

“...Our inability to link money and/or resources to student outcomes seems to be, at least in part, a result of not having...detailed fiscal data.”

The Collection and Use of Student Level Data: Implications for School Finance Research*

Lawrence O. Picus
Ed Robillard

The principal focus of school finance in the past has been on elimination of fiscal disparities among school districts. Whether the goal was to eliminate differences in per-pupil spending, or to establish greater taxpayer equity, most school finance research has focused on ways to measure equity and on treatments for differences in the fiscal capacity of school districts. While there is still much to be done on this front, school finance today must also accommodate a number of new issues related to: whether or not spending levels are adequate to meet the needs of our children; how educational resources are allocated and used; and how funding levels are linked to student outcomes (Odden & Picus, 2000). In this article, we suggest that to fully understand each of these issues, school finance researchers will need to collect resource allocation data at the student level.

In recent years, considerable attention has been devoted to the collection of school level fiscal data. These efforts seem motivated by both the growing trend toward more school site decision-making, and the growing demand for accountability for student performance. In the states with the most experience in school level data collection, one constant has been that gathering of these data is expensive and difficult. Often once collected, the data remain relatively unused. Moreover, to the extent that understanding how resources are linked to student outcomes, it seems probable that school level variables will suffer from the same lack of specificity that has plagued the use of district level expenditure variables in research on this topic. For that reason, we feel it important to consider the collection of student level resource allocation patterns. This effort is not without its difficulties and expense. In fact, it may provide more information that school districts really need for efficient fiscal operations. However, absent more knowledge of what is to be learned from student level data collections, we feel initial efforts in this direction are warranted. This paper provides a description of our initial work in identifying the resources available to individual students at one high school in the Los Angeles Unified School District. It begins with a brief review of the literature on resource allocation in schools. This review focuses specifically on the reasons for collecting student level data and how such data can help improve school finance research. Following this discussion,

Lawrence O. Picus is Professor in the Rossier School of Education at University of Southern California and Past President, American Education Finance Association. Ed Robillard is Assistant Principal at Los Angeles Unified School District.

we describe our research methods and offer our initial estimates of student level resource allocation patterns at one high school in Los Angeles. The article concludes by suggesting how such data might be collected in the future.

Review of the Literature

Despite the large sums of money spent annually for K-12 education, we know remarkably little about how those funds are used at the individual student and school level. School finance studies have traditionally focused on school districts as the level of analysis, and most states only collect information from constituent school districts at the district level. The focus of most state finance reporting systems is on fiscal accountability, not understanding how or why resource decisions are made. These systems generally focus on object level reporting. As a result, we know a great deal about how much our schools spend for salaries, benefits, contracts, etc. but relatively little about expenditures by function (instruction, administration, pupil services, maintenance and operations, transportation, etc.), and even less about how much is spent by individual program.

For example, many districts can not tell us how much is spent per pupil for elementary vs. secondary instruction, much less answer a question like what are per pupil costs for mathematics instruction at the high school, or how much is spent on individual students at the elementary level. Yet, until we can identify these costs, it seems unlikely we will be able to ascertain how the use of educational resources is linked to student achievement

Berne and Stiefel (1997) argue that student resource studies can answer three types of questions. They are:

- Resource effectiveness questions
- Equity questions
- Resource intent questions

Resource Effectiveness Questions

A large body of literature, both in economics and school finance, has focused on production function analyses that attempt to relate inputs to outputs. Studies of this type are useful for answering questions on the effectiveness of resource use, and the cost-effectiveness of different programs. To date, production function analyses that attempt to relate the student outcomes to resources have not clearly identified a link between spending and student achievement. Eric Hanushek's work in this field led him to conclude that there does not appear to be a systematic link between student achievement and the level of spending (see for example, Hanushek, 1989; 1994a; 1994b; 1996a; and 1996b). He does not suggest that such a link does not exist, only that at the present time, schools need to spend the resources they have more efficiently if they are to improve student learning with more money (see in particular, Hanushek, 1994b).

In recent years, a number of authors have challenged Hanushek's findings, arguing that more money does relate to higher levels of student achievement. Hedges, *et. al.* have argued extensively that if different statistical methods are used to conduct meta-analyses of production function studies, there is a clear link between spending and student achievement (see Hedges, Laine & Greenwald, 1994a and 1994b; Greenwald, Hedges & Laine, 1996a and 1996b; and Laine, Greenwald & Hedges, 1996). Ferguson found that "hiring teachers with stronger literacy skills, hiring more teachers (when students-per-teacher exceed 18), retaining experienced teachers, and attracting more teachers with advanced training are all measures that produce higher test scores in exchange for more money (Ferguson, 1991: 485)." Other work by Ladd and Ferguson (1996) in Alabama found similar links between spending and student achievement.

Cost-effectiveness studies are less common in the educational literature. In part this is due to the difficulty in measuring educational outcomes consistently across children. Cost-benefit analysis, of which cost effectiveness is a derivative (see Levin, 1983), relies on the ability to value both costs and benefits in dollar terms. The difficulty in education is that to compare student achievement, we need to rely on various test scores and measures of gain. Since tests in different subjects use different scales, as do different tests of the same subjects, it is virtually impossible to compare the cost effectiveness of different programs with district and state level aggregate cost data.

Berne and Stiefel argue that studies like the ones described above "...could be done with much more accuracy if there were student-level resource measures that were defined to be inclusive and to differentiate between kinds of programs and students. The data would be useful if it were gathered at the school level or, if it were a sample of individual student-level data that was representative at the school level. (Berne and Stiefel, 1997: 70).

Equity Questions

School finance has a long history of analyzing funding equity. However, most of that work has looked at spending differences across school districts. Very few studies have considered school level finance equity either within districts, or across districts in an individual state. Hertert, (1996) analyzed school level equity in California, but to do so was forced to collect data from a sample of school districts and key in their data by hand. Nakib (1996) analyzed school level equity in Florida using that state's extensive school level data. Picus (1993a, 1993b) used a national sample of school districts merged from the Schools and Staffing Survey and the 1987 U.S. Bureau of the Census, Census of Governments to analyze school level expenditure patterns by various district characteristics such as size, location and wealth. However, outside of this work, there have been few school level analyses of finance equity. Berne and Stiefel suggest "...a well-defined set of student resource variables would improve equity studies at the school level including studies that use administrative data, particularly if those variables are capable of serving as models for other data sets (Berne and Stiefel, 1997: 70)."

Resource Intent Studies

The third category of questions Berne and Stiefel identify have to do with how resources are used or how they flow to programs or schools. Studies of this sort include the Resource Cost Model developed by Chambers and Parish, and the work Bruce Cooper and the accounting firm of Coopers and Lybrand are doing in analyzing school district expenditures by program and level. This work provides a wealth of information on how educational resources are used. However, data collection methods are expensive, and all suffer from the inherent incompatibilities in the way districts and states report fiscal data. These complexities, combined with the need to make hard decisions about allocation of overhead costs and central office expenditures have led most analysts to shy away from such efforts.

Four School Finance Issues That Would Benefit From Student Level Data

Elsewhere, Picus (forthcoming) and Picus and Peternick (forthcoming) argue that collection of student level fiscal data will improve our knowledge in four school finance research areas. They are:

- Equity
- Adequacy
- Accountability
- Productivity

Equity

Although issues of equity have been the principal focus of school finance since the turn of the century (see for example Odden & Picus, 2000), school finance research will continue to look at issues of equity well into the foreseeable future. One area gaining more attention is within district spending disparities.

Hertert (1996) demonstrated that even in a state with relatively equal per-pupil spending (California), there are substantial differences in per-pupil spending among schools within a district and across schools among districts. She also showed that substantial differences exist in the types of resources available to children, finding a considerable disparity in the pupil/teacher ratio for teachers of high-level math and science courses. Clearly those students in schools with a lower ratio (fewer students per teacher) have greater access to teaching resources for those subjects.

The differences Hertert identifies across schools are an important concern for school finance researchers. Even if we make progress in improving the equity of district level finances, if differences continue to exist among schools, our ability to improve student learning for all may be compromised. Understanding the extent to which differences in spending, and educational resources are unevenly distributed among schools both within districts and across schools among districts within a state is another critical issue for future school finance research.

While school level data would improve our understanding of this considerably, anyone who has been in a school recently can't miss the fact that even within individual classrooms, considerable differences in the resources available for each child exist. For example, some children, as part of a special education inclusion program, may have their own teaching aide for all or part of the day. Other children may be taken from the classroom for a portion of some or all days each week for special instruction. This model is common in Title I programs, and is a critical part of the Reading Recovery program. These actions are clearly intended to improve the "vertical equity" in schools, something school finance research has had limited success in measuring to date. Moreover, this shows clearly that substantial differences in the resources available to individual children probably do exist.

Adequacy

The 1990s saw resurgence in school finance litigation. Since 1989, a total of 21 cases have found their way to the highest court in their respective state. In 12 of those, the court decided in favor of the plaintiffs (see Odden & Picus, 2000 and related web site <http://www.mhhe.com/schoolfinance>). Beginning with the 1989 decision in Kentucky, courts have been more willing to overthrow the existing funding system, define remedies and establish concrete requirements for constitutional remedy. In many instances, these decisions have focused on an alternative concept in school finance - adequacy.

In the past, school finance cases were brought on the more narrow grounds of funding equity for students, or taxpayer equity through remedies such as fiscal neutrality. Adequacy cases argue that it is the responsibility of the state to provide an "adequate" level of resources to insure each child receives a satisfactory education. As envisioned by William Clune (1994), adequacy shifts the focus of school finance reform from inputs to an emphasis on high minimum outcomes. Adequacy models focus on the resources needed to provide students with the education they need to attain high standards. It seems clear that the availability of student level resource data would improve the accuracy of estimates of the costs of providing students with an adequate education.

Accountability

Holding schools accountable for the performance of their students has become one of the staples of education policy in the 1990s. Policy makers talk about giving schools the funds they need and holding them

accountable for student performance. While this rhetoric is popular, it is a long way from a state actually relaxing its control over the basic accounting functions they currently require of school districts, particularly for specific grant programs. This is understandable as any legislator who appropriates billions of dollars for schools only to find that some have “misused” those resources will want to have some redress with local officials. Hence, we have been slow to remove restrictive and outdated fiscal controls on schools.

Some progress has been made in this direction through so-called “market based” approaches to school reform or reorganization. Specifically, programs that support site based management, school choice, vouchers and charter schools offer local school officials the opportunity to have more control over the allocation and use of the revenues they receive. The question facing school finance researchers is, do local educators take advantage of this new flexibility and use their resources differently? If they do, does it make a difference in student outcomes? Both questions are critical components of future school finance research. We also need to know if different organizational structures lead to greater gains in student learning than others and we need a better understanding of the relationship between organizational structure, resource use and student achievement. Armed with this information, it may be possible to hold schools accountable for the performance of their students.

Productivity

We are a long way from understanding the link between money and student outcomes. Despite hundreds of studies and years of debate, the question of how money matters is still hotly debated. What we need is better fiscal data. Today it is possible to get detailed student level demographic and performance data. Often we can only link it to district-wide fiscal data. If we better understood how much was spent at the school, or ideally at the student level, it should be possible to more fully understand the relationship between money and achievement. Additionally, it is also important to understand what resources money buys at the school. For example, it may be more important to know about the characteristics of individual teachers than how much they earn, or even how many students are in their classes.

Estimates of Student Level Resource Allocation in One Urban High School

In the pages that follow, we describe our approach to estimating the expenditures for each student in one urban high school in Los Angeles. We begin with a description of the school itself, follow with a detailed discussion of our methodology and conclude with the results of our analysis. In the conclusions to this article we discuss the strengths and weaknesses of our method and compare it to the use of national NCES data for the same purpose as has been suggested elsewhere (see Picus, forthcoming and Picus & Peternick, forthcoming).

Description of the High School

The school site used for this study is a large, comprehensive, urban, year-round, high school located in the Los Angeles Unified School District. The population of the school fluctuates between 3500 and 4000 students. Students attend school as part of one of three enrollment tracks (designated A, B and C). Students are assigned tracks primarily by zip code or program. The school offers a number of special and magnet programs which operate on one of the three tracks. Thus, students accepted in the Graphic Arts Academy enroll in the B Track. Students not enrolled in any particular program are assigned to a track by zip code. As students leave and new students enter the school, the registration office policy for assigning new students to a track is based on maintaining equal numbers of students in each track.

Eighty percent of the students in the school are Latino, and the remaining 20 percent are African-American. Approximately half of the Latino population is of Mexican descent with the other half from Central American and South American countries. This latter group includes many recent immigrants. The transiency rate is over 20 percent per year. More than 90 percent of the school’s students receive free and reduced price lunch each day. The school operates at its enrollment capacity and over 200 students in the school’s attendance area were bused to other schools at the beginning of the 1999-2000 school year.

The school utilizes block scheduling with classes meeting for two hours every other day Tuesday through Friday. On Monday, all six periods meet for one hour. Athletic teams meet as a physical education class either 5th or 6th period in addition to their after school time.

The school year starts in the beginning of July and ends the last week in June. The only time the school closes completely is during the last week in December. Each track meets for four months then takes two months off.

There are eight academies in the school. The academies offer instruction in specialized areas such as graphic arts. Approximately one-third of the students are enrolled in one of these eight academies. The school is governed using a school based management (SBM) model. The school’s SBM committee selected the principal along with most of the five assistant principals at the site. The school recently received the California Distinguished Schools award and is a finalist to become a New American High School.

Conceptual Framework and Method

To understand how resources are allocated to students, the school’s spending was divided into three categories. The first was those expenditures that could be directly allocated to individual students. Direct student expenditures included the dropout prevention program, social workers, attendance counselor and health clinic costs. These expenditures were assigned directly to individual students. Total direct student costs amounted to \$430,714 or 2.2 percent of the total school budget of \$19,307,808.

The second step was to identify the costs associated with each class offering in the school. To do this, we relied on the school’s master calendar to assign teachers and students to each class. That done, we determined the cost of compensation for each teacher and divided that figure by the number of classes a teacher taught. If an individual had administrative responsibilities for some portion of the day, the cost of that time was allocated to the school’s indirect costs as described below. Departmental costs were also allocated to each teacher and then to each teacher’s individual classes. Thus, if a teacher taught two language arts classes, and three social studies classes, the individual period cost of the social studies department would be allocated to the three social studies classes and the individual period costs of language arts department would be allocated to the two language arts classes. Classes that were part of academies that received additional funding shared equally in that funding. Total direct classroom costs amounted to \$10,595,450 or 54.9 percent of the school’s total budget.

Finally, all other costs in the school were allocated on a per student basis. These costs included administrators, student support services, administrative support, supplies, utilities, custodial, maintenance and operations, food services and transportation. These costs amounted to \$8,281,644 or 42.9 percent of the total budget for 1999-2000.

Direct student costs and per-pupil indirect costs were assigned to each student. Then, the cost of one student in each of the identified classes was estimated. The total costs for each student was the sum of the direct student costs allocated to that individual, that student’s equal share of the indirect or school level costs, plus the costs associated with one

student in each of the classes in which the student was enrolled. The figures reported in this article represent expenditure estimates based on the school's budget for 1999-2000 and are subject to revision at the end of the school year. We chose to use 1999-2000 budget data because data from the student information system for the previous year (for which we had actual expenditure data) was not available.

Data

A student database was created using the school's student information system (SIS). The data were placed in the database on a date in November 1999 when all three tracks were present on campus. Approximately 3800 student records were downloaded to our database. The variables captured included: student name, birthday, unique record number, grade, track, ethnicity code, and the course numbers in which the student was enrolled for each of the six periods of each day. We checked the database for duplicate students and for students not enrolled in any classes. This reduced our sample to 3,489 students.

The data on classes offered and their size was obtained from another district resource. There were approximately 1,200 different classes offered on the three tracks. The information available on this report also included what type of class (*i.e.* algebra IA, world history) and what type of program (magnet, Humanitas, etc.) each class represented. Individual class data were generated on the same day in November 1999.

We assumed, for the purposes of this study, that students would enroll in the same classes during the second semester of the school year. In the long run, we would prefer to estimate costs based on actual enrollments in each semester. However, issues of timing and the need to wait until well into the year 2000 to get all of the data necessary required that initially we make this assumption. We also assumed that the teacher force would remain constant throughout the year and that they would continue to teach the same classes each semester. Since teacher turnover has been less than three percent so far this year, the assumption is not too far from actual practice. While this assumption does not reflect the reality of any school, it seems reasonable for a first approximation of resource allocation and use. In the future, we hope to be able to totals based on students' actual enrollments throughout the year.

To determine class level expenditures, we used the school and district personnel systems to estimate teacher salary and benefits. These were allocated across the classes taught by each teacher on an FTE basis. We also determined the costs of assistant teachers (where they were utilized), departmental costs, academy costs, and special program costs. These were allocated to individual classes as appropriate to determine how much was spent on each individual class offered by the high school. The class cost was then divided by the number of students in the class to reach a per-pupil figure.

The last category of expenditures is the costs associated with running the school generally. These include expenditures for administrators, instructional support staff such as counselors and deans, administrative support staff such as security and school police, teacher substitutes, materials and supplies, utilities, custodial staff and supplies, maintenance, student cafeteria, transportation and costs associated with the district office. The total of these costs were then divided by the number of students to arrive at a constant per pupil figure of \$2,374 per pupil. These costs are summarized in Table 1.

Results

The average budgeted per-pupil expenditure at the high school we studied was \$5,534 for the 1999-2000 school year. Since this amount includes an estimate of district office expenditures, it is below the state-wide average of \$6,269. We expect this is the result of both less experienced teachers (with lower average salaries) and larger class sizes at the high school we studied. Table 2 displays summary statistics for

Table 1. Summary of School Level Costs Allocated on a Per-Pupil Basis

Category	Amount (\$)	Amount Per pupil (\$)	Percent of Total (%)
Administrators	512,182	147	2.65
Student Support	1,670,805	479	8.65
Administrative Support	1,223,257	351	6.34
Substitutes	221,880	64	1.15
Supplies	1,270,585	364	6.58
Utilities	170,369	49	0.88
Custodial	485,407	139	2.51
Maintenance	410,907	118	2.13
Student Cafeteria	1,256,400	360	6.51
Transportation	191,000	55	0.99
District Office	868,852	249	4.50
Total	8,281,644	2,374	42.89 ¹

¹Figure represents percentage of total school expenditures, not expenditures for school level only.

Source: Computed from school records.

Table 2 . Summary Statistics for Per-Pupil Expenditures

Statistic	Amount
Average -per-pupil expenditures (\$)	5,534
Standard Deviation (\$)	1,075
Minimum (\$)	3,615
Maximum (\$)	16,734
Range	13,059
Median	5,265
Restricted Range, 95 th - 5 th (\$)	2907
Gini Coefficient	0.091

Source: Computed from school data.

Table 3. Expenditures Per-Pupil by Grade and Track

Measure	Number of Students	Expenditure Per-Student (\$)
Grade		
9	1,248	5,507
10	1,042	5,332
11	663	5,805
12	539	5,649
Track		
A	1,196	5,357
B	1,101	5,436
C	1,194	5,800
School	3,489	5,534

per-pupil expenditures for each of the 3,489 students in our sample. The table shows that per pupil expenditures ranged from a low of \$3,615 to a high of \$16,734, a range of over \$13,000 per pupil. However, the restricted range representing the difference between the student at the 95th percentile and the student at the 5th percentile is considerably smaller, only \$2,907. The standard deviation in per-pupil expenditures is \$1,075. Finally, the Gini coefficient, which measures the equity of the distribution of resources is a relatively good 0.901. This suggests that even though there are a few students for whom tremendous levels of resources are being devoted, for the most part, students have roughly equal access to educational dollars at this high school.

We investigated some of the potential sources of variation in expenditures per pupil across the school. We found that there were slight differences by track and grade as represented in Table 3. The table shows that average expenditures are lower than average for 9th and 10th graders and higher than average for 11th and 12th graders. Note also the substantial drop off in the number of students in the 11th and 12th grades. This drop-off is most likely the reason for the increased per-pupil costs, there being fewer students to put in some, if not most, of the classes that are aimed at the older students. This would lead to higher average per-pupil expenditures. Analysis of expenditures by track shows relatively little variation, with Track C having expenditures somewhat above the school average and Tracks A and B somewhat below. This may be a function of teacher experience by track.

As described above, the high school has six academies and programs that provide specialized educational programs to students. Four of them have per-pupil expenditures higher than the school average, while the other two are somewhat below the average. The Magnet program spends \$5,276 per pupil and the Humanitas program some \$5,370 per-pupil. The remaining four academies, NAI, Graphic Arts, ISA and Perkins all spend somewhat more than the school-wide average.

Special education is a major expense item at the school. Not surprisingly, many of the highest cost children in the school receive special education services due to some disability. The school spends an average of \$7,958 per pupil enrolled in Special Day Classes (156 students), nearly \$7,000 (6,697) per pupil for students in Resource rooms (159 students), and an average of \$5,612 for the 1,341 LEP students. The school also spends \$5,564 on the 112 gifted students in programs at the school.

The question is, how can these data be used to improve schools? This question is the topic of the following section.

Conclusions

In order to address the school finance research topics posed above, school finance researchers will need access to a wide range of new data. It is clear that answering many of the questions posed requires detailed and accurate data at levels lower than the school district. Understanding how funds are distributed to schools, how those schools use those funds and what resources are available to individual students is critical to developing a better understanding of what we need to do to create high performing schools.

Development of school level data is one possible option. This appears to be an expensive alternative, and one that does not guarantee we will have substantially better answers to many of the questions posed above. Today, nine states have begun initiatives to collect school level fiscal data. Ohio, Texas and Florida have been pioneers in this endeavor, and some interesting research findings are beginning to emerge from the vast array of data available in those three states (Nakib, 1996; and Sherman, Best & Luskin, 1996). While other states will surely follow, at least one, Washington, has decided that at the present time, the expense of collecting school level fiscal data exceeds the value of those data (JLARC, 1999).

School level data are hard to collect. Two recent volumes of the *Journal of Education Finance* (v.22 n.3 and v.23 n.4) make this clear. The first, edited by Odden and Busch (1997) summarizes the efforts of CPRE to analyze school level data bases in a number of states, while the second, edited by Goertz and Stiefel (1998) described the results of a multi-year study of school level data and equity in four school districts, New York, Rochester, Fort Worth and Chicago.

While school level data is clearly important, a more cost effective strategy might be to collect student level resource data. If we are ever to truly understand how money matters, and get a truly accurate sense of the equity of the distribution of the funds we currently make available to children through their schools, we need to have a better picture of the resources available to each student.

It is unlikely that state data systems will ever have the capacity to handle data for the millions of children in our schools. Moreover, the expense of collecting these data probably far exceeds its value in terms of understanding educational productivity. However, with relatively few additional items, student level resource indicators could be collected through the major longitudinal surveys conducted regularly by the National Center for Education Statistics (NCES). Picus and Pternick (forthcoming) prepared a position paper on this issue and developed potential survey items for the Early Childhood Longitudinal Survey.

By adding questions related the services offered to each child, and the costs of those services, it may be possible to collect nationally representative data on student level resource allocations. Combined with more detailed state and school level data availability, school finance research will be able to focus directly on all four issues identified above: equity, adequacy, accountability and productivity.

Recent school finance discussions have focused on the importance of school level data collections. While this remains an attractive approach from a school finance perspective, it seems that our true focus should be on individual students. We already have student level data on student outcomes, demographics and academic characteristics. Our inability to link money and/or resources to student outcomes seems to be, at least in part, a result of not having similarly detailed fiscal data. School level fiscal data will only give us a partial solution to this problem. It is also very expensive to collect and there are considerable risks that comparisons across states and even across districts within a state may be very difficult, if not impossible.

It seems that it would be both more practical and cost effective for the federal government (through NCES) to support the collection of data at the student level. These data could be aggregated up to school, district and even the state level if desired. Picus and Pternick (forthcoming) have shown that it is feasible to collect a considerable amount of student level fiscal and resource data with a few additions to the current drafts of the Early Childhood Longitudinal Survey. If the data from this survey prove valid and useful, then future longitudinal surveys could be designed from the ground up with resource and fiscal data having a place in each instrument.

Collecting data through these surveys would provide a sound, statistically valid, sample of student level fiscal data which could be linked to other data on performance. More importantly, it would be possible to capture the differences in services received by children enrolled in the same classroom. The ability to distinguish services available to individual students is critical to making distinctions about why their performance varies.

Additionally, student level fiscal data allows NCES to collect information about resources directed toward students in any school setting that can be identified, and only requires that the type of schooling be made clear. It would then be theoretically possible to see if there are systematic differences in the funds and resources available to children in alternative

school settings, and see if those differences relate to differences in performance.

Thus, while school level data are attractive for a number of reasons, student level data collections have the potential to be more cost effective and more useful to improving our understanding of student learning. In all cases, the focus of this fiscal data collection should be to help better understand the factors that lead to improved learning on the part of our students.

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