauge the usefulness of existing state data for resource allocation research is the potential for

aligning different variables with each other. For example, to research the relationship between teacher pay and teacher certification levels, we would require data elements on pay and certification as well as a common identifier (such as teacher social security number) that would allow the data elements to be merged. Table 2 provides information on the potential for aligning teacher base pay with three important measures: teacher characteristics, student performance, and student demographics. The data from all four states have the potential to align teacher pay and teacher characteristics (e.g., certification type, years of experience, highest degree). The database structure of staff and student data in New Mexico is the only one that has the possibility of aligning individual teacher information with individual students. In the other three states we would have to consider higher levels of aggregation if we needed to align teacher pay and student information.

Table 2.
Potential for aligning teacher base pay with other data variables at the individual, grade, or school level (2002-2003).

Teacher base pay aligned with:	AR	LA	NM	TX
Teacher characteristics	I	I	I	I
Student performance	S	S	I	G
Student demographics	S	S	I	G

I=individual; G=grade; S=school

Application of Data to Policy and Research. Given the nature and quality of the available state data, we now turn to the use of teacher compensation measures for research directed at a state policy question. We show how the strengths and limitations related to data reporting and the quality of those data impact the research. We will summarize by discussing how the use of state data is more or less beneficial than Federal data for informing state policy issues.

There are a number of policy implications associated with teacher compensation. We illustrate our example application using the core question, *"How much should states pay their teachers?"* For both policy and research purposes, we tie the question to another main association of interest, whether teacher compensation is related to student achievement. The association between these two variables undergirds the policy issue of whether staffing schools with highly qualified, and therefore highly paid, teachers will maximize student performance, which is at the heart of Federal, state, and district reform efforts.

Current Policy Issues in the States. Policy makers struggle with the perennial question of whether their teacher salaries are competitive enough regionally to recruit and retain teachers. While average teacher salaries in the four states are relatively similar (see Table 3), Texas' salaries rank the highest.

Table 3

Average Teacher Salaries for 2002-03*

	AR	LA	NM	TX
Average salary	$37,753	$37,300	$36,965	$40,001

*NEA statistics

Arkansas's recent adequacy study contained a teacher compensation component that recommended raising the teacher salary levels to those of contiguous states and the member states of the Southern Regional Education board (SREB). This would require a 15% increase in teacher salaries at a cost of $277 million. Final decisions about salary increases are currently underway. In Louisiana, the state's designation of "highly qualified" teacher under the NCLB mandate is defined as certified to teach and teaching "in field." Inclusion of both criteria raises the bar for recruitment and retention and the price tag for staffing schools with qualified teachers.

New Mexico has implemented a three-tiered educator licensure system based on the attainment and demonstration of competencies determined by the Public Education Department. The new system is aimed at meeting some of the Federal mandates of NCLB and supporting and retaining teachers in the state. New Mexico has prioritized maintaining the funding for this new system and passed funding appropriation legislation to raise minimum salaries for their teachers. In Texas, reports from a recent adequacy study suggest that improvements in student performance will require significant increases in the education budget to bring districts up to funding level needs. All four states are wrestling with significant education policy issues related to funding for instructional staff and services.

Strengths and Challenges of the Data. As mentioned earlier, our overall goal is to investigate the feasibility of using state data to get a more refined picture of instructional resources and their connection to student achievement. We are interested in patterns of teachers' compensation at the school and district level. Additionally, we will study patterns of teacher characteristics distributed in those schools and districts, with all of their contextual features in mind. Teacher salary is one component of the teacher compensation measure we will study. Other components of compensation include benefits and supplemental pay. We only discuss teacher compensation information here in the interest of brevity, and briefly touch on student achievement data information.

There are a number of strengths and challenges associated with teacher compensation data. In all four states, teacher salary is compiled in detailed databases and reported in timely intervals during the school year according to budgeted and actual expenditures. The data on base pay are reported at the individual level, and at all levels of aggregation. For the purposes of computing a compensation measure that includes benefits at the individual level, however, three

of the four states do not provide information on amounts allocated to specific individuals. In Arkansas, amounts allocated to the major categories of benefits are reported for individual teachers, and the remaining categories reported at the district level can be averaged over all teachers. For the other three states we will use an aggregated measure to indicate benefits for teachers at schools or districts. As mentioned previously, salary allocations may include spending for instructional teachers who perform additional roles (e.g., teachers who also drive buses), reducing the accuracy of evaluating resources allocated to instruction solely.

Student achievement data, while complicated by the lack of uniformity in measures used across and sometimes within states, are accessible in all four states. Confidentiality issues increased the need to provide states' information officers with detailed information about the use and storage of the data. Since we will be reporting information about the data at an aggregated level, most of the concerns about releasing individual student level data were easily addressed and did not hamper data requests. One of the strengths of the data is the multiple measures available for each student, school, and district. On the other hand, that same quality is one of its challenges. It requires careful analysis of which measures are important to use, which measures are meaningful to the state policy makers, and when and how the tests are given to the students. For example, in Arkansas, norm-referenced tests are administered every other year, including a gap of two years between middle and high school years, making it difficult to conduct longitudinal analyses of yearly progress and a previous year input score for a "value-added" model. Also, as mentioned previously, it is difficult to align the individual teacher data with the individual student achievement data in all but one of our states. Further, in order to consider the student demographics of the test-takers, the demographic data reported with the student achievement data must be reliable. At this point in our analysis of the quality of the data, we

understand that there are several problems with the demographic data accompanying the test scores. Given this problem with reliability, we will have to merge the student achievement data on the unique identifier for each student with the larger database collected by the state on student demographic information.

Benefits of Using State Data. Our ability to provide accurate information from our research is limited to the accuracy of the state data. While the data systems and the data itself present several challenges, there are major benefits to using the states' data over the Federal data sets. The most important benefit is the fact that policy makers resonate with reports addressing measures they are accustomed to seeing. The relationships built with state departments of education staff are informative and facilitate the dissemination of information that the researchers have gathered during individual state visits. Several opportunities have arisen during our data request meetings to discuss regional state data system issues and solutions. The data are far more refined and current at the state level than they are at the Federal level. Many of the states in our region have uploaded large amounts of data to websites that are relatively easy to access. As we finalize our data collection and quality analysis we will gain better insight into the strengths and limitations of using the data for statistical purposes.

Next Steps of this Study. We are finalizing the collection of sample data from each state in order to determine and confirm data quality on the complete set of variables of interest. Once all sample data are received from the states, we will complete the examination of the quality of data based on several criteria (see Appendix A). Researchers will also use descriptive statistics to describe the samples and inferential techniques to investigate differences among samples to further understand the level and scope of resource allocation research that could be conducted with the existing state data.

Summary

Through interactions with education decision makers about their information needs, we have recognized the importance of using existing state databases for policy research. This study represents the first step in creating state-specific, policy relevant information about how instructional resources are allocated and what allocation strategies might support student success. Our findings from interviews with data managers, review of documentation, and data collection efforts have provided preliminary evidence that state data are available to measure some important instructional resources at the individual, grade, school, and district levels. We also found that the data elements could potentially be aligned with each other for use in statistical analysis. We will conclude this study by the end of 2004 and apply the completed findings towards a regional study of the relationship between resources and student performance using existing state databases.

Appendix A: Data Quality Criteria, Indicators, and Measures

Criteria	Indicators	Measures
Availability/ Accessibility	Do sufficient data exist to measure instructional resources, student performance, and demographic characteristics at a useful level of analysis?	• Visual examination of data points
	Do data reflect current (2002–03) measures? Are data contained in accessible formats? Do state policies regarding confidentiality balance privacy concerns and need for access?	• Discussion with state data managers
Usability	To what extent are data currently being used to guide policy, what are the barriers that prevent such use? What feedback mechanisms exist to increase the usability of data? Is there a time lag between when the data are collected and when they are useable by policy audiences?	• Discussion with state data managers
Completeness	Are data complete? Do data measure all levels of the education system (classroom, school, district, and state)?	• Visual examination of data points • Examination using descriptive statistics (frequency, means, ranges)
	Has completeness been maintained through standardized data collection procedures?	• Discussion with state data managers
Accuracy	Are data an accurate reflection of reality?	• Visual examination of data points • Examination using descriptive statistics (frequency, means, ranges)
	Has accuracy been maintained through data cleaning, editing, calculations, and storage?	• Discussion with state data managers
Consistency	Is consistency evident among student, school, and district level data? Do data reflect uniform use of definitions? Are data consistent over time so that comparisons can be made longitudinally?	• Visual examination of data points • Examination using descriptive statistics (frequency, means, ranges)
	Has consistency been maintained through uniform reporting procedures?	• Discussion with state data managers
Alignment	Are there common data elements that can link fiscal, staffing, performance, and demographic data systems? Do data identify each record unit by all standardized identifiers that apply to the unit (e.g., do school-level data elements contain the school name, state ID for the school, district ID for the school, etc.)?	• Visual examination of data points • Examination using descriptive statistics (frequency, means, ranges)