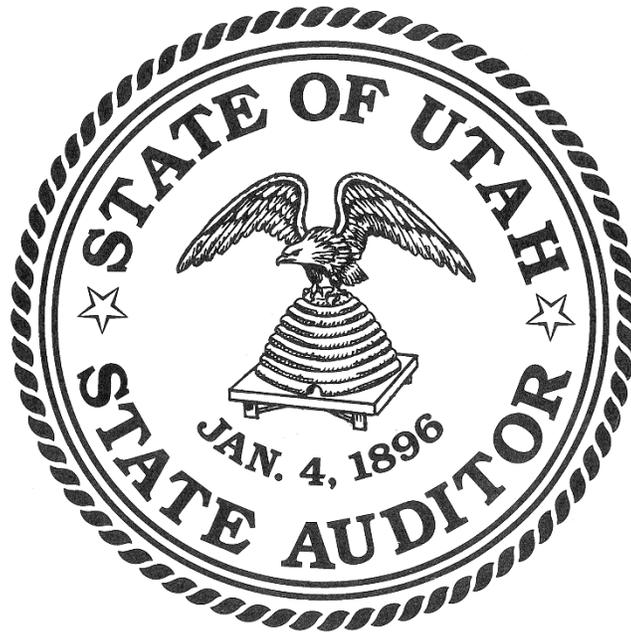


Project KIDS Literature Review

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1. EXECUTIVE SUMMARY

Project KIDS (Key Integrated Data Systems) integrates financial, operational, and performance data to improve data-driven decision-making in Utah K–12 public education. This report introduces influential academic research and initiatives by other states which provide rationale for specific elements of the project's methodology that drills dollars down to individual students.

Education funding is prescribed at multiple organizational levels: by federal, state, and local governments, as well as schools and programs. As a result, multiple independent accounting systems exist at several organizational levels—none of which can alone comprehensively measure the efficacy of investments in student outcomes. The relationship between public education financial investments and student outcomes is therefore difficult to track (Monk, 1981; Hanushek, 1997; Roza, 2010).

While LEA stakeholders with access to detailed financial accounts can theoretically track spending, no uniform infrastructure currently exists in Utah to support such a detailed analysis of spending efficiency. Project KIDS has developed an infrastructure to empower education stakeholders to more thoroughly evaluate the effectiveness and efficiency of educational spending patterns at scale.

The Project KIDS approach to the problem of complex public education accounting is inspired by other research and methodologies designed to allocate expenses to the level of the end user. Specifically, the Project KIDS methodology incorporates elements of data analysis and presentation explored by other states in the United States as well as those investigated by academic education finance researchers (i.e., Brent, Roellke, & Monk, 1997; Hanushek, 1989; 1997; Rumberger & Palardy, 2004; Roza, 2010). The Project KIDS pioneering effort within Utah's public education finance system puts into practice methodologies put forward by other investigators.

Project KIDS presents interactive education finance and student outcome information to stakeholders to empower increased data-driven decision-making. The methodology's bottom-up approach to spending allocation is similar to those employed by academic researchers and other states, with some additional necessary innovations. In effect, Project KIDS has created a database that assigns education costs to the level of the student and presents these data to education stakeholders. The methodology is designed such that these interactive visualizations allow stakeholders to see where money is flowing, prompting critical questions to help align financial resources with their strategic objectives.

The Office of the State Auditor aims for transparency in its analytics choices. Therefore, this document introduces the literature and other past work that both corroborated and influenced elements of the Projects KIDS analytic pipeline. This document also attempts to address the specific strengths and potential limitations of the approach as currently implemented.

2. PROJECT BACKGROUND

2.1 Project Purpose

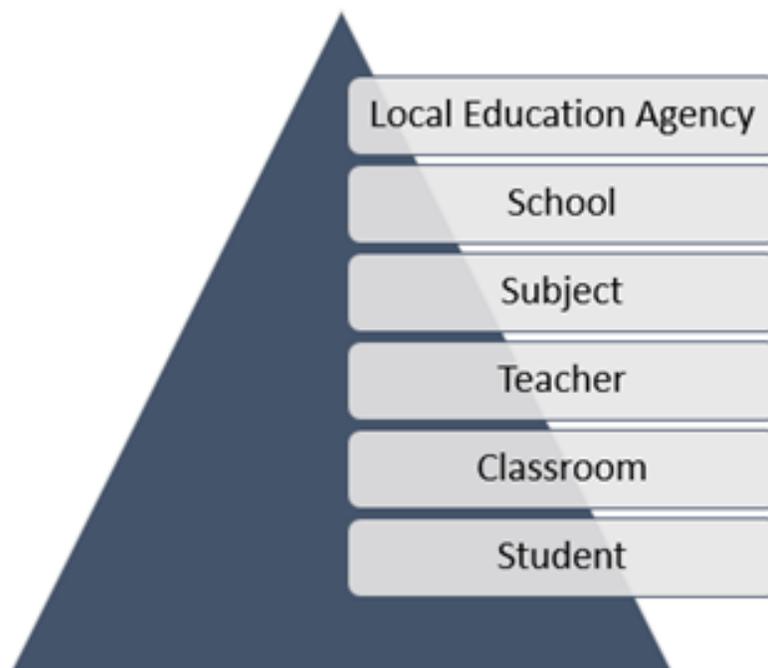
Project KIDS is a special in-depth performance audit that integrates financial, operational, and performance data to create interactive visualizations that inform Utah stakeholders where the money goes within public education.

The purpose of this audit is to empower stakeholders at each level of education decision-making to make better data-driven financial allocation decisions, not to prescribe how money should be spent. Project KIDS works to integrate data from previously siloed data sources to make this information more easily accessible to public education stakeholders, who also understand the goals and unique characteristics of their entities.

The data populating these visualizations are collected from the Utah State Board of Education (USBE), Local Education Agencies (LEAs), and Transparent Utah. Project KIDS analyzes spending and performance data from these key systems at the student level and presents results in dashboards.

These dashboards enable users to analyze spending at several levels of granularity. Stakeholders can see spending at the LEA, school, subject, teacher, classroom, and even the individual student level.

Figure 1. Expense Allocation Levels of Detail



This performance audit answers the question: *Where did the money go in public education?* These non-normative visualizations then allow stakeholders to ask, with expert contextual knowledge: *How well was that money spent?* In summary, Project KIDS aims to empower public education stakeholders to more closely align financial resources with their strategic goals, with interactive visualizations tailored to support data-driven decision-making.

2.2 Project Motivation

Each year, billions of dollars are spent to educate over a half-million Utah children (Utah State Legislature, 2021). In a few decades, this is forecasted to grow to a million school-age children (Utah State Board of Education, 2021). Education spending consumes a high proportion of public sector budgets, and the limited nature of these resources, paired with the state of Utah's large school-age population, will drive a need for education decision-makers to be more strategic with education spending.

However, given the complexities, it is difficult to track and assess where these billions of dollars flow. This lack of clarity is partially due to the fact that education spending is prescribed at multiple levels: by federal, state, and local government. Various formulas allocate money to the LEAs, but accounting systems are not designed to track the multiplicity of programs and purposes for which money is spent on school-level activities. Vying priorities and funding fungibility muddle the answer to the question: How much does it cost to educate each student?

A similar problem occurred at the University of Utah Health Care Center. In 2015, Dr. Vivian Lee asked a seemingly simple, yet radical question: *What are the actual costs of the goods and services provided by the hospital system?* Costs at academic medical centers in the area increase on average by 2.9% per year. Meanwhile, the medical system transitions towards a reimbursement model where hospitals get a single payment for an entire course of treatment rather than individual payments for each service or test rendered. In other words, the hospital bears the cost of these runaway medical charges. This prompted Dr. Lee to question which services deliver high value or contribute little to patient recovery (Kolata, 2015).

To answer this question, University of Utah Health Care designed a data system that tracks the costs of all goods and services provided by the hospital, like a minute in an MRI machine or an extra blood test. The system also monitors patient outcomes, like days in the hospital and readmissions. By integrating the costs and outcomes for each individual patient, the team could make more informed decisions about tradeoffs in care, produce lower costs, and improve patient outcomes. In a field of ballooning costs, the hospital's annual medical expenses *decreased* by 0.5% (Kolata, 2015).

In theory, an examination of these data can help administrators develop more effective and more efficient interventions. Furthermore, databases such as these could also empower medical consumers with actual cost data, ultimately engendering more financially-informed medical decision-making. The Office of the State Auditor has also developed a Health Cost comparison tool (*HealthCost.utah.gov*) to display median actual procedure costs to empower data-driven medical decision-making. The same motivations underlie the efforts of the Project KIDS team to aggregate and display detailed expense and student performance data for public education stakeholders.

Those in the field of public education encounter challenges similar to those faced by other complex systems. The cost of education continues to rise, but performance does not consistently follow (Hanushek, 1997). Furthermore, many stakeholders lack the data systems that support robust analysis of effective resource allocation. The Project KIDS data system is designed to bridge this gap. The interactive data dashboards allow stakeholders to understand where money

flows at scale. This can help stakeholders to ask critical questions about aligning financial resources with their strategic objectives.

When asked how much services cost in education, many stakeholders have not had adequate answers. This is largely because detailed expense data were inaccessible to stakeholders in their desired context. This gap leaves two questions unanswered: With so much money pouring into education: 1) *Where is that money going?* and 2) *How well is that money being spent?*

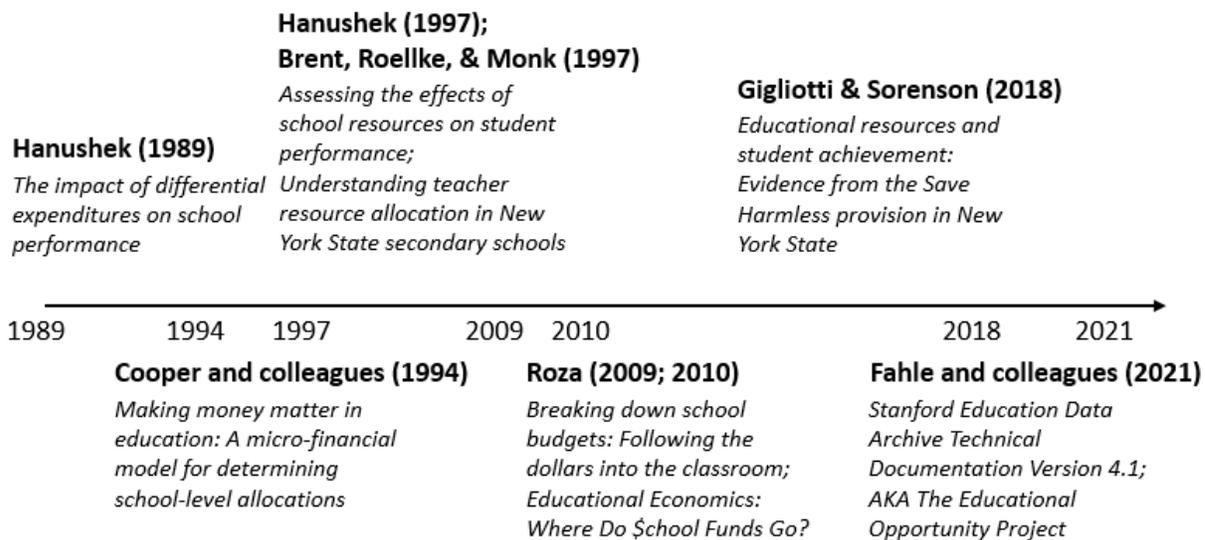
3. THEORETICAL FRAMEWORK

3.1 Review of the Literature

Attempts to collect, organize, and report public education financial data require an investigator to make several analytic decisions, each with corresponding strengths and potential drawbacks. For example, analysts must decide which levels of analysis they will explore, which final models they will share, and how they will categorize ambiguous expenses.

Fortunately, considerable peer-reviewed academic research has explored issues relating to public education financial analysis. This body of work directly informs the Project KIDS methodology. The project’s organization and presentation of expense data draws on methods suggested by some of education finance’s most eminent scholars. This section summarizes related academic works and explores connectivity to the Project KIDS theoretical framework. **Figure 2** chronicles several relevant academic publications in education finance, which are discussed throughout this section.

Figure 2. Timeline of Education Finance Research



Detailed Expense Allocation

In her 2010 book, *Educational Economics: Where do School Funds Go?*, Marguerite Roza explores education policy practices and often challenges conventional approaches. Many of the examples she uses in the book point to a common trend: that although stakeholder intentions are often noble (e.g., the equitable distribution of resources across student populations), the processes in place which influence education policy decisions often preclude strict adherence to data-driven decision-making.

Recall that school funds come from many different sources and may therefore be earmarked at various levels of decision-making for specific purposes, populations, or programs. While analyses often reveal ineffective resource allocation practices, this siloed nature of public education funding can prevent schools and their administrators from deploying resources to their greatest effect.

Roza (2010) also addresses the concern that districts and schools are held accountable for student outcomes but frequently have little control over ‘available’ resources. Districts and schools have limited control over resources because federal, state, and local governments often prescribe how funds should be directed, commonly without careful consideration of student outcomes. These funding regulations can result in suboptimal spending than district and school administrators might otherwise choose with more complete contextual understanding. A large portion of the money received by districts and charter schools come from restricted funds with tight rules about how and where the money can be allocated.

Despite limitations, school administrators still have access to unrestricted funds which allow for discretionary spending. Within certain restricted spending funds, there can be a great degree of freedom. For example, funds set aside for early literacy might cover teacher salaries, benefits, school supplies, teacher aides, special technology, and more. As long as the funds are connected to the early literacy program, administrators may allocate the funds in numerous ways. While freedom in resource allocation could promote better resource alignment, if those decisions are not connected to clear goals and measurable outcomes, fungibility itself could redirect funds away from potential high-value learning interventions toward other activities. For example, Roza contemplates cases in which extra funding for impoverished schools within an LEA could be entirely supplanted by funding mechanisms that funnel extra resources to wealthy schools.

Roza (2010) proposes seven components of an improved funding system:

1. an accountability system that seeks the most effective use of funds,
2. greater transparency in student outcomes,
3. weighted allocations for different student types,
4. an open market for providers,
5. alignment of functions and clarity of roles,
6. transparency in student outcomes and most productive practices, and
7. standards for student performance.

Project KIDS is part of this broader solution, as it engenders accountability and transparency by aggregating, tracking, and presenting student spending and performance data to decision-makers.

According to Roza (2010), this approach to data transparency is a necessary condition for improving the structure of the education finance system. She writes in regards to state-level engagement with education resources, emphasizing “the need to separate the functions of allocating resources, setting standards, and defining accountability from the function of making decisions about resource use. If states could recognize that they play some role in the first three, they might be convinced that they should not also take on the fourth” (p. 99).

Roza (2010) describes the state of education finance as a “wicked problem,” or a problem with “so many factors and conditions, all embedded in a dynamic context” (p. 74), which as a result is difficult to resolve without a systemic overhaul. Addressing a “wicked problem” requires incremental solutions that tackle difficulties faced by decision-makers at several organizational levels. Project KIDS aims to address this challenge in collaboration with districts and charter schools. Indeed, Project KIDS cannot address all of the ideal elements Roza (2010) outlines; the project has no say in the provider market, nor does it set standards for LEAs to achieve. Project KIDS simply reports what has already taken place.

The Project KIDS goals and methodology are very closely aligned with the ideal conditions that Roza outlines. Project KIDS aims to empower stakeholders to improve data-driven decision-making by integrating previously siloed data into a single system, making the information more easily accessible. This allows stakeholders to ask more detailed questions regarding the efficiency of their spending patterns.

Detailed account information is used to determine which expenses were intended for which students and detailed course and demographic information is used to determine which students qualify for allocation of which expenses. In addition, the methodology tailors the specifics of its data analyses and presentations to each LEA, recognizing that each entity is unique in its stated goals and the resources it has available to achieve those goals. Stakeholders at all different levels of decision-making can then use that data to improve processes in their districts and schools.

Project KIDS aims to place more control in the hands of education stakeholders, who (as Roza argues) are often held responsible for student outcomes, but have previously not had sufficient resources to inform their cost allocation decisions that could drive better outcomes.

Furthermore, Roza has argued elsewhere (2009) that in order for stakeholders to understand how efficiently school funding is being distributed among students, policymakers need to look at education at the classroom and student level. The classroom is ultimately where actual instruction takes place, but oftentimes stakeholders lack the data to understand how well classes are being funded. This lack of information can make it difficult for stakeholders to know whether their actual spending is aligned with their strategic goals. For example, knowing how much money is being allocated to mathematics courses versus extracurricular activities can help administrators understand tradeoffs where they may be underfunding core classes.

Furthermore, because different student populations require different resources for their education, stakeholders need to understand spending at the student level in order to ensure that they are meeting the unique needs of different student groups. For example, migrant students may require specific additional resources, and an evaluation of the resources available to these students can help stakeholders understand how to improve achievement of migrant students relative to their peers. Through understanding how much money students are receiving and then

aggregating to the classroom level, administrators get a clearer picture of how resources are allocated and whether they are helping students succeed.

Project KIDS follows this recommendation and traces funds to the student-level by both utilizing detailed expense information (see *Technical Manual, Section 6*) and disaggregating teacher payroll data into detailed expense-type categories (see *Technical Manual, Section 5*). This approach is important because it not only affords more precise allocation of resources, but it also reduces inflation of teachers' instructional salaries. For example, a single teacher may teach classes and also coach a student sports team. In this case, a teacher's instructional pay is distributed among the students in her classes but not the students on her sports team (see *Technical Manual, p. 53*). Furthermore, the teacher's non-instructional compensation stays out of the classroom and is allocated to the students most likely to benefit from those resources (e.g., students participating on a sports team or club).

The Project KIDS methodology allocates all other expenses to students based on their actual education situation and needs, including demographics and programs. For example, only students in the special education program are allocated expenses marked for special education, and only students who took dual language immersion (DLI) classes are allocated DLI funds. Using this method, Project KIDS builds resource profiles for each individual student, which include approximately 200 spending categories with unique rules for allocation. These resource profiles effectively drive spending down to the student level. Simplified examples of three different student resource profiles are given in **Figure 3**.

By disaggregating spending categories in line with Roza's (2009) recommendations, Project KIDS features greater specificity in the allocation of teachers' compensation and other general expenses to individual students.

Figure 3. Example Student Resource Profiles



Category	Amount
Teacher Pay	\$ 5,530
Transportation	\$ 0
District Administration	\$ 1,100
English Language Learners	\$ 0
Athletics	\$ 500
Nutrition	\$ 850
Instructional Support	\$ 1,500
Special Education	\$ 0
Dual Language Immersion	\$ 0
Operational Expense	\$ 2,300
Total	\$ 11,780



Category	Amount
Teacher Pay	\$ 3,550
Transportation	\$ 800
District Administration	\$ 1,100
English Language Learners	\$ 0
Athletics	\$ 0
Nutrition	\$ 150
Instructional Support	\$ 1,295
Special Education	\$ 0
Dual Language Immersion	\$ 1,250
Operational Expense	\$ 2,300
Total	\$ 10,445



Category	Amount
Teacher Pay	\$ 7,100
Transportation	\$ 800
District Administration	\$ 1,100
English Language Learners	\$ 0
Athletics	\$ 0
Nutrition	\$ 500
Instructional Support	\$ 2,500
Special Education	\$ 3,000
Dual Language Immersion	\$ 0
Operational Expense	\$ 2,300
Total	\$ 17,300

Driving Effective Spending

In a quintessential policy analysis, Eric Hanushek (1997) concluded that no relationship exists between school resources and student achievement. Indeed, his meta-analysis revealed that across almost 400 studies, the estimated effects of several “key resources” (e.g., teacher-pupil ratio, expenditure per pupil) on student performance were more likely to be statistically insignificant than statistically significant. Furthermore, Hanushek (1997) emphasized that the relationship between added resources and student performance varied by aggregation level: data processed at the school or state level were more likely to indicate that added resources improved student performance than data processed at the classroom or student level.

These findings present a challenge for Project KIDS and similar methodologies: if adding key resources to the education system does not improve individual student performance, then what value is gained by a presentation of spending and performance like that of Project KIDS?

The Project KIDS methodology is designed to help stakeholders make improved data-driven decisions about resources after identifying the relationship between those resources and student outcomes. While Hanushek (1997) finds a general lack of relationship between spending and student performance, he argues that the blame for this weak relationship rests on the incentive systems in place.

The current expectations are that increased investments will produce better student performance. However, educator career developments and promotions, which increased resources are often directed to, are not strongly tied to improved student performance. In other words, the incentive structures present in public education environments do not explicitly reward student improvements, and as a result, “[g]ood and bad teachers or good and bad administrators can expect about the same career progressions, pay, and other outcomes” (Hanushek, 1997, p. 155). Therefore, “the choice of programs, organization, and behaviors [are] less dependent on student outcomes than on other things that more directly affect the actors in schools” (Hanushek, 1997, p. 155).

More purposeful spending toward improving student outcomes could change the currently insignificant relationship between resource allocation and student achievement. Importantly, Hanushek (1997) concludes that, ultimately, resources and investments do matter, but that some organization and incentive systems “do little to ensure that any added resources will be used effectively” (p. 155–156). Recent research with data from New York State supports the conclusion that investing educational resources can produce small but robust achievement gains for students (Gigliotti & Sorensen, 2018).

Other researchers, such as Cooper and his colleagues (1994), have developed accounting models that demonstrate similar results. Their paradigm, which involves a thorough accounting of investments through the multiple levels of education financing, led district superintendents to report that the micro-financial data “allowed them to save money, improve programs, and reassure the voting public that resources went into worthwhile functions” (Cooper et al., 1994, p. 86). Project KIDS aims to help stakeholders do just that: investigate educational resources to support student achievement through enhanced data-driven decision-making.

Monk and his colleagues (1995) developed a method of tracing resources to the classroom level, which enables comparisons between spending patterns within a single state's educational system. They demonstrated how school officials could determine whether resources were being used effectively. Their evaluations also captured qualitative aspects of teaching not represented in high-level expense categories.

Monk began by outlining spending at the classroom level and used this data to understand how money was spent across course subjects (mathematics, language arts, etc.). He then aggregated the information to the school level, making it easy to compare spending across urban and rural schools, as well as high-income and low-income schools. Monk's methodology was crucial both for understanding the importance of drilling down costs to more granular levels and outlining how such a process would operate.

While Monk only used a small number of representative schools in his study, Project KIDS uses a similar methodology across all schools in Utah. By analyzing data on how money was spent within each classroom in Utah, Project KIDS aims to help stakeholders better understand spending patterns across the state and how they influence student achievement.

3.2 Other State Education Projects

Several state entities have published their methods for investigating public education spending in a fashion similar to those used by Project KIDS. The following subsections summarize the work of two state governments to analyze and present these types of data. Notably, this section is far from exhaustive; at least twenty-two states have published their investigations into multi-layered education spending systems (see *Section 6.1: Education Data Projects in Other States*).

The Project KIDS methodology is corroborated and influenced by other states' projects and adopts several of their effective approaches. Nonetheless, important distinctions exist between the Project KIDS methodology and these other projects. This section outlines how Texas and Colorado have influenced the Project KIDS methodology that empowers Utah public education stakeholders.

Texas Smart Schools

Project KIDS aims to present public education spending data available at several levels of granularity and draws on Texas' past efforts to analyze education finances.

A critical element of the Project KIDS analysis pipeline corroborated by Texas is driving down costs to individual students, rather than at more aggregated levels, such as the classroom, school, or district. In this regard, the Texas Smart Schools (TSS) project is informative. TSS aims to empower stakeholders to compare similar education entities, with similarity defined by a variety of factors, such as the number of English Language Learners or the student to staff ratio in each school (txsmartschools.tamu.edu).

In their publication, TSS also visualizes cost-adjusted spending per pupil against academic progress and allows viewers to interact with the data to compare districts or schools within a district. This approach also manifests in Project KIDS: both methodologies estimate per-student spending, and emphasize interactive data platforms that empower cross-site comparisons (see *Technical Manual, Section 8*). **Figure 4** displays an example of how TSS visualizes average spending per student against student performance.

Importantly, however, TSS and Project KIDS approach per-student spending estimates differently. On the one hand, Project KIDS estimates per-student spending *for each student* and then aggregates those estimates to represent per-student spending within a district or school. On the other hand, TSS measures total student spending within a school and then divides this total among students. *The bottom-up approach used by Project KIDS is unique and is possible due to the project's access to highly detailed data resources.*

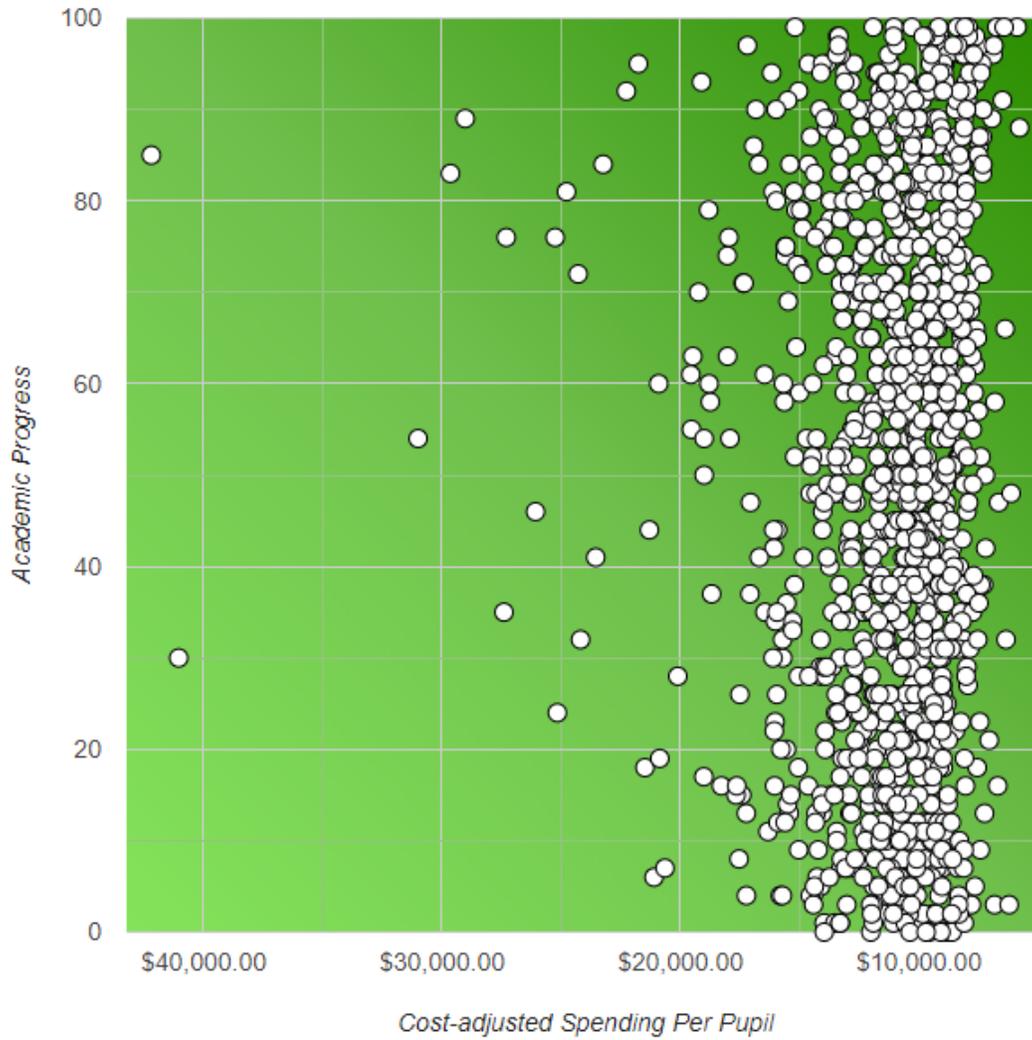
Stakeholders may find point-estimates of students' academic progress useful. Similarly, scoring systems for school-level spending efficiency may be useful information for understanding the outputs of education investments at an aggregate level. TSS explores these options: their methodology computes a score which indicates a school's spending efficiency compared to their academic progress. In line with TSS's goals, the score is intended to empower comparisons between similar districts and schools on useful metrics.

Project KIDS quantifies effectiveness differently than TSS. While TSS partly aims to empower stakeholders with access to modeled comparison scores, Project KIDS emphasizes the student-level expense analyses. This methodological difference is important as it exemplifies the *non-normative* guiding principle for Project KIDS. Although the project presents data that supports school- and district-level comparisons, The Office of the State Auditor is not attempting to evaluate whether entities are *effectively/efficiently or ineffectively/inefficiently* allocating resources. Rather, the data visualizations aim to empower stakeholders to supplement their expert contextual knowledge with historical financial and performance data to find answers to questions that they find critical.

An additional difference between Project KIDS and TSS is the high granularity of student data Project KIDS uses to allocate resources to individual students. Financial and performance data are processed at the level of the individual student because Project KIDS has access to detailed

enrollment data for all students, which includes demographic and even class schedule and attendance information.

Figure 4. Texas Smart Schools Cost-adjusted Per Pupil Spending versus Academic Progress



Financial Transparency for Colorado Schools

While Project KIDS' chief objective is to help education stakeholders answer questions about education funding and its impact on student achievement, the project's target audience extends to the public sphere as well. Inspiration for targeting a larger audience comes from several projects, one of which is a noteworthy effort by Colorado to categorize and present historical education data to the public.

The Financial Transparency for Colorado Schools (FTCS) project aggregates spending data from school districts and charter schools and presents spending sums and per-student averages for select expense categories, such as instructional, athletics, and administration spending. Aggregated spending is visualized and made publicly available on the project website, and additional features are in place which allow the comparison of similar districts and schools.

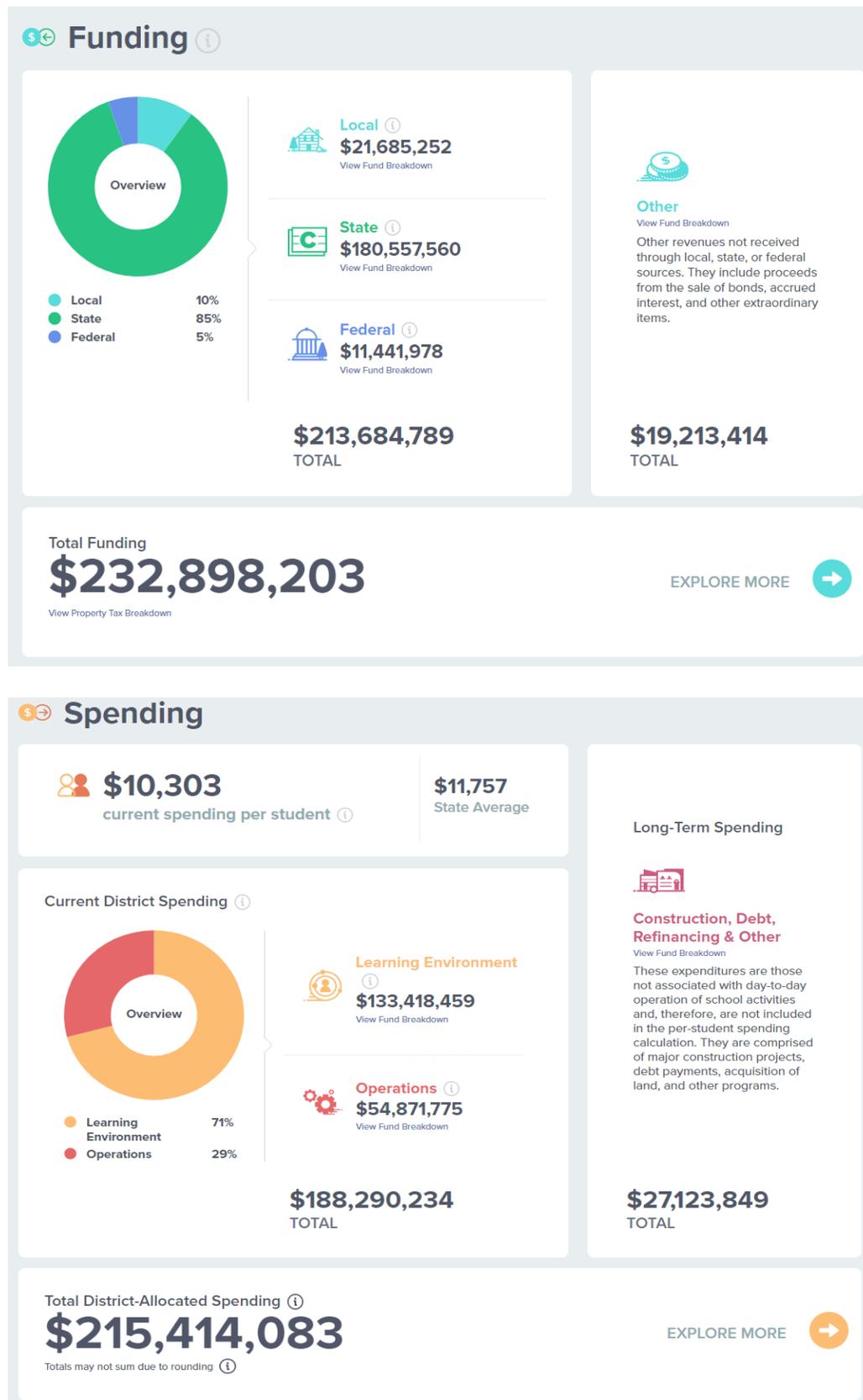
Comparisons between similar entities allow stakeholders to consider the effects of resource allocation decisions at several sites. This increases their sample size for getting answers to important policy questions. For example, stakeholders can look to a specific school with efficient and effective spending patterns and collaborate with that school to improve their own programs. **Figure 5** displays two images: both are examples of how the Colorado project visualizes both school funding and school spending.

Furthermore, the Colorado project isolates expense categories based on a standard chart of accounts, thereby giving users a comprehensive view of funding and spending patterns. Project KIDS adopts a similar strategy: expense categories are displayed for each district, school, and charter school, and these approximately 200 categories are based on the information present in Utah's standard chart of accounts (see *Technical Manual, Section 5*). This attention to accounting detail is a critical component of Project KIDS. Our aim is to accurately estimate resource allocation to individual students, so our expense categories are therefore as detailed as possible. We also aim to help stakeholders answer questions about resource allocation, and we therefore keep expense categories as familiar as possible to avoid end-user confusion.

An important distinction between FTCS and Project KIDS data exclusions relates to the treatment of capital costs. The Colorado project excludes capital expense data from student-level estimates, though a summary breakdown of capital expense totals is available. In contrast, Project KIDS approaches capital expenses, such as building and construction costs, as integral to the complete functioning of the education environment.

However, capital expenses are often large and inconsistent between years. Thus, analytical practices such as annual top-down allocation of capital costs to students produce highly variable estimates of student spending year over year. Therefore, capital expenditures are available in two formats in the Project KIDS data dashboards: viewers can choose to view the 'Actual Cost' of capital expenses, which inflates yearly spending sums in those years where large capital purchases occurred (by including the 'Actual Cost' of capital expenditures); or, viewers can view the 'Depreciated Cost' of capital expenses, which smooths out the spending function and allocates money across all of the years of useful life of the capital investment (see *Technical Manual, Section 5*). The latter format is generally preferred within Project KIDS to facilitate an apples-to-apples comparison.

Figure 5. Selected Visualizations from Financial Transparency for Colorado Schools Website



Project KIDS and the FTCS project share several philosophical similarities. Both projects aim to empower stakeholders and the public by sharing public education spending information, and each project facilitates this effort through the aggregation, analysis, and reporting of expense data.

A major difference exists between the projects in the estimation of per-student spending, as with the TSS project. On the one hand, the Colorado project takes a top-down approach: school- or district-level spending summations are divided by the number of students to produce a post-hoc estimate of per-student spending. Project KIDS, on the other hand, takes a bottom-up approach, and assigns dollars to individual students by accessing detailed enrollment and expense.

Top-down summary statistics may provide useful answers for some policy questions. However, the variability in spending across student groups and individual students is more meaningful, and can only be attained through a bottom-up approach. The bottom-up approach in particular allows stakeholders to analyze spending patterns and performance within and among different student groups. For example, stakeholders can view the difference in spending patterns and performance based on student demographics, grade levels, course-taking patterns, and so on.

4. UNIQUE PROJECT KIDS METHODOLOGY

Several elements of the Project KIDS methodology are novel out of necessity. Constructing the final product required defining the scope of the project and making choices about various design elements. This section addresses these methodological decisions and the rationale behind them.

The Project KIDS methodology is evolving in real-time. These continuing developments are designed to address limitations in the way data are collected, analyzed, and presented. An important note is that final estimates are only as accurate and reliable as the data used to produce them. Project KIDS relies heavily on external data stewards to monitor, clean, and report their data and although there are ways to verify data quality, stakeholders are ultimately responsible for their data's accuracy. Because of inherent complications in collecting student-level data across every school in Utah, a small margin of error in final estimates is expected. Specifically, Project KIDS chose to overlay existing systems rather than require changes to LEA accounting and other systems. For example, some LEAs capture more detailed information regarding extracurricular participation or school building cost allocation. Nonetheless, Project KIDS is actively improving its data verification processes.

A second important caveat is that there is some ambiguity in the allocation process because Project KIDS analysts lack some LEA-specific knowledge that would inform which students should receive allocations of each spending category. Analysts research district and school programs to accurately allocate resources to students. Nonetheless, in situations of imperfect information, analysts must make their best assumptions and generalizations about how money was likely spent in specific circumstances that may not perfectly reflect the actual spending patterns. For these reasons, Project KIDS provides a first order approximation and not a dollar-for-dollar accounting. The Project KIDS analyst team continues to work to refine the accuracy of its decisions in these contexts.

Public education administrators should leverage their data resources to improve student outcomes. Project KIDS represents the Office of the State Auditor's best efforts to empower local education leaders in these efforts. The Project KIDS methodology is informed by education finance research and other state governments' similar efforts. Nonetheless, the accounting systems which currently exist to support public education decision-makers throughout the state are unique and demand tailored solutions. Therefore, the Project KIDS methodology is evolving and reflects feedback received from the stakeholders it is meant to empower.

4.1 Student Exclusions

Many districts and schools across Utah serve preschool and adult-age learners. There is considerable evidence which emphasizes the importance of both pre-kindergarten (Şahin, Sak, & Tuncer, 2013) and adult education programs (Knowles, 1970). Nonetheless, Project KIDS restricts its scope to only include students in kindergarten through grade 12.

This restriction is not grounded in theory; indeed, stakeholders who direct resources for non K–12 education would likely benefit from the Project KIDS methodology for the same reasons outlined previously for K–12 stakeholders. Rather, Project KIDS chooses to limit its research and analysis to K–12 students for practical reasons. Data is usually sparse for these non K–12 students, classrooms, and teachers. Thus, extending the analysis may require extensive data imputation or other technical adjustments. In addition, requesting these additional data from LEAs places a burden on their personnel.

An extension of the present analysis to non K–12 education finance and student performance may be fruitful in the future.

4.2 Detailed Spending Allocation

In addition to collecting education expense data, Project KIDS requests supplementary enrollment data and ties expenses to individual student performance measures (e.g., standardized test scores and GPAs; Allensworth & Clark, 2020). In this way, Project KIDS aims to help stakeholders find and understand relationships between spending and student achievement.

While data requests place an additional burden on the reporting education agency, the Transparent Utah compensation data is not the most comprehensive record available. Project KIDS' use of the additional data prevents over inflation of teachers' instructional salaries and ultimately more precise resource allocation (see *Technical Manual, Section 3*). Importantly, education finance research suggests that data is processed across several levels of analysis—the students, the schools, and the districts—to ensure that models track resources through characteristics unique to structures at each level of analysis (Cooper et al., 1994).

However, the value of a district's or school's new education program cannot be reliably assessed if the dollar inputs or outputs are not clearly and adequately defined, recorded, and analyzed. For example, teachers may provide instructional and non-instructional services to students, and these different responsibilities may best be understood as just that. Likewise, resources may be allocated to central office or school-specific accounts, and a comprehensive resource allocation model would track not only the intended function of the resources, but the specific schools, classes, and students whom they benefit.

Cooper and colleagues (1994) ultimately suggest that money does matter for education outcomes—so long as the funds are appropriately traced through the financial system. Hanushek (1997) made a similarly qualified claim. Project KIDS follows these recommendations and separately categorizes teacher instructional compensation (i.e., wages and benefits for courses taught) and non-instructional compensation (e.g., wages and benefits for being a volleyball coach). To review technical aspects of these methods, please see *Technical Manual, Section 4*.

Project KIDS aims to allocate education expenses to individual students relative to each student's approximate resource use. Therefore, the methodology assigns money to students proportional to their time enrolled in classes. Project KIDS creates classrooms based on student enrollment data. This process involves four necessary steps:

1. identifying the correct teacher for a course in which students were enrolled,
2. defining the term length (e.g., quarter-long course, semester-long course, etc.),
3. pairing that teacher with their students, and
4. computing weighting coefficients for each student for each unique teacher-class-year combination.

The data processed by Project KIDS allows for a straightforward resolution to steps 1–3 (see *Technical Manual, Section 3–4*).

To address the fourth step, Project KIDS surveyed Utah teachers and asked: Do you feel you spend a more proportional amount of time between your courses or between your students? Overwhelmingly, teachers reported that they spent their time proportionally between their

classes more than they spent their time proportionally among their students. Therefore, computing weighting coefficients was determined to be an effective means of allocating resources proportionally to students' access to classrooms and teachers. A teacher's pay is first allocated equally among their classes, then students within each class receive a share of that pay based on their weighting coefficient. The coefficients for each student within a class are based on two quantities: the number of teachers instructing the class (generally one, but occasionally more) and the proportion of total course days in which the student was enrolled. For example, if a class started in August and ended in December, students enrolled in the course for the entire duration would receive 100% of an equal share of their teacher's pay. A student who enrolled in the course in August but exited the course in November would receive a smaller portion of their teacher's pay.

By tracing funding down to individual students' access to resources, Project KIDS aims to support stakeholders in their evaluations of education programs and progress towards strategic goals (Roza, 2009).

4.3 Student Performance

Project KIDS has not created new performance measures. Instead, the project leverages existing performance measures as determined by USBE or LEAs. However, in this section we review the literature regarding the efficacy of certain student performance measures and the levels at which they are displayed and analyzed.

Education agencies set goals which explicitly aim to improve their students' test scores. Stanford University recently launched the Educational Opportunity Project (EOP), which aims to place student performance data in the hands of policymakers to help them improve educational opportunities (Fahle et al., 2021). The EOP group argues that the most accurate measure of student performance is the change in test scores from grade to grade (i.e., *learning rates*). They posit that other measures, such as test scores for a single grade averaged across classrooms and schools, fall short in that those averages are strongly affected by community and home variables which also influence learning.

The Project KIDS methodology embodies this suggestion and furthermore, extends it to an analysis of individual students' learning rates, rather than only students grouped within their districts and schools. Importantly, including student-level information produces visualizations which can be used to identify students by ID number or name. Thus, Project KIDS shares sensitive information only to approved education stakeholders with authorization to access such data. *Publicly available Project KIDS dashboards omit all protected student information.*

Project KIDS presents student growth percentiles (SGP) in districts' data dashboards. Several alternative methods are available to estimate student performance and academic growth, but researchers and educators commonly use SGP models as they are easier to interpret compared to more intensely analytical models and generally provide accurate and reliable estimates for student outcomes (Betebenner, 2011). For example, some researchers have explored newer, more complicated methods of measuring student growth; these methods aim to measure how well observed student growth may be attributed to higher levels of organization, such as individual teachers and schools.

Value-added (VA) models add considerable statistical complexity to the final interpretation of student performance, but a comparative study by Guarino and colleagues (2015) suggests that the increased accuracy in estimating teacher and school effectiveness might be worth it. Furthermore, VA models and other models with higher statistical complexity (e.g., dynamic ordinary least-square regressions) more accurately rank teacher performance compared to SGP models when students are non-randomly assigned to classrooms (Guarino et al., 2015).

Nonetheless, Project KIDS presents the SGPs made available from USBE as they are easy to interpret and are generally regarded as reliable and valid estimators of student performance, especially in contexts where students are randomly assigned to teachers. Furthermore, implementing a VA model requires the selection of one of many model formulations, which come with their own minor, but sometimes significant variations (Guarino et al., 2015). To get a sense of how intuitive SGPs are, consider an illustration provided by Betebenner (2011, p. 3) of the interpretations one can draw from growth percentile models:

An infant male toddler is measured at 2 and 3 years of age and is shown to have grown 4 inches. The magnitude of increase—4 inches—is a well understood quantity that any parent can grasp and measure at home using a simple yardstick. However, parents leaving their pediatrician’s office knowing only how much their child has grown would likely be wanting for more information. In this situation, parents are not interested in an absolute criterion of growth, but instead in a normative criterion locating that 4 inch increase alongside the height increases of similar children. Examining this height increase relative to the increases of similar children permits one to diagnose how (a)typical such an increase is.

Presenting student achievement in normative terms may help stakeholders see relationships between resources and student outcomes. Such presentations also allow laypeople to explore relationships between student performance and spending, which is another aim of Project KIDS.

Project KIDS aims to empower stakeholders to evaluate the effectiveness of their educational efforts. Each program has different aims for student achievement. The Project KIDS dashboards therefore display all available student performance measures. This expands the scope of the project, and allows more stakeholders to utilize the visualizations to ask their contextually-specific questions. In addition to growth measures, the dashboards also display student proficiency levels for statewide testing, early literacy testing information, ACT scores, advanced placement (AP) testing scores, and General Financial Literacy testing scores.

Ultimately, a variety of analytical tools are available, and each comes with its own set of benefits and drawbacks. Project KIDS uses SGPs as one metric of student performance and growth because that is the measure made available by USBE. It may be that VA models would also be useful to Utah public education stakeholders. However, value-added models can be complex to construct and interpret; therefore, the use of SGPs also reflects Project KIDS’ goal to help Utahns from *all* backgrounds explore the questions: (1) *Where is the money going?* and (2) *How well is that money being spent?*

5. CONCLUDING SUMMARY

Answering questions about the relationship between spending and student performance requires a combination of rich data and expert contextual knowledge. Project KIDS has built a data infrastructure which unites previously siloed data resources. These data are visualized in LEA-specific dashboards and shared with LEA stakeholders. Assembling the data in this way empowers leaders at the district level to ask and answer questions relevant to their districts' strategic objectives.

For instance, an LEA might aim to improve fifth grade language arts proficiency to a criterion percentage. With Project KIDS data dashboards, stakeholders can measure the extent to which their expenditure patterns are aligned with this goal. Fifth grade language arts proficiency is included in the dashboard as a student outcome variable, and early literacy and language arts expenses are specifically recorded and presented. In this way, Project KIDS addresses the question, *Where did the money go in public education?* so that stakeholders can answer, *How well was that money spent?*

Project KIDS draws inspiration from multiple sources. Numerous scholars' research efforts in the domain of education finance and student performance inform the Project KIDS methodology. These scholars aimed to answer the question of how much money was being spent, not just at the school level, but at the classroom and student levels. Monk and colleagues (1981), Roza (2009, 2010), Hanushek (1989, 1997), and Cooper and colleagues (1994) all pioneered methods for drilling costs to the level of the individual students instead of relying on top-down averages, because they observed allocation strategies which failed to align financial resources to strategic objectives.

Accurate estimates must reflect the various activities students engage in to track the resources they use. Using this framework, the Project KIDS methodology traces spending down to the individual student in order to estimate how much it costs to educate each student.

Several states, like Colorado and Texas, have also engineered ways to monitor and report education data, making it easy for the public to understand how money is spent. While each of these projects differed in scope and methodology, the overarching goal of these efforts was to increase access to education and spending data to improve student outcomes. Project KIDS aims to increase public access to summary-level education data and empower educational stakeholders with more detailed reports and dashboards about their respective schools.

Importantly, Project KIDS does not prescribe any answer to the question of how LEA resources *should* be spent. In other words, Project KIDS is non-normative. The Office of the State Auditor is building the infrastructure to empower and inform education stakeholders, not to evaluate how well LEAs are allocating resources. Such an infrastructure empowers stakeholders to better align their financial resources with their strategic objectives as they work to improve student learning.

In summary, Project KIDS, relying on academic research, other states' efforts, and important within-state contextual information, integrates LEA data to estimate per-student spending and create interactive visualizations. These spending estimates are broken down into separate spending categories which reflect the allocation strategies employed by districts and schools. The

methodology aims to empower stakeholders to ask and answer questions regarding spending efficacy and efficiency. In line with the global objectives of the Office of the State Auditor, the project aims to inform the public where the money is going in public education, so Utahns can determine how well that money is being spent.

6. SUPPLEMENTARY MATERIAL

6.1 Education Data Projects in Other States

State Program	Website	Description
Arizona School Report Cards	https://azreportcards.azed.gov/	This resource grades schools within the state on various performance metrics, such as test scores and attendance. Based on the data, the department assigns each school a letter grade, making school comparisons easier for the public. This tool also provides financial, demographic, and general information about each district and school within the state.
Public Policy Institute of California	https://www.ppic.org/publication/school-finance/	This research organization has examined California's education finance system and produced research explaining both how the system is structured and how the system can improve.
Colorado K12 Financial Transparency	https://coloradok12financialtransparency.com/#/	Colorado's reporting systems show the sources (local, state, and federal) of the money that is allocated to schools.
Connecticut State Department of Education EdSight	http://edsight.ct.gov/SASPortal/main.do	This project gives the public access to school financial records, student demographic information, and grades on overall school performance. Users can also find information on teachers and specific courses taught throughout the state.
Delaware Department of Education Report Cards	https://reportcard.doe.k12.de.us/	Delaware's school report system presents data on enrollment, language arts and mathematics performance, graduation rates, attendance, and college/career readiness at the state, district, and school level.

<p>Florida Department of Education Report Cards</p>	<p>https://edudata.fldoe.org/ReportCards/Schools.html?school=0000&district=02</p>	<p>In addition to giving the public access to numerous data points, such as graduation rates, per-pupil expenditures, and academic assessments, Florida’s education portal grades each school district within the state. These grades come from a mix of standardized testing and growth metrics.</p>
<p>Georgia Department of Education School System Financial Reports</p>	<p>https://www.gadoe.org/Finance-and-Business-Operations/Financial-Review/Pages/School-System-Financial-Reports.aspx</p>	<p>Through this portal, the public can access financial records for any school within the state’s education system.</p>
<p>Idaho Department of Education</p>	<p>https://idahoschools.org/state/ID</p>	<p>Beyond simply mapping the schools by type and category, this website provides information about multiple key indicators for each school in the Idaho education system. These key indicators include student performance, teacher information, and school financial information, among others.</p>
<p>Maine Department of Education Dashboards</p>	<p>https://www.maine.gov/doe/dashboards</p>	<p>Maine’s education dashboards report information on numerous academic and non-academic indicators, such as student demographics, bullying, and state assessments.</p>
<p>Massachusetts Department of Elementary & Secondary Education Data & Accountability</p>	<p>http://www.doe.mass.edu/DataAccountability.html</p>	<p>This site serves as a hub for education data for the state of Massachusetts. The public can access information on student attendance, school profiles, and education research, among others.</p>
<p>Missouri Department of Elementary & Secondary Education: Missouri Comprehensive Data System</p>	<p>https://apps.dese.mo.gov/MCD/S/home.aspx</p>	<p>This easy-to-use website offers multiple levels of detail regarding Missouri’s education system. The site contains data on school performance, basic directory information, and more.</p>
<p>Growth and Enhancement of Montana Students</p>	<p>https://gems.opi.mt.gov/</p>	<p>Montana’s dashboards are similar to other states in that they provide both state-level performance statistics and school-level key</p>

		indicator information. These key indicators include information regarding enrollment, nutrition programs, and school finances, among others.
Nevada Department of Education Report Cards	http://nevadareportcard.nv.gov/DI/nv/humboldt/2019	Similar to other states, Nevada’s education data portal provides the public access to state, district, and school information regarding academic performance, graduation rates, bullying, and other related topics. The public can also access detailed reports, including a school ratings spreadsheet with information on school performance.
State of New Jersey Department of Education School Finance	https://www.nj.gov/education/finance/	New Jersey’s school finance portal contains links to numerous reports on education financing, from generic financial reports to in-depth analyses of student transportation and state aid.
New Hampshire Department of Education Data Reports	https://www.education.nh.gov/who-we-are/division-of-educator-and-analytic-resources/bureau-of-education-statistics/data-reports	New Hampshire’s page acts as a hub for reports and information on a variety of topics relating to education. The site contains reports on attendance, general financial information, and school performance.
NYC Department of Education's Fair Student Funding	https://www.nycenet.edu/public/apps/Offices/FSF/OverviewReports.aspx	To provide more transparency in school accounting in New York City, this tool allows the public to search detailed school financial records, such as public budget and audited financial statements, by fiscal year and district/school. The tool also includes an interactive view of school budgets, with information on spending by category.
North Carolina School Finances	https://gdacreporting.ondemand.sas.com/srcfinance/index	North Carolina’s school finance page contains information on how money is spent at the district level, including information on spending

		by demographic, funding sources, and average spending per student.
Rhode Island Department of Education's Data Center	https://datacenter.ride.ri.gov/	Rhode Island's data portal contains information on special education, graduation rates, and financial data for schools across the state.
South Carolina School Report Cards	https://screportcards.ed.sc.gov/	This resource grades schools within the state on various performance metrics, such as test scores and attendance. Based on the data, the department assigns each school a letter grade, making school comparisons easier for the public.
Texas Smart Schools	https://txsmartschools.tamu.edu/	The <i>Apples2Apples</i> tool allows the public to compare schools across a variety of education-related metrics.
State of Vermont Agency of Education Financial Reports	https://education.vermont.gov/data-and-reporting	Similar to New Hampshire, Vermont's website acts as a hub for reports and information on a variety of topics relating to education. The site contains reports on attendance, general financial information, and school performance. Vermont's system also includes interactive reports on individual schools, which allow for easier academic performance comparisons between educational entities.
West Virginia Department of Education Dashboards	https://wveis.k12.wv.us/essa/dashboard.html	This resource grades schools within the state on various performance metrics, such as test scores and attendance. Based on the data, the department assigns each school a letter grade, making school comparisons easier for the public.

6.2 References

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