FRAMEWORK FOR A COMPREHENSIVE EDUCATION DATA SYSTEM IN CALIFORNIA

Unlocking the Power of Data to Continually Improve Public Education

Research and analysis conducted by McKinsey & Company

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This project was led by the California Department of Education (CDE) and the Office of the Governor of California and jointly funded by the Bill & Melinda Gates Foundation and the William and Flora Hewlett Foundation, at no cost to taxpayers. The research and analysis on which this report is based was conducted by McKinsey & Company.

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EXECUTIVE SUMMARY

Introduction

We would never expect a pilot to be able to fly an airplane without a fully-functioning navigational system, or ask a doctor to heal her patients after taking away her diagnostic equipment. Without these tools, pilots would be unable to make the countless course corrections they need to fly the safest and most efficient route, and doctors would be much less accurate when determining whether a particular treatment was helping or not. Similarly, we should ensure the same level of support for California's education system, so that we have the best equipment and information at hand to make the critical decisions that affect the lives of our students. For example, we need to be able to:

- Determine which sets of courses may best lead to success in college or various work environments, so that students and families can make choices accordingly
- Establish what kind of professional development equips teachers to thrive in their careers for many years
- Identify which of the reform programs upon which millions are spent are truly working and have the greatest impact on student achievement
- Provide transparency for parents, students, and other stakeholders about schools and the education system so that they can participate in a fully-informed way.

The purpose of this paper is to: identify gaps such as the ones above for all of the stakeholders in California's education system, describe benefits of addressing those gaps, and develop an implementation road map for addressing the gaps. The intended audience is broad, ranging from parents to teachers and principals to state officials to advocacy groups; this is in recognition of the joint responsibility and broad base of cooperation required to implement the recommendations offered.

Where we are now

There are examples of world-class teaching and learning throughout the state. California has some of the best schools in the country, many of which operate under challenging constraints. The state has demonstrated a commitment to education, with several important reforms having been achieved in recent years. California has implemented impressive new standards and accountability systems, and math and reading scores on the California Standards Test (CST) have seen real, consistent improvements over the past 5 years. This is a significant accomplishment of which our schools should be proud, especially given that this improvement has been achieved within the context of California's content standards for what students should learn in each grade, which are among the most rigorous in the nation. California should also celebrate the 300,000 teachers who enter their classrooms every day with the purpose of serving the needs of all the students in our public schools. This dedicated group, along with the non-teaching staff in the schools, districts, and the state who support their work, is the system's most important resource.

There still is a need to do dramatically better. In 2007, only half of our elementary and middle (grades 2-7) students achieved above a basic level on the Mathematics California Standards Test (CST), and only 45% did so on the English CST. Furthermore, there continues to be an achievement gap for some students, such as poor children, certain ethnic groups, and children who are learning English as a second or third language.

Not only is serving our state's children fully and equitably a moral duty, it is an economic necessity. The lack of qualified graduates leaves us with a skilled labor gap that is only going to grow over time; the state is currently projected to produce 100,000 fewer skilled workers than we need each year. A recent study from the California Dropout Research Project estimates that the state benefits by nearly $400,000 in present-value terms for each

additional high school graduate (through increased taxes plus lower crime, health, and welfare costs). Using that estimate as a guide, California is on track to lose $40 billion annually unless it is able to improve the effectiveness of its system.

Where we want to go

As critical as this situation is, hope is provided by a number of examples of schools and districts—many of them here in California—that are tackling these challenges and succeeding. One can find numerous places where students are mastering California's highly rigorous academic standards. The connection that runs through these examples of success is "continuous learning through the use of data." Described simply, a continuous-learning system is one that has defined processes for getting better over time—for example, a school district that uses evaluation forms to improve its professional development offerings each year.

This project has identified four practices as the main components of continuous learning and improvement: rigorously using information to drive decision-making***;*** sharing best practices across the system; encouraging innovation; and supporting improvement through meaningful professional development. Although these practices may look different in different settings, some form of them is common to the highest-performing organizations and systems. This paper describes how to foster these practices across California's education system.

Two assumptions underlie the application of continuous learning through the use of data to education in California. The first is that data may be able to help facilitate continuous-learning practices. Data by itself will be neither sufficient nor necessary to drive change, and implemented without the right supports it is certain to be ineffective or potentially detrimental. However, done in the right way, data can be used to support efforts that are otherwise ongoing. The second assumption is that the practices of continuous learning apply to all of the education system's stakeholders. In the ideal continuous-learning environment, all stakeholders would have the data they need for regularly improving the system:

- Students and parents have easy access to accurate information about local schools that they use to make decisions about enrollment and course selections, among many other important decisions
- Classroom teachers are able to share their best ideas with colleagues throughout the state, unimpeded by geography
- State policymakers can reliably tell which programs are making the biggest difference for students, and use that information to inform funding decisions
- Researchers use data, in a way that preserves privacy, to rigorously answer critical questions about what works without unnecessary administrative barriers and delays
- Taxpayers have visibility into the education system's finances, operations, and successes
- These examples are not comprehensive; they illustrate only a few of the countless ways stakeholders in the education system can act to continuously improve it.

How to get there

The recommendations in this paper are intended to facilitate behaviors such as the ones described above through the use of data, and encompass four steps:

- California should **continue building the longitudinal student and teacher data systems** (CALPADS and CALTIDES) that are currently underway
- Starting immediately, California should **enhance the quality, accessibility, completeness, and basic use** of its current K-12 data systems

- Next, California should **expand the use of that information and data** by building more advanced systems
- Lastly, California should **create interagency linkages to better inform decisions** using data beyond K-12.

By following these steps, California can build on the passion and knowledge that exists within the state and have a significant impact on our state's education system. Certainly, specific tasks like the ones listed in the introduction—ensuring that students are well-prepared for work or higher education, and determining which academic interventions are the most effective uses of resources—would be greatly facilitated. More importantly, these practices, while not the single cure-all for our education system's challenges, together unlock the power of the system to improve itself.

PROJECT APPROACH

This report and the enclosed recommendations are intended to provide a framework for the state of California in developing and implementing comprehensive statewide student data. The recommendations are presented in steps as the system will need to be constructed incrementally over time, building on success and incorporating factors such as available funding, evolving best practices, and changing needs.

1. The starting point for this project was the identification of the four basic practices of continuous learning; these were distilled from published research and a collection of case studies of high-performing organizations. The examples and case studies used were focused on education systems in California, but also included several from other states and from outside the education sector.

2. The next step was to conduct research on the information needed by the education system's stakeholders, including students, parents, teachers, community-based organizations, school and district leaders and staff, state policymakers, researchers, and employers. In all, over 200 individuals representing over 100 organizations (including schools and districts) gave input through a combination of one-on-one interviews and facilitated group discussions. This research was supplemented with a review of the literature on this topic.

   The two basic research questions were: what would the ideal vision of continuous learning in California's education system look like, and what (if any) kind of data might help achieve that vision? The following set of principles were used to guide the pursuit of the answers to these questions:

   - The overall objective is to support student achievement by improving the decisions and practices that impact the education of our students
   - Work on this topic has already been begun, and progress already made, in California; the recommendations build on existing systems and successes and expand on plans that are already in progress
   - In addition to supporting overall achievement, the recommendations are intended to help support the work of closing the achievement gap
   - While data may be part of the solution, data are not the whole solution; therefore, the recommendations address key factors such as local capacity
   - Any new systems must protect privacy for students and educators alike, and maintain the security of the data
   - The recommendations allow the system to be built over time and to adapt to evolving needs.

3. In parallel with this research, the project included a survey of the data already collected by California's education data systems, including both K-12 and non-K-12 systems. This survey provided the "starting point," that is, the basis from which the recommendations would expand.

4. Together, this research was combined to create a detailed vision for continuous learning in California: a vision for an environment in which all stakeholders in the public education system have full access to the information that they need to make important decisions that support the achievement of students.

5. Lastly, this vision was translated into a series of recommendations for California to follow. The recommendations are presented as a series of steps that describe the pathway from the current situation to the ideal vision laid out by the various stakeholders of the system.

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THE PRACTICES OF CONTINUOUS LEARNING

This section provides a more detailed overview of the four practices of continuous learning (for the full discussion please see Appendix A). Each practice is described briefly, with an example of how data may be used to support it. These examples are not limited to the classroom—they reference district operations and parental support, for instance—but each has the same goal, which is an improvement in student achievement.

1. Rigorously using information to drive decision-making

Much of the value of a continuous-learning environment comes from the incremental but ongoing improvements that occur as a result of using data to check progress against set goals, and adjusting plans to account for those data. This description may sound technical, but in practice this behavior is common sense. For example, consider a school district operations officer who notices that the students along a particular bus route tend to have more late arrivals than average. She examines that bus route and discovers that it doubles back on itself unnecessarily. She therefore decides to simplify the route, and in the following weeks keeps track of the timeliness of the students in question. If she is successful, these students will have the benefit of a more effective start to their instructional day.

Though quite simple, this example illustrates the four basic steps of data-driven decision-making: posing an important question that reflects one's priorities ("Are the bus routes efficient?"); using data (tardiness records) to answer that question; developing a plan on the basis of the results (rerouting the bus in question); and reviewing the measurements to determine whether the plan was successful. With these new results, the cycle starts again.

The simple example also illustrates another key point—that although the information used to drive decisions need not be stored in a complex computer system, sometimes there is a role for technology. For example, the example above becomes much easier to imagine if the district officer has access to a system that links student records (tardiness) with operations records (bus routes).

2. Sharing best practices across the system

Educators, like professionals in any industry, learn a lot of what they need to know from their colleagues. This sharing of ideas and learning from each other happens already, both formally through organized meetings, and informally through conversation in teachers' lounges. These methods of collaboration can be highly effective. However, there are also limits—educators will be most likely to share ideas with colleagues who are nearby, whether in the same region or on the same floor. Furthermore, these modes of collaboration presuppose that stakeholders are already connected to each other personally, or receive invitations to the organized meetings. The ability to share would benefit by removing these barriers, so that educators and parents facing similar challenges would be able to share ideas without being geographically close to each other, and even without knowing each other personally beforehand.

Thus, the guiding question for this practice is: "How does the system ensure that people who need a piece of knowledge have access to it?" In the ideal environment, those parents would be empowered to easily learn how best to support the literacy of their child (and, by engaging in the practice of data-based decision-making, would know when additional literacy support was necessary).

3. Encouraging innovation

While data-driven, decision-making results in a steady stream of small improvements—and this steady stream accounts for most of the value of a continuous learning system—sometimes improvements come in larger steps, through more major innovations. A hallmark of a well-designed continuous-learning environment is that innovation is ingrained in the culture so that it is not limited to accidental or reactive contexts. In order to achieve this, an organization needs to be thoughtful about the creating, testing, and scaling of new ideas.

The testing and validation of new ideas requires an awareness of what each innovation is meant to accomplish, and a method of measuring that desired outcome. Here it shares some attributes with data-driven decision-making; namely, questions must be asked and data must be collected and analyzed to answer those questions. Because of this commonality, the tools we can use to facilitate decision-making can be used to facilitate innovation. For example, the linked student information and operations systems that is used to uncover inefficiencies in bus routes can also be used, with the right other processes in place, to help innovate new ideas about reducing absences (among other purposes).

4. Meaningful professional development

The phrase "professional development" is often used in a limited way, to refer to the workshops that teachers attend after school or on weekends. However, in this paper, the phrase is used more expansively; it refers not only to teacher workshops but also: the informal coaching that occurs between teachers and their peers; the organizations principals participate in to improve their instructional leadership; the training that district staff is given; informational sessions for state-level policymakers about educational topics; and community meetings for parents about school operations—to name just a few other categories. In essence, the phrase "professional development" is meant to invoke the full set of potential activities that develop the skills that education stakeholders need to make the most of the system. An important feature of these activities is that they often take place in "communities of practice"—that is, among groups of educators that form around similar objectives. Appendix A has a fuller description of the forms that these activities can take.

With respect to the recommendations, professional development is mentioned in two main ways. The first is a set of recommendations geared specifically toward using information to make professional development more effective—the idea being that teachers (or principals, or district staff, or parents) should exit each professional development activity knowing that it was worth their time. As with the other practices, one can imagine how technology can facilitate this goal; for example, technology can make it easier to categorize and find professional development offerings that are targeted to the particular goals and challenges in a specific classroom, thus giving educators more of an opportunity to make the greatest difference for their particular students. This kind of facilitation can happen while preserving the ability of local systems to create and tailor professional development that best meets the needs of their local environments.

The second way that professional development comes into the recommendations is more pervasive, and inverts the relationship between the practice and technology. Whereas the examples above describe how technology can facilitate the continuous-learning practices, professional development is critical to supporting the effective use of technology. This point cannot be overemphasized: Without quality professional development for all potential users of technological tools or data systems, the potential of the technology to provide real value disappears. In addition to professional development about the use of data, professional development is needed for the creation of data—for example, the judgment that is inevitably involved when new information is captured and entered.

Continuous learning in other sectors

Public education systems are unique environments with much at stake, and comparisons between educational institutions and organizations in other sectors must be drawn carefully. There are risks to applying lessons from the private sector or other public domains into education without the necessary adaptation to the particular characteristics of schools and districts, for example.

With that acknowledgement, examples of continuous-learning practices—and the technological infrastructures that help to facilitate them—abound in other sectors as well. Three examples are provided below; additional detail is provided in Appendix A.

- Economic development and poverty reduction. The World Bank is a complex, multinational organization that aims to use knowledge-sharing to reduce global poverty. In the last 20 years, the Bank has offered an

increasing amount of support in the form of knowledge to partners in developing economies. At its best, the Bank can take lessons from one economy and apply it elsewhere. It codifies this knowledge in many forms ranging from the high level (e.g., policy white papers, economic statistics, step-by-step reform recommendations) to the very concrete (e.g., the best crops for a 3,000-person sub-Saharan village). The Bank also conveys knowledge through a range of media including written word, videos, websites, and face-to-face interactions.

Recently, the Bank rolled out a host of processes and practices in order to increase its ability to collect and share knowledge. As part of the tools to enable sharing, the Bank created a "first-alert" directory of experts on specific topics as well as a one-stop portal for searching documents and ideas. Finally, it supported forums for knowledge-sharing including the creation of subject communities that met regularly to share knowledge in their area. These efforts have dramatically improved the ability of people at the Bank to efficiently find the information critical to the performance of their jobs.

- Health care. In another case study, a regional hospital system in the U.S. whose mission was to offer an integrated health-care delivery system that provided patients a continuum of coordinated high-quality care wanted to reduce physician errors and improve patient care. In addition, it wanted to embed everyday knowledge-sharing (about medical information on diseases, syndromes, medications, etc.) into everyday work processes. As a first step, the organization developed technological tools to automate and monitor prescriptions and orders for lab tests. These tools were then linked to a single database of clinical best practices, and further linked to a patient medical record database. This allowed the physician to automatically check the information in multiple databases that pertained to his or her patients.

  In addition, new features were added to remind physicians to check up on certain tests and procedures, enable physicians to consult with each other real-time via teleconferencing, and provide access to journals, periodicals, and textbooks through an integrated internet portal.

  As a result, serious order-entry prescription errors were reduced by 55%, allowing the organization to prevent unnecessary hospital stays and adverse drug events.

- Energy use and production. Increasingly, utilities and other energy-intensive companies are beginning to apply the concept of smartgrids to their businesses. In essence, smartgrid technology brings communications and computing infrastructure to electric-power networks in order to increase energy efficiency through feedback on real-time usage and pricing, reduce operating costs through advanced metering infrastructure, and increase reliability through the intelligent routing of power. For example, by drawing on detailed information that shows exactly where and when energy is being used, and using the analysis of that information to test and measure new practices, a utility, company, or even individual user can change behaviors to maximize the desired results (for example, lowering cost). Though this concept and the technology to support it is relatively new, over time they will drive large improvements by increasing energy productivity, reducing cost, and reducing greenhouse gas emissions.

Although these examples cannot be applied directly to education, they provide support for the belief that it is possible to provide the functionality that education stakeholders asked for in interviews.

A note on the need for rigor and quality control

Before describing in detail how to enable the continuous-learning practices. it is important to note that if the practices are truly to lead to increased student achievement, they must be applied with rigor. For example, the evaluation of professional-development programs cannot be performed simply on the basis of satisfaction surveys; the methodology may include measurements of student outcomes, and above all must be agreed upon and consistently applied. Although the development of such analytical methodologies is not addressed in this paper, it is noted as a non-trivial requirement for continuous learning to lead to real results.

OVERVIEW OF THE RECOMMENDATIONS

Progress toward the vision of continuous learning can be described as a series of steps. These steps indicate a general sense of timing, but are overlapping. Importantly, the initial work for each of the steps can start now, as some of the requirements for the later ideas can most efficiently be put in place in the near term.

- California should **continue building the longitudinal student and teacher data systems** that are currently underway
- Starting immediately, California should **enhance the quality, accessibility, completeness, and basic use** of its current K-12 data systems
- Next, California should **expand the use of that information and data** by building more advanced systems
- Lastly, California should **create interagency linkages to better inform decisions** using data beyond K-12

Step 0: Continuing to build the foundation

California has already begun the work of meeting the needs through two new systems that are currently being built: the California Longitudinal Pupil Achievement Data System (CALPADS) and the California Longitudinal Teacher Information Data Education System (CALTIDES). These systems, when completed, will be able to track critical educational information at the individual student and teacher level, while maintaining privacy. This gives rise to a host of new capabilities, including being able to have instant access to a transfer student's past records, being able to determine with precision where teachers with particular credentials are working, and being able to accurately report school dropout rates.

Along with several other key systems, CALPADS and CALTIDES form the core K-12 information systems upon which the recommendations are based. For example, these systems take us a long way toward meeting the requirements for effective data systems laid out by the Data Quality Campaign (more detail on the elements suggested by the DQC is provided in Appendix G). As such, the continued implementation of those systems is considered to be "Step 0" of the recommendations and is listed accordingly.

However, as these new systems do not completely address the needs identified in the research, this paper describes three additional necessary steps. These steps—especially Step 1, which deals with quality and access—should be pursued immediately, without waiting for CALPADS and CALTIDES to be finished.

Step 1: Quality, accessibility, completeness, and basic use

The main rationale for this step is that although current systems—especially when one considers what is planned for CALPADS and CALTIDES—contain much of the raw data that stakeholders need for information-driven decision-making for increasing student achievement, those data are not necessarily ready for extensive use. Users cited concerns about the accuracy of the information in education data systems and the ease of pulling together data stemming from multiple sources. In addition to possible errors in data entry, the use of data across systems (for example, comparing data from two districts) raised the possibility that two different systems might have conflicting information—for example, one system might use the nickname "Jon" where another spells out the full name "Jonathan." Though seemingly trivial, these kinds of inconsistencies can be a heavy burden on individuals trying to use the system.

In addition to accuracy, users expressed a desire for educational information to be easier to access. An example of this need is illustrated by the School Accountability Report Card (SARC). This is an annual report required of each public school in California. The SARC is intended to provide parents and others with a snapshot of the key details regarding each school; one use may be to make better-informed decisions about enrollment. However, several problems exist with the SARC. It is often a long document, and it is sometimes difficult to find a particular piece of

information within it. Furthermore, each district may use a different format for this report, and may make it accessible in different ways. The lack of one source and format therefore makes it difficult to compare schools. Lastly, many parents are still not aware of the document. Because 85% of the information on the SARC comes from CDE, there is an immediate opportunity to address these challenges. The recommendations are aimed at challenges such as these. Helpfully, there are several initiatives already in place across the state that can be used as models. For example, the Governor's Schoolfinder (www.schoolfinder.ca.gov) website makes it easier for parents and the public to find information about schools of interest to them, and compare schools across certain characteristics. Schoolfinder and other similar initiatives should be celebrated and built upon; the recommendations are intended to do this.

Because access can mean different things to different audiences—whereas researchers may interpret "better access" to mean "more data," it may mean "less data but in a clearer form" to parents—the recommendations seek to balance the needs of various stakeholder groups. However, in general, access means an unfettered ability of stakeholders to find the information they need to make decisions; any non-identifiable data should be as widely available as possible.

Lastly, Step 1 includes a recommendation to add ~30 cored data elements and suggests ways to foster the use of the data, mostly for the practice of information-driven decision-making and innovation at the school and district level. These represent some of the most basic and straightforward ways to use the educational information systems.

Cost estimates for Step 1 are $32-66 million in one-time costs and $4-8 million in ongoing annual costs; Appendix E has the detail behind the cost estimates.

Step 2: Expanding the use of information and data

The next collection of recommendations adds the other two key practices: best-practice sharing and professional development. In addition, this step builds on information-driven decision-making and innovation by applying it to all federal, state, and local educational programs. It is worth mentioning that the recommendations in this step are focused on data that might facilitate these practices, but one certainly does not need a computer or the internet to collaborate with colleagues, for example. Research was conducted, therefore, to ensure that the recommendations address an actual need, rather than suggesting data for data's sake.

The findings were that there are specific applications of technology that make sense for these practices. For example, e-learning is not likely to replace in-person professional-development (PD) workshops in the near future, but an online system that could be used to keep track of in-person PD offerings was deemed useful by teachers. Similarly, though offline networks continue to be the main way that educators interact with their colleagues, there is an opportunity to draw from the successes of examples like Facebook, Wikipedia, and Amazon to enhance those networks.

Lastly, the focus on programs included in this step is in recognition of the fact that the wide range of interventions at each of the governmental levels collectively draws a sizeable fraction of our education budget and other resources.

Step 3: Linkages outside of K-12

The last step is to connect the information in the K-12 system to systems related to other parts of the student's academic experience. For example, one of the key needs expressed by families and researchers is the need to determine what K-12 academic offerings best prepare students for work, or for higher education. Researchers are interested in this question for purposes of educational policy; parents because they want to guide their children toward the most beneficial path. Teachers need to appropriately respond to individual student needs. However, answering these questions requires the ability to follow students from K-12 into the workforce or into college. This implies a connection between various information systems.

In this step, the connections are divided into three main categories: the "outputs" of K-12, which are employment and higher education; the "inputs," which include social services, health, criminal justice, and foster care; and Pre-K, which flows into K-12. Pre-K is also separated as a category because of the need to start collecting basic

information about students in Pre-K programs (the other categories, in general, already have established data systems). It should be noted, however, that some Pre-K programs are operated through school districts, such as Los Angeles and Santa Maria-Bonita, that also operate K-12 schools. In the case of those districts, the integration of Pre-K information would more naturally fall into Step 1. Cost estimates for Steps 2 and 3 together are $24-77 million in one-time costs and $5-15 million in ongoing annual costs. In total, the comprehensive plan would require $56-143 million in one-time costs over the next 5+ years, and $9-23 million in annual costs by approximately the year 2015. These cost estimates (also detailed in Appendix E) are less accurate than those for Step 1; these figures will need to be updated once implementation begins.

A note on the collection of additional data elements

One of the first aspects of an "education data system" that may come to mind is the list of data elements in that system—that is, exactly what pieces of data are being collected about students and teachers. While one recommendation, #4, does directly relate to the collection of additional data elements, the bulk of the recommendations go beyond data elements and instead focus on connections among systems, tools that help stakeholders make better use of the information in the system, and the other enablers like training.

Where additional elements are discussed, mainly in Recommendation 4, the recommendations attempt to balance the desire for more information with the need for privacy and concerns about misuse of information. The resulting list, included in Appendix C, is limited to only those core elements that are most needed to support the uses described throughout the document.

A note on the cost estimates

Though rough cost estimates are included above and in Appendix E, at least two major questions pertaining to funding are unresolved—namely, "will the financial benefits of these ideas outweigh the costs?" and "if so, what will be the sources of funding?"

In answering the first question, an important consideration is that in addition to the potential improvements to student achievement, many of the recommendations may result in financial savings. For example, the elimination of redundant data collections and the simplification of the error-correction process reduce cost and save effort. Some of these estimates have been provided with the cost figures. More difficult to quantify, but perhaps correspondingly larger, are the potential savings from spending the education budget more efficiently and effectively, especially once programs and other efforts are more systematically evaluated for results. No estimate for these savings is provided.

The second question is made more complicated by the fact that many of these ideas are intended to be implemented on a statewide basis, with benefits that are often focused at the local level (Recommendation 5, on formative assessments, is an example). Although focused on the costs incurred at the state level (for statewide functionality), this paper does not specify the optimal allocation of costs across different governmental levels or across potential private sources such as businesses or foundations.

Lastly, these cost estimates:

- Are based on estimates of the additional human resources, hardware, software, and project management and oversight needed
- Do not include costs or savings at the local level, nor the issue of mandated costs for local systems
- Do not include the cost of CALPADS and CALTIDES, although the functionality offered by these planned systems makes it easier, and less expensive, for California to implement Steps 1 through 3
- Are estimates and are not meant to replace vendor quotes.

A note on the current context of data in districts

These recommendations are intended to address districts across the state; however, current data systems vary greatly from district to district. Whereas some districts have basic systems, others—especially large districts—have advanced systems with advanced functionality. Therefore, the benefits offered by these recommendations also vary from district to district.

For districts with less advanced systems, most or all of the recommendations in this paper represent new capabilities. For districts with more advanced systems, some of the recommendations may refer to capabilities they already possess, but there is a benefit in scale. In some cases this scale benefit is one of cost. For example, error-correcting tools may be less expensive when purchased on a statewide basis, and this savings would be available to districts that otherwise would have purchased those tools. In other cases, the scale benefit is one of compatibility; even a large district with an advanced data system will find more value in that system if its data are able to be shared with other districts across the state.

A note on the format of the recommendations

The four steps (Step 0 – Step 3) introduced at the beginning of this section are detailed in the following pages using the following format. First, each step is divided into major recommendations; these recommendations are numbered 0 through 10 and are summarized on the first page of Appendix B.

Second, each major recommendation is divided into minor recommendations, using decimal numbers (e.g., 1.1 or 10.4). These minor recommendations contain the individual actions that are required to fully implement the major recommendation. Lastly, the minor recommendations are grouped into three categories:

- Data, information, and tools
- Governance, policies, and funding
- Culture, training, and incentives

The primary focus for this project is the first of these categories. However, the others are as critical to the successful implementation of these recommendations as the technology itself. Because of this, the recommendations that follow include, in their detailed descriptions, specific initiatives in each of these categories. The initiatives in the first—data, information, and tools—are fleshed out in much more detail, but the others are included to illustrate at least some of the additional work required of all stakeholders in the system in order to achieve the ideal vision of continuous learning.

DETAIL FOR STEP 0: CONTINUE BUILDING LONGITUDINAL STUDENT AND TEACHER DATA SYSTEMS

Recommendation 0. Continue building CALPADS and CALTIDES and ensure that they can be linked to other state data systems

Because the plans for CALPADS and CALTIDES were already being implemented when this project began, the details of those systems are not included in this document. However, there is an important nuance in the recommendation included in Step 0 above. Currently, CALPADS and CALTIDES are being designed as stand-alone systems. Because of the need in later steps to create linkages between these systems and others, the features that allows these systems to link to others, such as for higher education, should be added now. This linking feature is an addition that would not alter the basic structure of these or other systems. Rather, it is essentially a piece of software than can be added on to facilitate the future evolution of the system; doing so while the system is being built is likely to be more efficient than waiting.

DETAIL FOR STEP 1: QUALITY, ACCESSIBILITY, COMPLETENESS, AND BASIC USE

Recommendation 1. Improve quality and timeliness of existing data collections

As mentioned above, information in the current systems needs to be accurate. In addition, the processes for ensuring this accuracy should have the benefit of increasing efficiency, and therefore speed and timeliness. The ideas below are intended to address these goals.

In addition, this recommendation includes suggestions that are intended to prepare the systems for the later steps. Specifically, although linkages between various data systems are included in Step 3, there are various preparatory steps that are better done ahead of time; some of these steps are included here.

Data, information, and tools

1.1 Provide additional advanced data-quality tools to schools, districts, and county offices of education to improve data at source for key state-level collections

Currently, the process for collecting statewide data—for example, student records—is that data are entered at schools and districts and sent to the state systems by upload or by sending CDs. Once collected at the state level, the data are checked for errors, and if errors are found, requests for corrections are sent back to the original schools and districts. This back-and-forth of the data creates delay, wasted effort, and increased opportunity for errors.

Instead, districts should be provided with automated error-checking tools that are used when the data are first entered. These flexible software-based tools can monitor data as it is being entered and catch a wide variety of errors—for example, entering a student's age in the place for her gender, or duplicating a student entry because of a misspelling of the name. These tools can also automate some of the entry—for example, automatically filling in a city and state when the zip code is given. Lastly, the tools can offer pop-up help screens when the individual entering data has a question about a particular element. The dual benefits of these tools are both an improvement in accuracy and the saving of time and money.

1.2 Develop a common data dictionary for core education-specific elements for P-20 and non-education state systems

Step 3 of the recommendations includes building linkages between various systems, including Pre-K, higher education (P-20), and others. A concern that arises from this recommendation is that different systems may have inconsistencies in how they capture information. For example, one system may capture a middle initial while another uses a middle name, or one may allow an individual to have only one ethnicity while another allows a combination. Because of this, there is a need to have a "translating" table that can bridge across these kinds of differences. This table can be developed and implemented now, yielding the benefits of clear consistent definitions for the systems that use them before the linkages in Step 3 are built.

Governance, policies, and funding

1.3 Develop cross-agency data-management organization

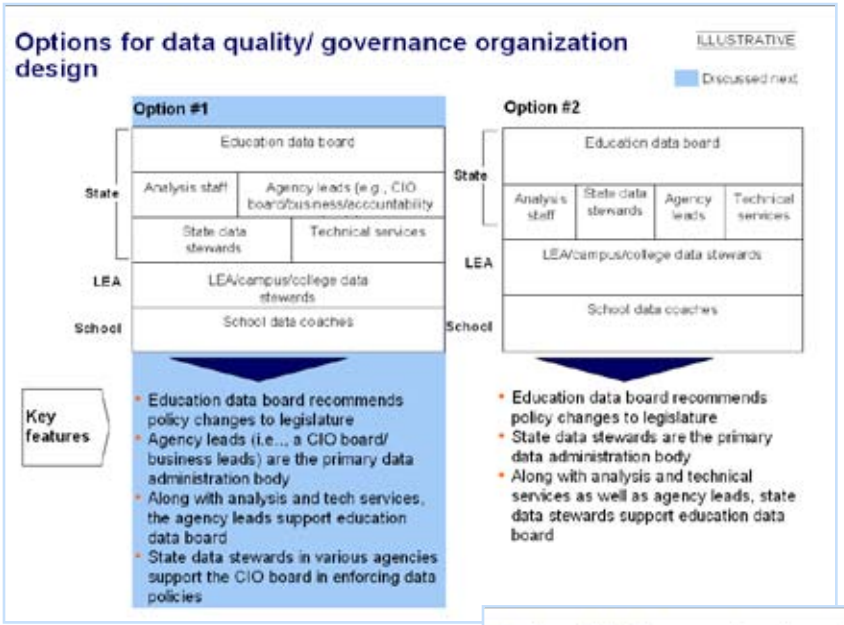
One of the complications of linking various data systems (this is in Step 3) is that the individual agencies that own the data systems have their own policies for managing those systems. The creation of linkages between systems, or new data elements, or new data systems altogether, will give rise to many policy questions that need to be answered before the full set of linkages is complete (for this reason, this initiative is included within Step 1). For example, in implementing the recommendations laid out in this paper, California would need to answer (among other questions):

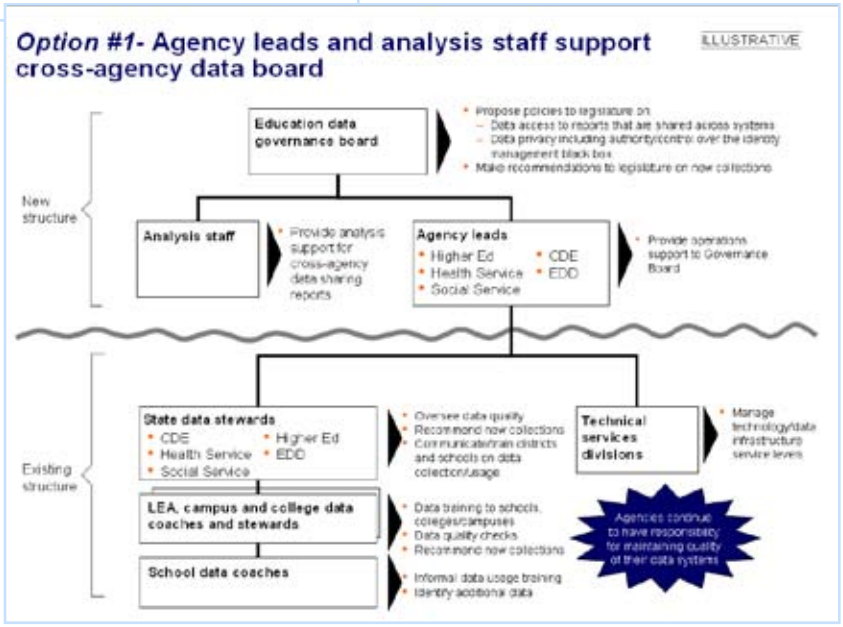
- How is accountability arranged throughout the system, and which individual has ultimate accountability for ensuring that the system meets the needs of all of the stakeholders it serves?

- How is data quality defined, measured, and enforced?
- Who is given access to identifiable (or otherwise private) data?
- How should redundant systems be integrated?
- What changes to the system will be made over time, in response to changing user needs?

This paper suggests neither the answers to these questions nor the exact process used to answer them. Instead, it highlights the need for a governance model to answer questions like the ones above. In many of the recommendations that follow, specific references will be made to this initiative (1.3) to add detail to the kinds of responsibilities the model must address.

Also, although this paper does not advocate a specific model, California can look to other states for options. The illustrative organization charts below are based on Florida (option 1) and Tennessee (option 2) and can be considered as possible models.





1.4 Enhance data audit field visits for all collections using a sampling methodology

A limited set of state data-quality audits should be conducted to check that the tools and other processes are, in fact, resulting in accurate data. These audits can be conducted using a random sampling method in conjunction with local governance bodies.

1.5 Provide districts and counties with an integrated calendar of data collections

Because state systems like CALPADS pull information from so many sources, it is critical that there is a common understanding of when the data must be updated. For example, if CALPADS is used to produce a report on drop-outs on a certain date, all of the sources must have updated their enrollment information before that time. Providing a calendar that includes these important milestones helps to ensure that reports are accurate; in addition, local districts will be better able to make use of the systems if the timing of the updates in transparent.

1.6 Invest adequate resources for data-quality initiatives

This paper includes a rough estimate for the financial costs of all of the recommendations in Appendix E, and each numbered recommendation includes language referring to these investments. Although repetitive, this is meant to emphasize that results are impossible without an appropriate level of investment.

In addition to the estimates laid out in Appendix E for Recommendation 1, stakeholders at both the local and state level may provide other non-financial resources, such as time or hardware. Estimates for the local cost range from $10-$30 per student for the initiatives within Recommendation 1.

Culture, training, and incentives

1.7 Provide analytical reports back to the districts and schools as a key incentive to improve data quality

1.8 Develop rewards and appropriate consequences for schools, districts, and county offices of education that promote maintenance of good-quality data

These two initiatives suggest some ways to provide incentives for high-quality data. The most effective incentive is usefulness; if the state data collections produce information that individuals at the local level can use to improve student achievement, the goal of accuracy and timeliness becomes a shared goal. Therefore, any planning for statewide collections should include this objective. In addition, there is a range of other incentives that California can consider, from public recognition for high-quality data to eligibility for funding. A difficulty that is introduced with these external incentives, however, is that measuring data quality may be difficult. This paper does not include recommendations for specific rewards and consequences; that decision must be carefully considered by policymakers.

1.9 Develop effective modes of data-quality certification and training

1.10 Integrate data training into pre-service and ongoing educator and administrator professional development

Lastly for Recommendation 1, California should develop a training program that covers the topic of data quality. This program can be integrated into training programs that cover the use of data, and may be worked into other professional development for district and school staff. Kansas offers a model for a dedicated certification program for data entry personnel that California may consider called Kansas Individual Data on Students (KIDS) Data Quality Certification. In addition, California has launched similar efforts in the past, including a program with Microsoft as a partner that provided technology training for educators.

Recommendation 2. Improve transparency of information for all users by ensuring access to data and developing user-friendly interfaces and reports

This recommendation has two main goals: making sure that education information can be found easily by those who need it, and making sure that the information is presented in an easy-to-use way.

Data, information, and tools

2.1 Consolidate existing state education reports into a statewide education portal

One of the key parts of this recommendation is a "one-stop-shop" for education information. As mentioned previously, one of the key challenges that the public faces is not a lack of information, but rather difficulty in finding what's available. This education portal, which would be web-enabled, would contain pointers to existing sources of education information within privacy guidelines. For example, CDE's Dataquest site would be linked to the portal. In addition to aggregating these sources, the portal would give users the ability to log in and have access to personalized information based on their role. Teachers would have access to personalized information about the students in their class; students would have access to their own records. Either one would be able to much more easily answer the questions: how is the student doing in the class, and exactly where does he or she need the most attention? In addition, automated data feeds should be provided to approved users; these would enable researchers or third parties quicker access to large databases (these databases would not in general have personal identifiers).

There is a natural tension between the desire to provide easier access and the need to maintain both privacy and security of the information. The technical specifications included in Appendix D provide more detail on ways to balance both needs; California can also look to the models provided by online financial services or certain government services to inform the design of this system.

2.2 Improve the accessibility of the School Accountability Report Card (SARC)

As mentioned previously, the SARC is a required publication for all public schools in California that is intended to provide important information about each school to the public. However, potential SARC users often do not know about it, or find it difficult to navigate. The state should provide districts with simplified dynamic templates for this report. These templates would include all of the elements required for the SARC, but would arrange the information is a form that is easier to use. Several third-party vendors provide models for such a template.

In addition, the report should be available in various formats, including paper and web-based. And addendum to the report might include interactive school reports based on surveys and comments from school stakeholders (for example, staff, students, and parents). A model of this is provided by Schoolfinder (www.schoolfinder.ca.gov), an initiative launched by the Governor to make it easier for parents and the general public to compare schools that are of interest to them.

These templates would be optional—numerous districts already have programs to improve the usability of their SARCs; these would not be affected, for example. However, given that 50% of districts use the templates provided by CDE, these updates would be impactful.

2.3 Ensure that individual school, district, and state performance is reported by subject (i.e., math, reading) and by subgroup

A key public need relating to education data is to understand the performance level of a particular school or district. In order to effectively do this, the public needs access to information that is simultaneously detailed and easy to understand. Currently, although there are several ways for the public to get a sense of how their schools and districts are doing, there is no easy way for a parent, for example, to know how a school is performing on a specific subject like math or language arts. The results of the California Standards Tests (CSTs) are available by subject but are presented in tables and are difficult for the average parent to interpret and compare. California needs an indicator that falls in the middle of the spectrum for both specificity and simplicity.

2.4 Standardize the "look and feel" of education reports by developing format standards, interactivity, and common data definitions for education data reports and school data websites (opt-in)

This recommendation is a generalization of the ideas presented above for the SARC. As schools and districts make more information easier to access for the public, they should be able to draw on common presentation standards at their option. For example, districts might decide to adopt similar-looking formats for student transcripts, or similar designs for the "parents' resources" section of their websites. This would facilitate the public's ability to interpret and compare across district lines.

2.5 Support ongoing last-mile network upgrade effort for remote and capacity-constrained schools and districts

California has undertaken impressive efforts to ensure that all schools have internet connectivity and computer resources more generally. This is a recommendation to continue that work with a focus on the areas that currently have the least resources. Specifically, it makes the most sense to upgrade equipment in 5-10% of California's public schools.

2.6 Translate all state data reports and websites into the languages most spoken in California

The languages spoken in California are too numerous to count, and it would be impossible to translate all education resources into every one of them. However, currently there are numerous resources, such as on the CDE website, that are available only in English. These should be made available to the languages that are spoken by significant portions of the population.

Governance, policies, and funding

2.7 Ensure access to non-identifiable raw education data (e.g., the information contained in the Standardized Testing and Reporting header sheets) for all stakeholders and to identifiable data based on user's access privileges

The phrase "non-identifiable" in this recommendation refers to education data that do not link to individuals, whether students or adults. Therefore, users of this data would not be able to identify any particular person. In general, these data are aggregate results, for example at a whole-school level. Access to education information that is not identifiable should be made easy and immediate, and should allow for users to analyze it on their own. In addition, identifiable data should be made available to those with appropriate access, in accordance with privacy and security guidelines. An example is provided by the header sheets for the CSTs—they record information about instructional materials, allowing one to ask about the impact of using various materials on test scores.

As an example, the general public should be able to answer almost any question about performance and characteristics that is asked at a school level (assuming that the school is not so small that one would be able to determine specific facts about an individual student or staff member). This is true for all public schools, regardless of type (for example, charter schools, non-traditional schools, etc; in fact, all of the recommendations in this report pertain to all types of public schools). Such questions include: rates of student achievement compared to neighboring schools; how the school budget is allocated across major spending categories; accurate dropout rates; how many students go onto college; etc.

2.8 Create a process to review inter-agency data sharing requests across data systems

As linkages are created among various agency systems, especially as described in Step 3 of these recommendations, a need for policies relating to the flow of information across agencies will arise. The data management organization referred to in 1.3 should be proactive about designing these policies, and respond to new needs as the linkages continue to develop.

2.9 Invest adequate resources for improving data accessibility

Rough estimates for the financial costs of this recommendation are included in Appendix E.

Culture, training, and incentives

2.10 Provide professional development and data training at all levels to increase awareness and use of existing data

2.11 Provide seminars and workshop training to increase educator and administrator computer and internet usage

Each new option for access will create a need for greater awareness. This awareness should be fostered within the schools themselves, but also outside the school walls. Training and informational sessions should be available for members of the public who are interested, and should include policymakers in their scope. For example, posting explanatory materials on the CDE website, hosting town halls for parents on the use of new systems, and conducting briefings for state policymakers might be considered.

Recommendation 3. Develop feedback and innovation capabilities to continuously improve instruction, administration, and policymaking

Recommendations 1 and 2 are intended to ensure that our existing education information is accurate and accessible. Recommendation 3 suggests additional functionality to that existing information to make it more useful for the purposes of continuous learning.

Data, information, and tools

3.1 Include feedback capabilities in the integrated statewide education portal, as described in Recommendation 2.1

The power of the education portal is not only that it provides an access point for all categories of stakeholders. It also creates an opportunity to provide basic analytic tools that users can tap into in order to "turn data into information"—that is, it can give users the ability to delve into the data in order to use it to inform important decisions. A district superintendent would be able to set targets for student grades or parent satisfaction, track progress in real time, and use those data to inform district policies. Parents would be able to do the same—using class grades or homework completion, for example—to inform ground-level decisions about school activities or homework assistance. It is important to note that these capabilities would be made available within all applicable privacy guidelines.

3.2 Enhance the ability of schools and districts to assess effectiveness of local initiatives using models like Cal-PASS or the National Student Clearinghouse

Several partnerships have developed in California around the idea of better tying together the rich warehouses of information that districts and other organizations for use in local decision-making. These organizations can be used to expand the goal of Recommendation 3.1. Whereas 3.1 is meant to spark use of statewide data sets, these organizations provide a model for sparking the use of local data sets. First, California should offer these partnerships the ability to take advantage of statewide data collections, especially to make sure that the same information is not collected twice for state and local purposes. Secondly, California can expand these partnerships, and make sure that any district or local organization that chooses to participate in such an effort can.

These models allow schools and districts to perform analyses on their operations that are too often impossible. For example, a district with multiple parent outreach programs may have a sense that some are less effective than others, but may be unable to decide with certainty which ones to expand and which ones to phase out. Ideally, this district should be able to determine the answers to questions like: which ones have the highest parent satisfaction? Which programs are most effective at reaching a broad range of parents? Which ones reach the parents of the students with the greatest needs? Which ones seem to lead to greater parent involvement, and better student outcomes? Models such as the ones described above allow these kinds of questions to be asked and answered.

In particular, both Cal-PASS and the NSC, by providing local linkages with higher education systems, are sources of data regarding post-secondary performance data. These data can potentially be used to help improve the ability of the K-12 system to prepare students for college, in advance of the statewide linkages referred to in Recommendation 9.

3.3 Provide assessment tools for local counties, districts, and schools to support more frequent identification, classification, and reclassification of students (e.g., EL students) (opt-in)

3.4 Make available survey platforms and items to districts and schools so that they could customize (as needed), administer and analyze results to track effectiveness in developing a climate of teaching and learning

These two initiatives are examples of benefits that local entities would be able to draw from the recommendations, on an optional basis.

Although districts and schools can and do design their own assessments and surveys in order to measure their progress against goals, there is an opportunity to provide support for these activities at a statewide level. In the interviews and discussion groups, local educators validated the value that statewide tools would provide. These tools would include pre-developed surveys, for example, to measure a school's learning environment or sense of safety. These surveys would be **optional and customizable**, thus preserving local initiative while potentially saving the work and cost of "reinventing the wheel" with respect to the basic set of questions. The same kind of tool can be made available for more technical uses, such as assessments that local educators use to classify English-language learners (EL students).

Surveys are called out here as an example because in several districts in California and elsewhere throughout the country, surveys have been an effective tool for increasing community engagement and for providing all stakeholders, including parents and students, valuable insight into barriers to improving student achievement. This use does not diminish the need for other metrics of success as well, nor does it lessen the need for a rigorous definition of success and analytical process.

In addition to providing pre-developed assessments and surveys, platforms for the administration of these tools can be provided (several models for survey platforms exist in the private sector).

Governance, policies, and funding

3.5 Encourage local capacity to design, run, and track pilots

As previously mentioned, organizations that excel as innovators have processes in place that ensure energy is put into creating and testing new ideas. California can apply this lesson to its education system by creating pilot teams dedicated to trying out new ideas in partnership with local systems that choose to participate. An important aspect of this pilot approach is the rigorous use of information systems, such as the ones described above, to measure results. These pilots would be driven at the state level, with benefits at the local level. An example pilot program might be focused on an employment internship program for middle-school students, for which high-school matriculation and eventually graduation is tracked.

3.6 Invest adequate resources for initiatives on feedback and experimentation capabilities

Rough estimates for the financial costs of this recommendation are included in Appendix E.

Culture, training, and incentives

3.7 Encourage schools and districts to pilot and track effectiveness of new initiatives. Rewards could take the form of flexibility in use of funds, superintendents' awards, public recognition on CDE website, etc.

The counterpart to supporting innovation (through pilot teams and the technology they use) is celebrating the results of that innovation. The options for celebration and recognition are numerous and California can explore a variety.

Recommendation 4. Enhance existing K-12 data collections by capturing key additional data on students, teachers, programs, and facilities

Most of the most important data elements—that is, the pieces of information collected about individuals, schools, programs, etc.—that are needed to inform our collective decision-making are already collected by existing data systems. Thus, Recommendations 1 through 3 focus not on adding additional elements, but rather on making those existing collections more accurate and easier to use. Also, the plans for CALPADS and CALTIDES already expand on the availability of critical information to inform educational decisions, as described above. That said, there is a relatively short list of additional elements that would enable the state to research and answer questions that are neither answerable now nor once CALPADS and CALTIDES are fully implemented.

Data, information, and tools

4.1 Collect ~30 core additional data elements (currently not planned or collected) in K-12 education data systems in order to analyze aggregate data to inform statewide programs and policy changes

These data elements are listed, along with the rationale for including each element, in Appendix C.

4.2 Reinforce additional optional elements for local systems that are already collecting them. These additional elements would not be rolled-out to other local systems. This could include providing guidance on definitions and collection capability

The previous initiative relates to statewide collections. In addition, California can make the collection of other important but optional data elements more robust by providing common definitions for districts to use, if they choose to do so. For example, districts may want to track the supplemental textbooks or other instructional materials they are using in each of their schools. A common categorization of such materials would make cross-district comparisons easier to conduct, for those districts that choose to make such comparisons.

4.3 Determine the optimal sourcing strategy to avoid duplicate data collections in K-12 state data systems

Currently, there are a few elements that are collected redundantly in multiple data systems. These duplications should be eliminated.

For example, the special education system (CASEMIS) requires certain elements that are already found within CALPADS. Either linkages should be made to ensure that the information from one flows into the other, or the systems should otherwise somehow be integrated.

Governance, policies, and funding

4.4 Invest adequate resources for key collections

Rough estimates for the financial costs of this recommendation are included in Appendix E.

4.5 Create a process to periodically revisit data collections to assess whether elements are meeting user needs

The list of important questions that stakeholders need to answer will evolve over time; therefore, processes that ensure a parallel evolution of the data collections should be implemented.

Culture, training, and incentives

4.6 Incorporate training on the definitions and use of core data elements in professional development offerings for educators, administrators, and others

No collections are valuable unless they are used; California should ensure that all potential consumers of education information are aware of what information is available, and to what purposes this information can be used.

Recommendation 5. Develop an opt-in bank of assessment items and support formative assessment capabilities

This recommendation is a response to needs expressed by classroom teachers. In the interviews and discussion groups, many teachers cited the value provided by software that is used in the formative assessment process. The phrase "formative assessment" is used in this paper to describe the ways in which teachers gauge how well their students understand the concepts being taught. Once the teacher has a sense of the level of understanding, he or she can make a decision about how to tailor instruction for that student.

The most common form of formative assessment is a simple question, asked and answered aloud. For example, a teacher may ask a student to summarize a piece of literature; depending on the answer, the teacher may or may not move onto another topic. In addition to this kind of near-immediate formative assessments, teachers employ longer-term assessments—for example, an end-of-week quiz that is used to decide what to do in the new week. The effective use of these kinds of assessments requires time, professional development, and coaching, among other resources.

It is important to emphasize that formative assessments are not primarily about assessment items, but rather the process of gauging understanding and responding appropriately. This requires professional development on what to do with the data. Technology can only provide some automation for some steps of the process, making it easier for teachers to do things like compute and analyze results, compare across students and across years, and communicate their results to their peers and coaches.

Data, information, and tools

5.1 Provide formative assessment capabilities to districts and schools on an opt-in basis

Many districts throughout the state have already engaged in partnerships with vendors that provide them with software that automates the administration of certain kinds of assessments. For example, a software package may allow teachers to quickly create an assessment by drawing upon a bank of items, and may allow them to use a scanning machine to quickly tabulate and analyze the results. The analysis gives insight into what topics each individual student has or has not yet mastered. However, many other districts do not have access to such software, some due to cost. California should ensure that all districts and schools that want to use this kind of assessment system have access to it.

The primary benefit of providing this capability is that it would make it easier for teachers to periodically check on their students' progress, and have individual reports for each student that can be used to guide further personalized, standards-aligned instruction.

5.2 Provide links between formative assessments, standards, and best practices that are related to the content of the items and assessments

The power of the automated assessment capabilities can be increased if results are linked to suggested instructional strategies. For example, if a student is struggling with the proper use of adverbs, the assessment analysis would indicate that fact, and provide links to tested approaches to covering the use of adverbs. Recommendation 8 provides more detail about a model for a broader best-practice sharing capability.

Governance, policies, and funding

5.3 Have item and assessment analysis groups meet periodically to review the content in the formative item bank system (e.g., groups could submit content for certification by the State Board of Education or other entities)

There is debate about the type of assessment items that the system would offer—that is, the kinds of "test questions" that teachers would be able to draw from in order to create tests. One potential source is the collection of released questions from the California Standards Test (CST). However, these tests are designed to be used at the end of the year, and so are appropriate for testing the overall level of understanding of a group of students rather than pinpointing the particular needs of individual students. In

addition, there is an incremental cost associated with releasing these items. Other potential sources include new formative items created at the state level, items provided by textbook publishers, items created by third-party vendors, and items uploaded by teachers themselves.

A model that California may consider is one that is flexible enough to allow for multiple sources, but that clearly identifies the source of each item. This way, teachers are not forced to abandon any of the assessment approaches that they currently use. However, this flexibility would create an increased burden to ensure that the system offers a collection of assessment items that have been tested for their ability to accurately indicate a student's level of mastery of the content standards. Therefore, California should regularly review a subset of the items offered by the system; teachers who want to use certified assessment items would be able to search for these specifically.

5.4 Invest adequate resources to acquire vendor-provided assessments and items at bulk license rates
Rough estimates for the financial costs of this recommendation are included in Appendix E.

5.5 Invest adequate resources for holding off-schedule workshops for educators to convene and provide items and assessments to the system (e.g., this is the model used by Kentucky's Jefferson County School District)
In relation to initiative 5.3 above, a possible source of additional items is teachers themselves. California can consider organizing groups of interested educators for the purpose of supplementing the bank of assessment items.

Culture, training, and incentives

5.6 Integrate "walk-through" training for using assessment systems to support formative assessment into existing professional development programs

5.7 Launch web-based and video-conference training series for experienced educator and administrator professional development

5.8 Communicate widely the success stories from using formative assessments
As much as for any of the recommendations in this paper, professional development is critical for the successful promotion of effective formative assessment practices. Technology provides only a small portion of what is required; California should explore various ways to continue to develop these skills for educators throughout the state.

DETAIL FOR STEP 2:
EXPANDING THE USE OF INFORMATION AND DATA

Recommendation 6. Develop systems to encourage collaboration and best-practice sharing for instruction, administration, and other district functions

Currently, educators have access to a wide variety of websites and other systems that can be used to store and share knowledge about successful instructional practices. A challenge in using these systems is the fact that, in general, they do not have the critical mass of users required to create widespread awareness. Because of this, there is still a need for a system that is more widely used and therefore offers users access to a greater range of best-practice ideas. In its ideal form, such a system would provide educators with a platform on which they could create professional learning communities and where they would innovate, share, and improve upon ideas.

The advantage of describing such a system in the context of the other recommendations in this paper is that there are natural links to many of the other ideas. For example, an ideal entry point to the best-practice sharing system would be the portal described in 2.1. Additionally, tools such as the formative-assessment system would benefit from a connection to a best-practice sharing capability, as described in 5.2.

Several points are worth noting here. First, California can make the most of these possible links while not stifling other knowledge-sharing efforts. For example, explicit links can be made to other websites; these links would benefit the individual websites as well as increase the usefulness of the best-practice sharing system described here. Secondly, use of the system would not be limited to teachers. Sections of the system could suit the needs of parents, or non-instructional district staff (for example, the system could contain templates for the development of school budgets). Lastly, though the phrase "best-practice" is used here for convenience, there is no implication that it is possible to identify the single "best" approach for any topic. The assumption is that all of the good ideas contained in the system would need to be customized and applied where contextually appropriate.

Data, information, and tools

6.1 Create a best-practice sharing system

This system would allow educators, administrators, and other stakeholders to upload existing materials, create new materials, categorize the content and search for it using tags, and differentiate content quality through a variety of means.

6.2 Develop collaboration tools within the best-practice sharing system

Currently, educators and other stakeholders collaborate with peers and colleagues through forums like parent groups and teacher networks. The best-practice sharing system should allow those networks to be replicated and expanded online. This would make it easier for individuals to collaborate more often and without regard to geographic separation. Online discussions could be used, for example, to debate the merits of various instructional approaches, or to create new content for the system.

6.3 Develop tools to "push" content to users, such as alert e-mails, auto suggestions, and e-mail subscriptions within the best-practice sharing system

In addition to providing search capability, the system could allow users to sign up to receive new content with certain characteristics automatically—for example, all the content created by members of a particular group, or content that relates to a particular grade level and subject.

6.4 Establish processes to determine and publish content quality

In order for the system to grow, a crucial feature is openness—that is, the system should be able to incorporate content from as many different sources as possible. A counterbalancing concern, however, is quality; the greater the openness the greater the difficulty in finding high-quality information.

One way to resolve this tension is to offer a variety of quality measures. For example, users can be given the ability to search for content on the basis of user ratings (such as a 5-star system) or number of downloads. In addition, a dedicated group of editors could select a small subset of the content to give more "official" reviews.

None of these would be all-encompassing, and they would not serve as a constraint on what the system would contain, but any user with a particular need for a reviewed or high-rated piece of content would be able to find content using that filter.

Governance, policies, and funding

6.5 Establish processes to continually review system functionality, adding or deleting functionality over time based on user statistics

As with the other recommendations, it is important to acknowledge that user needs will evolve over time. The system should be built so that it can respond.

6.6 Invest adequate resources from multiple sources such as the state, foundations, businesses, etc.

Rough estimates for the financial costs of this recommendation are included in Appendix E.

Culture, training, and incentives

6.7 Develop a system roll-out strategy, adding functionality and user groups in phases and establishing a critical mass of content, users, and networks at each phase

6.8 Build best-practice sharing networks off-line (through established relationships, workshops, etc.), expanding to on-line

6.9 Develop a communication plan at all levels (state, county, districts, and schools)

Perhaps more than the other recommendations in this paper, the best-practice sharing idea requires scale as a critical ingredient to its success. Unless use is truly widespread, the greatest potential benefits of the system cannot be realized. Therefore, once it is built, use of the system should be driven by focusing first in those areas where it is most immediately valuable (e.g., existing professional networks), and then systematically rolling it out to other areas.

Recommendation 7. Expand capabilities to provide standard ways to evaluate local, state, and federal-funded programs

The term "program" is used in this section to refer to the discrete education services and interventions offered at all levels.

Data, information, and tools

7.1 Build interfaces from CALPADS to program information systems (e.g., ConApp, Cal-PASS) to enable tracking of student-level program data by collecting enrollment in state (ConApp), federal (opt-in0, and local programs (in CAL-Pass)

7.2 Build interfaces from CALTIDES to program information systems (e.g., ConApp, Cal-PASS) to track educator-level program data by collecting educator IDs for state (Con-App), federal (opt-in), and local programs (in CAL-Pass)

Currently, the systems that track programs are not also required to track student enrollment and educator participation in those programs. Building these missing interfaces is the first step in creating the ability to evaluate programs.

7.3 Use web-based forms for Consolidated Application Data System (CADS) application to streamline data collection for state, federal, and local programs
Similar to Recommendation 1.1, California can offer web-based tools to improve the process of collecting information in CADS, which is used to collect data about programs.

7.4 Standardize a core set of data elements collected across all programs and collect additional data elements identified in Recommendation 4.1
The additional recommended data elements are included in Appendix C.

7.5 Launch sections on the best-practice sharing system that describe high-quality programs that address various needs
Recommendation 6 describes a model for a broader best-practice sharing system in detail; California can use this platform in part to describe examples of tested programs that effectively serve various educational objectives.

7.6 As mentioned in 3.1 and 3.2, develop a CalPASS-like system to track effectiveness of local initiatives as well as develop survey instruments to track effectiveness in developing a climate of teaching and learning
These opt-in capabilities, previously described, can be used specifically to measure effectiveness of local efforts using criteria that are customized to the local context.

Governance, policies, and funding

7.7 Establish program-evaluation research groups (within CDE or external)
Once the data to enable the evaluation of programs are implemented, California can promote the use of those data to set program standards by program type, review system-wide programs and local programs, and build awareness for effective and ineffective programs. A model for this is found in Texas; the Texas Education Agency Program Evaluation evaluates the effectiveness of state- and federally-funded grant programs. A wide variety of programs would be candidates for evaluation—after-school programs, professional development, parent outreach, career education, drop-out prevention, etc.

The need for analytic rigor, and well-defined, agreed-upon criteria for evaluation, is reiterated.

7.8 Invest adequate resources for the rigorous evaluation of programs at all levels
Rough estimates for the financial costs of this recommendation are included in Appendix E.

Culture, training, and incentives

7.9 Creative incentives for voluntary submission of detailed program information and outcomes (e.g., additional priority for funds based on submission of data)

7.10 Offer awards to schools and districts that demonstrate innovation
Appropriate incentives and recognition can stimulate both the collection of data about programs, and use of that data to guide the creation and testing of new programs, as well as the propagation of programs that prove to be most effective.

Recommendation 8. Develop systems to improve educators and administrator recruiting, effectiveness, professional development, and retention

Professional development, as one of the key practices of continuous learning, is mentioned throughout this paper as a requirement for enabling the successful implementation of every recommendation. Recommendation 6 offers suggestions that can be used to make professional development itself more effective.

Data, information, and tools

8.1 Create a web-based self-directed professional development (PD) system

Currently, educators learn about professional development offerings—for example, workshops offered by districts—through a variety of ways, but none of them offers a comprehensive view of what is available. Rather than relying on word-of-mouth or notification from a district, educators should be provided with an online database of offerings available to them, including across district lines. The system should also allow them to register easily, and keep track of their professional development history. This system should be self-directed, and allow each teacher, school, and district the flexibility to create professional-development paths that are most appropriate to their local contexts; this notion of self-direction was critical to teachers interviewed.

8.2 Provide analysis tools (opt-in) to districts and schools to evaluate and improve effectiveness of PD programs using a variety of non-identifiable data sources

In addition to providing visibility into what is available, the PD system should provide measures of effectiveness of the PD offerings themselves. These measures can come from a variety of sources, such as analyses based on impact on student performance using non-identifiable data or participant surveys.

8.3 Create a common data dictionary for educator and administrator data

Such a dictionary would allow various systems that keep track of educators to communicate more easily with each other. For example, in the case of the PD system mentioned above, some standards would be created to allow for the common categorization of PD offerings. In the case of the recruiting system in 8.6, common definitions would be created for candidate and school characteristics.

8.4 As mentioned in 4.1, enhance scope of CALTIDES

The data elements pertaining to educators is provided in Appendix C, as referenced by 4.1.

8.5 Provide districts with web-enabled opt-in survey templates, administration, and analysis tools, (e.g., POET at Elk Grove, survey templates at the Ventura County Office of Education)

Like 3.4, this initiative provides one example of a benefit that local entities can draw upon. Districts may want access to a set of surveys that are used to measure all aspects of the professional development process, including teacher results and the climates in which educators work. This can be done in a way that protects privacy; for example, Elk Grove's Principal Online Evaluation Tool (POET) does not allow administrators to access results associated with individual teachers. However, these surveys can be used to give district leaders an understanding of the strengths and weaknesses of their professional development offerings from the perspective of the participants.

8.6 Enhance existing systems (e.g., EdJoin) that match teacher candidates with open positions

EdJoin is a web-based system that matches open teaching positions with candidates. Systems like EdJoin provide greater transparency in the market for teacher candidates. The benefits of increased transparency include a greater ability to match skills with need, and better choices for teacher candidates as a result of more information about schools with open positions. California should expand this use of these systems, allow candidates to search for positions on the basis of school characteristics, and allow for the automated upload and capture of relevant candidate characteristics.

Governance, policies, and funding

8.7 Establish a state-level support mechanism for the new PD system as well as district-level support for analytic tools

The management of the PD system described above requires resources both at the state level (for example, to support the comprehensiveness of the system), and at the local level (for example, to provide evaluations of PD offerings).

8.8 Invest adequate resources for professional development and professional-development tools at all levels

Rough estimates for the financial costs of this recommendation are included in Appendix E.

Culture, training, and incentives

8.9 Link eligibility for PD-program funds to the use of the PD system as well as to the quality of data collections, as mentioned in Recommendation 1.8

8.10 Motivate educators and administrators to leverage data-driven decision-making

California can use various approaches to promote use of the PD system. In addition, there can be a focus on professional development that supports data-driven decision-making and the other practices of continuous learning—in other words, a focus on professional development that supports the implementation of the other recommendations in this paper.

DETAIL FOR STEP 3:
LINKAGES OUTSIDE OF K-12

Recommendations 9a and 9b. Create linkages from K-12 to higher education and employment data systems to better understand how to prepare students for the workforce or post-secondary education, and create linkages within K-12 data systems and from K-12 to foster care, health, criminal justice, and social services systems to inform educational decisions and interventions

An overarching requirement for all the linkages described within this recommendation is that they adhere to all relevant privacy guidelines.

Data, information, and tools

9.1 Link K-12 databases with other agencies. This includes links within K-12 data as well as with Cal-PASS, higher education and employment (EDD), social services, criminal justice, and health services

The goal of this initiative is to give California the ability to answer questions about our education system that relate to outcomes and other areas of our students' lives. For example, California offers a number of Career Technical Education programs. One good way to evaluate the effectiveness of these programs is to track whether graduates are successful in finding employment in their chosen fields. This tracking would be enabled by linking to the employment database. Another example of use relates to foster care. The foster care system should have access to education information so that better-informed decisions can be made about the students. For example, a failing grade might trigger increased attention from the foster care system. Similarly, sharing information about health or social services with schools—as long as it is within all applicable privacy laws and policies—can inform decisions made at the school.

The last point about privacy is worth highlighting. All linkages would need to adhere to laws such as the Health Insurance Portability and Accountability Act (HIPAA) and the Family Educational Rights and Privacy Act (FERPA); in addition, California may enforce its own privacy and security policies to ensure that information is not misused.

9.2 Develop "translatable" identifiers in all state systems to enable them to link in the data service layer

This translator will enable each system to maintain its own means of identifying individuals. For example, while EDD uses social security numbers, CALPADS uses a different statewide identifier (SSID). In essence, the translator would be a black box that would match the IDs used by different systems.

9.3 Ensure that the "integrated statewide portal," described in Recommendation 2.1, with role-based accessibility, interfaces with the underlying data systems mentioned in Recommendation 9.1 and reporting applications like SARC, DataQuest, etc., as well as best-practice sharing and collaboration systems

Once links are established between systems, access to the information contained within them—constrained by applicable privacy laws and policies—can be made available through the statewide information portal, and other tools.

9.4 Include a common data dictionary for relevant data elements starting with the core elements of the P-20 systems, as described in Recommendation 1.3. Develop this dictionary in a phased manner as linkages are developed for non-state education systems

Any common elements across different data systems would need to be mapped to each other using data dictionaries, as previously described.

Governance, policies, and funding

9.5 Establish a cross-agency data-management structure, as described in Recommendation 1.3
This data-management organization, previously described, would have primary responsibility for navigating the complexity that arises when separate data systems, each managed by a different agency or entity, are linked together. The particular policies that the cross-agency body would enact are not specified in this paper, nor is the exact form that such a body would take.

9.6 Invest adequate resources for the development and ongoing maintenance of SOA data layer, unified online portal, and governance bodies
Rough estimates for the financial costs of this recommendation are included in Appendix E.

9.7 Establish statewide data-sharing agreements and provide models for local counties, districts, and schools to build partnerships with local organizations that can provide support services (e.g., Redwood City District shares data with Boys and Girls Club)
In addition to the large-scale links that are created at a state level, California can expand on models of local data-sharing partnerships by sharing guidelines for how to build such partnerships. These guidelines would be based on successful examples found throughout the state.

Culture, training, and incentives

9.8 Motivate users to share and use data across agencies
Training and appropriate incentives can increase awareness of the new capabilities created by the cross-system linkages, and can support the use of those capabilities.

Recommendations 10a and 10b. Develop systems to track and evaluate Pre-K programs beginning with state funded programs and expanding to non-state funded programs, and create linkages from Pre-K to K-12 systems to inform decisions about Pre-K

An overarching requirement for all the linkages described within this recommendation is that they adhere to all relevant privacy guidelines.

Data, information, and tools

10.1 Enhance existing Pre-K collections for state and non-state funded programs
Currently, and in general, information about students in Pre-K programs is not regularly collected. Starting with state-funded programs, basic information should be collected about students enrolled in these programs. In addition, the Pre-K collections should use the same identifier (SSID) as CALPADS, so that creating the linkage between Pre-K and K-12 is made as easy as possible. Appendix C contains a full list of suggested Pre-K data elements, as referenced in 4.1.

10.2 Develop easy-to-use standardized statewide assessments on kindergarten readiness for children coming from various Pre-K programs (state, federal, or local private)

10.3 Develop linkages from Pre-K to CALPADS for core elements mentioned above
One of the key research questions that a Pre-K linkage will enable California to answer is the question of how to best prepare students for kindergarten and the grades beyond. The goal is to determine which factors in a student's Pre-K experience correlate with success in K-12. These lessons about can be worked into standard assessments on kindergarten readiness, which are currently lacking. The availability of standard assessments would facilitate the identification of Pre-K programs that are most effective at preparing students for kindergarten.

It should be emphasized that these systems are intended to evaluate Pre-K programs, not individual students.

10.4 Enhance the best-practice sharing system vision, as described in Recommendation 6.1, to include portals for Pre-K educators; these have specific content and links to 3rd party pre-existing collaboration and knowledge-sharing portals (e.g., "Plan4Preschool" portal)

The best-practice sharing system is intended to cover the entire educational experience, and so should include the full set of features for Pre-K teachers, parents, and other stakeholders. This is made more possible once the Pre-K data are being collected and are linked to K-12 datasets.

Governance, policies, and funding

10.5 Invest adequate resources for enhanced data collection, coaching, and additional local capacity for SSID and other Pre-K data collections

Rough estimates for the financial costs of this recommendation are included in Appendix E.

10.6 Develop shared data-collection centers for non-state funded Pre-K programs (e.g., for private schools)

Variety among Pre-K programs is immense; as a result, one cannot expect all programs—especially private ones—to have the resources needed to perform their own collections. Therefore, as the vision expands to non-state-funded programs (on an optional basis), California should provide shared resources to collect information about students that programs without their own systems can use.

10.7 Establish a Pre-K data-management structure as a part of the overall education data organization

Similar to the description provided for 9.5, the inclusion of Pre-K into the network of connected systems necessitates the inclusion of Pre-K into the data-management organization; however, Pre-K is unique in that there is no pre-existing body that currently manages Pre-K data. Therefore, California needs some data-management capacity, likely provided at the county level and below in the form of Pre-K data stewards and coaches. These individuals can be trained at a statewide level.

Culture, training, and incentives

10.8 Motivate collection and usage of data at Pre-K level

As with other collections, California should provide incentives to schools that track program quality and leverage data-driven decision-making.

CONCLUSION

The scope of this paper is in some ways narrow, for example, in its focus on data, which by itself is insufficient to drive meaningful improvements. However, the hope is that this paper provides a long-term vision that is as comprehensive as possible within the constraints of that scope. It is meant to be used as an input and reference for all stakeholders of California's education system as they pursue the goal of continuous learning and improvement for the benefit of our students.

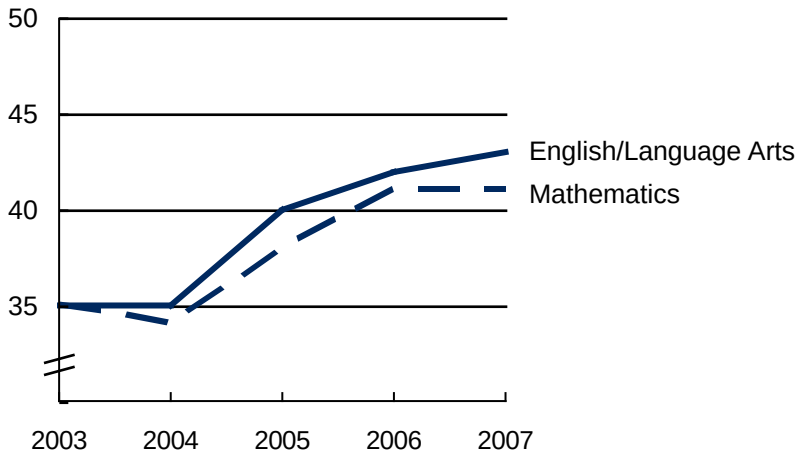
Appendix A:
The need for continuous learning to improve student achievement

Celebrating education in California

Throughout the state, one can find examples of world-class teaching and learning. California has some of the best schools in the country, many of which operate under challenging constraints. California had 231 schools included on *Newsweek*'s most recent list of the nation's 1,300 best public high schools. Sixty of those schools served student populations where more than 50% qualified for free or reduced-price lunch. Our public higher education system is widely regarded as the best in the nation (for example, UC Berkeley is consistently the top public university ranked in *US News and World Report*, and as a model for both achievement and access.

In addition, some of the primary measurements of student learning show that achievement is getting better over time. The state Academic Performance Index (API), one such measurement, continues to rise each year. Furthermore, math and reading scores on the California Standards Test (CST) have also seen real improvement over the past 5 years. This is a significant accomplishment of which our schools, teachers, and students should be proud. As a reference, an above-average school (60th percentile) in 1999 would, with the same level of achievement today, be in the bottom 10% of all schools. These results are more impressive given the fact that California's standards are some of the highest in the nation.

Percentage of students scoring at or above "proficient" levels on the CST



Most importantly, every day over 300,000 teachers, with an average of 13 years of experience each, go to their classrooms with the purpose of serving the needs of all the students in our public schools. California's teachers approach their task with energy and passion, and often spend long hours and dollars from their own pockets in the effort to provide our students with the best learning environments they can. This dedicated group, along with the hard-working and vital non-teaching staff in the schools, districts, and the state who support their work, is California's most important resource in the effort to educate our children.

A need to do dramatically better

Despite the improvements, there are still large numbers of students who are failing to achieve the levels of proficiency that they should in math, language skills, and other subjects. In 2007, only 41% of high school students achieved scores of "proficient" or "advanced" on the English/Language Arts CST, and only 21% of high school students achieved proficient and advanced on the various mathematics CSTs. In addition, there is a persistent achievement gap for certain populations of students, such as poor children, children who are learning English as a second, students with disabilities, and some ethnic minorities.

Not only is serving our state's children fully and equitably a moral duty; it is an economic necessity. The lack of qualified graduates leaves us with a skilled labor gap that is only going to grow over time, at a rate of about 110,000 people per year for the next 15 years. In order to maintain our economic competitiveness, the workforce gap must be closed. This shortage of skilled workers results in billions of dollars of lost GDP from the lost competitiveness of our businesses and forgone tax revenue.

Economic analysis

- California's economy faces several challenges that need immediate response. Between 2000 and 2006, state debt per capita almost doubled from $1,661 to $3,018. At the same time, the technology sector, a stalwart of the California economy, has gone from 20.4% annual growth GDP in the '90s to only 9.5% today because of commoditization and competition overseas.[1]
- What's more, a looming workforce gap represents a drag on the California economy. GDP in California is projected to grow by 3% between 2006 and 2015. Over the same period, employment growth is only projected at 1%[2]. One would expect these numbers to be similar unless a) worker productivity is increasing and b) the growth in the size of the workforce does not keep pace with GDP.
- It turns out that a lack of skilled[3] workers represents a large proportion of this gap. The annual average workforce gap between 2005 and 2025 is projected to be 168,000 people. In 2005, international migrants could fill a net of about 66,000 of those positions. U.S. migrants from other states, however, contributed a net loss of about 9,200 skilled workers. This leaves an annual workforce gap of about 112,000 skilled workers per year in California.[4]
- To fill this remaining gap, California will have to do more than increase quotas for new workers. It will have to increase the number of people who graduate from California school systems. Some estimates suggest that, every year, as many as 63,000 students who enter 9th grade drop-out before graduation.[5] If, in the most optimistic case, high-schools were able to send all these kids to complete college, it would eliminate 67% of the workforce gap.[6]
- A question arises: Where best to find these kids? It turns out that low-socio-economic status (SES) kids represent about 49% of all children in the education system.[7] At the same time, only 24% of high-school graduates come from low-SES household.[8]
- If we were able to graduate the same percent of low-SES kids who enter HS as we do all kids who enter HS, it would yield almost 31,000 more graduates per year or almost a full 28% of the workforce gap.[9] The net benefit to the state of both increased tax revenue and reduced crime is about $342,000 per person for a present value of about $12 billion.[10] This is enough to eliminate almost two-thirds of this year's budget deficit.
- In other words, our moral imperative to improve service to all children coincides with the needs of our state economy.

1 McKinsey analysis, Economy.com (leveraging Bureau of Economic Analysis, Census Bureau)
2 Bureau of Economic Analysis, Census Bureau
3 Refers to adults ages 25-64 with a college degree
4 Johnson, Hans P. and Reed, Deborah, "Can California Import Enough College Graduates to Meet Workforce Needs," Public Policy Institute of California, San Francisco, 2007
5 California Department of Education, Data Quest, 2005-2006; this number could be up to 16,000 people lower given the debate that exists as to the proper methodology for calculating dropouts
6 McKinsey analysis
7 California Department of Education, Ed Data; this includes high school, elementary, and unified districts
8 California Department of Education, Data Quest
9 McKinsey analysis
10 Belfield, Clive R. and Levin, Henry M., "The Return on Investment for Improving California's High-School Graduation Rate," August 2007; McKinsey analysis

Of course, businesses are not the only victims of a lack of skilled workers. Seen from the perspective of tomorrow's workforce, our education system is a failure if it does not prepare students to participate fully in an ever more demanding economy. Without that ability, the dream of improving a family's quality of life from generation to generation becomes impossible.

Whether or not one is focused on the pursuit of equity or economic growth, the conclusion is clear and unavoidable. The level of achievement reached by students must increase and thereby the pipeline of students flowing into colleges or directly into the workforce with the skills they need to thrive must expand. As the state superintendent of public instruction, Jack O'Connell, pointed out in his State of Education address in 2006, "Sadly, too many people view [our state's] diversity as a big problem... Instead… imagine the potential of that diversity in today's—and tomorrow's—global economy. If we educate these students well, our state would not only be able to compete more effectively, but it would be able lead our nation and the world economically."

One reason that we are not doing as well as we should is that we are not taking full advantage of what we know to be working. Consider that every day, 25,000 5th-grade teachers enter their classrooms and individually face essentially the same questions: how to introduce the prepositional phrases, and how frequently to assign math homework. In our current system, we certainly provide some answers to these questions, but ask each one of those teachers to arrive at his or her own answers to others. Consequently, we end up with 25,000 different approaches—many of which are excellent, but some of which may not meet the needs of students they are meant to address.

Keep in mind that all of those 5th-grade teachers is likely working hard to do the best they can to achieve their goals; it is not their failure that there is no easy way to find existing lesson plans that have already been proven successful.

Furthermore, we are often unable to determine what is working and what is not. Imagine, for example, that literature professors in the CSU system develop a new textbook for teaching English in junior high (in fact, this happened in 1989 for high school mathematics with the Interactive Math Program). The State Board of Education has a process for determining whether the new textbook will be made available to public schools in the state, through the use of pilots. Selected teachers try the textbook and, largely on the basis of their evaluations, a decision is made whether to adopt it. However, the decision process does not require us to verify that the new book has made a real, positive impact on student achievement—for example, by rigorously comparing whether students using the new book learn more than those using the old one.

This is a failure of the system and not of teachers in the pilot or the members of the decision committee; in fact, we lack the data to perform that rigorous analysis. This system failure must be addressed. Especially considering that spending on textbooks in California is in the hundreds of millions of dollars each year, it behooves us to improve the way that we make these kinds of decisions.

Finally, there are some things that we just do not yet know how to do. There are persistent problems that we still have not solved, even in our most exemplary schools. An example is the question of how to serve the needs of poor students. In his research for the *Getting Down to Facts* project, UCSB professor Jon Sonstelie points out that only one of the 715 schools highest-poverty elementary schools achieved an API above the statewide target of 800, whereas only 11 of the 491 wealthiest elementary schools achieved APIs *lower* than 800. (In this example, "highest-poverty" means over 90% of students qualify for subsidized lunch, and "wealthiest" means less than 10% of students qualify.) Although many of those high-poverty schools have made amazing gains over the years, it seems that the winning strategies that will *fully* eradicate this achievement gap do not seem to be in the system—yet.

Research and real-life examples of success to draw upon

The kinds of challenges described above—the fact that we effectively ask teachers to "reinvent the wheel" in each classroom, or our lack of a way to say for certain which supplemental materials would be best for a particular teacher—are not new ones. In fact, there is a large body of research on the topic, done on the basis of both education examples as well as non-educational organizations. For example, Harvard professor Chris Argyris developed a theory about learning organizations in the corporate environment around the central notion that the most effective companies will be those that can learn faster than their competitors. In his book *Schools that Learn*, Peter Senge applies that principle to an educational environment and offers descriptions of how schools can "learn to learn." Other researchers, such as Karin Chenoweth, of the Public Education Leadership Program at Harvard, have systematically examined schools that are demonstrating success despite having what are sometimes considered to be challenging contexts and attempt to draw commonalities among them. Senge disciplines are as follows:

- Building shared vision
- Mental models
- Team learning
- Personal mastery
- Systems thinking – the fifth discipline that integrates the other four

This paper draws on these and other similar research efforts; it also includes additional real-life case examples of success which are highlighted throughout. Furthermore, the research also includes the results of many other projects focused on improving California's education system (for example, the *Getting Down to Facts* project, and the Governor's Committee on Education Excellence).

It would be naïve and inaccurate to suggest that all of this work could be fully summarized by one concept. However, one theme stands out as an appropriate focus for statewide reform efforts.

The practices of continuous learning

Research and real-life examples of success suggest that we can do better by supporting four practices of "continuous learning and improvement" throughout the state.

Long Beach

Long Beach exemplifies all four practices of continuous learning in the creation and adoption of a new math program

- **In 1994, Long Beach embarked on a teacher-driven effort to collect assessment data.** The district wanted to better understand issues regarding retention. In response, district leaders built out a system to collect and track retention data. As teachers began to find the data useful, they demanded more until they eventually had a full-scale, longitudinal data system.
- **As the district compared school-wide math scores, they discovered a new math curriculum in one overachieving school.** District-wide math score data showed one school with significantly higher performance than others. Investigation revealed that a teacher at the school had designed his own math curriculum. When data showed a sharp increase in his math scores, the school opted to roll it out to other classes.
- **The district then supported expansion of the curriculum to other schools.** As part of an effort to support innovations, the district helped the teacher produce materials on the new curriculum. District leaders then piloted the program in other schools, which they prioritized based on academic need. Eventually, they also asked the teacher to become a coach on how to teach the curriculum.
- **Pilot schools, even among those that typically underperformed, performed better than all other schools.** The pilot schools saw a one-year 24-point gain in API for 5th-grade math proficiency. What's more, schools that were normally in the 5th percentile on math started passing 65% of students at grade level.
- **Data continue to show ways to improve the new program.** Most recently, the data showed a decline in math performance as students left elementary school for middle school. The problem lay in the fact that middle-schools still used their own math curriculum. In response, the district is now diverting its resources to middle schools in an effort to roll the curriculum out more broadly.

The concept of *continuous learning and improvement* is a connection that runs through the examples of success and the research that we have examined. Described simply, a continuous-learning system is one that has defined processes for getting better over time. Although there are many ways to "get better," we find that four practices are the foundation for continuous improvement:

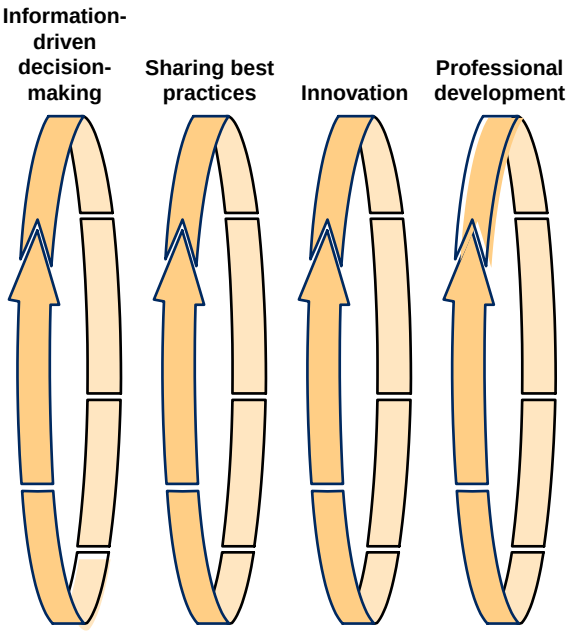
- Rigorously using information to drive decision-making
- Sharing best practices across the system
- Encouraging innovation
- Supporting improvement through meaningful professional development.

These four practices are required to address the challenges laid out above:

- Having the right processes in place to make data-driven decisions helps to ensure that each time new textbooks are introduced in the state, there is a greater certainty that they actually work, and that all groups of students have materials that are effective for them.
- A way to regularly share best practices would enable a new 5th-grade teacher to quickly find a collection of tested instructional strategies.

- Without a shared and unrelenting commitment to innovate, the goal of closing the achievement gap cannot be achieved.

- Professional-development programs are needed to help educators use data, share knowledge, and innovate more effectively, even if they are already engaged in these practices.



Moreover, these practices endow a system with an evolutionary quality that can be quite powerful. In *Managing School Districts for High Performance*, Susan Moore Johnson and Tiffany Cheng tell the story of the Mason School in Boston. After winning the National Blue Ribbon School award in 1997, this racially diverse and relatively low-income (78% of student designated as low-income) school dropped in one year from being one of the highest-rated schools in the district to one of the lowest due to changes including a new principal, a change in the state standardized test, and the departure of a majority of the teaching staff. However, the school benefited from a strong culture built on continuous-learning principles; for example, teachers had 90 minutes a week of common planning time in which they jointly reviewed results from formative assessments. After 1998, the teachers redoubled their efforts by creating new formative assessments and using them to test school-wide curricular changes. These changes worked; by 2006, Mason had made dramatic improvements (for example, it increased its proficiency rates on the state test from 0% to 41% in 4th-grade grade English/Language Arts, and from 4% to 59% in 4th-grade math).

Though these practices are common-sense, they still represent a fundamental change to the system. One might ask whether these practices really represent anything new—they may sound obvious when laid out on paper. The answer is, "yes." The truth is that these practices have never fully been a part of our traditional educational approaches (and, to be fair, companies and organizations of all types are relatively new to following the process laid out above with thoroughness). For example, data in schools traditionally were intended mainly for external audiences and signaled the end of the educational process. Test scores were assigned at the end of the year. Report cards went home at the end of the course. Data-driven decision-making requires a different perspective altogether: that information should be collected throughout the educational process and used internally.

Continuous learning also avoids the trap of a one-size-fits-all approach. Superintendent Ernie Anastos has made technology a priority for California's Lemon Grove School District. In fact, because the idea of connectivity for teachers, students, and parents is so central to his strategy, the school district has actually taken on the task of providing internet service to student homes and has, in the process, become one of the largest internet providers in the city. That tactic works for a small eight-school district like Lemon Grove. Five miles away, however, San Diego Unified manages more than 200 schools and has 130,000 students; it is likely that the approach would need to be at least partially modified in order to work there.

This example highlights one of the biggest difficulties faced by reform efforts that simply try to "copy-paste" good ideas from one location to another: If not district size, then demographics, personnel, facilities, language, or any number of other differences may render what works well in one place ineffective in the next. Furthermore, it is wrong to believe that anyone can simply walk into a school that is succeeding and determine with precision what they are doing to succeed. Like great athletes and artists, the best schools and teachers often cannot explain exactly what it is that they are doing to achieve spectacular results. The practices of continuous learning address these concerns through their reliance on data-driven decision-making. Because of that foundation, they have embedded within them the notion that any new idea is repeatedly examined, revised, adjusted, and improved.

In addition, continuous learning does not require the abandonment of strategies that work. The history of educational reform is in many ways an endless succession of "improvements," often quickly adopted and just as quickly dispensed with. Small schools, class-size reductions, whole language, phonics, high-stakes tests, direct instruction—the introduction of each of these ideas required educators to alter their focus. The consequences of drastically changing strategies every few years are that ideas are not given enough time to work, and educators soon tire of having to reorient themselves so frequently.

The practices of continuous learning, as described here, do not require throwing out what schools are working on now. In fact, the practices themselves contain no perspective on how to teach kids best, or how to measure their performance, or how to build schools that work. Rather, these practices take the educational theories that are in place and make them more robust and useful—by requiring that data be collected to demonstrate impact, by asking practitioners to be creative and share ideas, and by underscoring everything with solid professional development.

1. Data-driven decision-making

Garden Grove

Garden Grove uses data to identify a way to improve performance on AP exams

- **For several years, Long Beach and Garden Grove were both perennial finalists for the prestigious "Broad Prize."** Every year the Broad Foundation looks at assessment data from districts across the U.S. They offer a prize to districts that demonstrate high overall academic achievement as well as a good growth trajectory among their kids. Long Beach and Garden Grove were both nominated for several years before winning in separate years.
- **The prize helped the districts identify each other as potential collaborators.** The Broad results are widely publicized, along with details of each district. The districts, less than 25 miles apart, soon realized they might be able to learn from one another. As such, the superintendents called one another up to discuss collaboration.
- **Their new collaboration immediately highlighted potential for improvement on Garden Grove's AP program.** The two districts agreed to share data on everything from AP scores, A-G preparedness data, CST scores, and more. They discovered that Long Beach was getting a significant number of kids to pass AP exams. What's more, many of the kids that passed came from under-served sub-groups that do not traditionally take AP tests.
- **The data revealed a way for Garden Grove to improve their AP scores by collaborating with Long Beach.** Long Beach had, it turned out, developed a professional-development program called the "AP Summer Institute." The districts agreed they could both send their teachers to the summer program and, in exchange, Garden Grove would pay for part of the program. While there, the teachers not only learned how to improve instruction on AP classes, they were able to share best practices from their respective districts.
- **As a result of the collaboration, more Garden Grove kids pass the AP exams.** Garden Grove was able to report they are enrolling far more kids in the AP program. While the overall percentage pass rate has dipped slightly, the total number passing went way up. What's more, the district is seeing great gains in the number of kids passing from underserved demographics.

Most of the value of a continuous-learning environment comes from the incremental but ongoing improvements that occur as a result of using data to check progress against set goals, and adjusting plans to account for those data. For example, consider a teacher who examines last week's test scores and discovers that most of the class struggled with subject-verb agreement, and therefore decides to do a supplemental lesson on the topic. These supplemental lessons might be followed with another quiz, whereupon the teacher would re-assess her success on the topic.

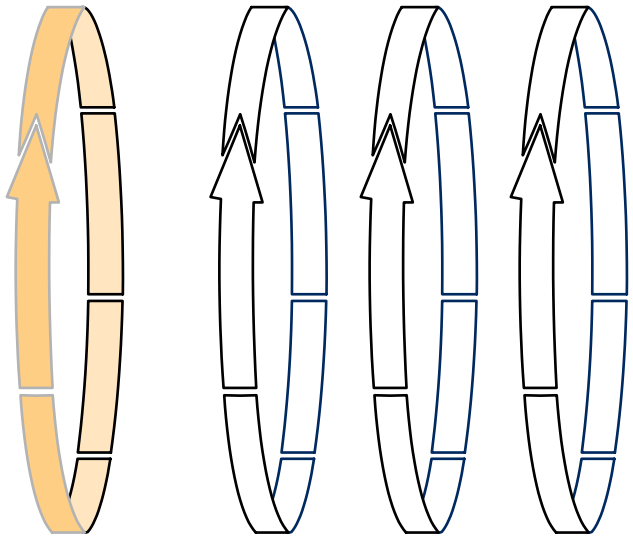
Though quite simple, this example illustrates the four basic steps of data-driven decision-making: posing an important question that relates to an instructional approach ("did last week's lesson help my students understand this grammatical concept?"); using data (test scores) to answer—or try to answer—that question; developing a plan

with a goal on the basis of the results (the supplemental lesson in order to master the concept); and reviewing the measurements to determine whether and how the plan was successful (the quiz), then readjusting the goal and/or plan to start the cycle again.

Information-driven decision-making

Steps

1. Pose an important question related to an instructional strategy
2. Use data to try to answer the question
3. Develop a plan based on the results
4. Measure the outcome of the plan



Data-driven decision-making starts with an educational strategy. Since the practices of continuous learning do not, in themselves, contain assumptions about how to teach students, educators seeking to implement them need to start with their own instructional strategy. For example, when a principal decides to use data to improve reading scores, she can not simply ask teachers to collect report cards and expect that lesson plans will emerge. Rather, the process is more akin to experimentation; the principal may start with a belief that providing reading books to parents will improve literacy and seek to test that hypothesis.

One of the most important ways to make data-driven decisions is to use feedback on performance. In fact, although we can describe countless other uses of this practice (for example, reviewing data on lost textbooks to make purchasing decisions, or using teacher demographic information to make recruiting decisions), the cornerstone application is the review of feedback on student performance. For example, Garden Grove used comparative AP scores to ground its decision to change professional development for AP teachers (by allowing them to participate in a particular summer institute). In the ideal vision of continuous learning, therefore, the state of California should do all it can to facilitate the active definition, collection, and use of student achievement data at the local level.

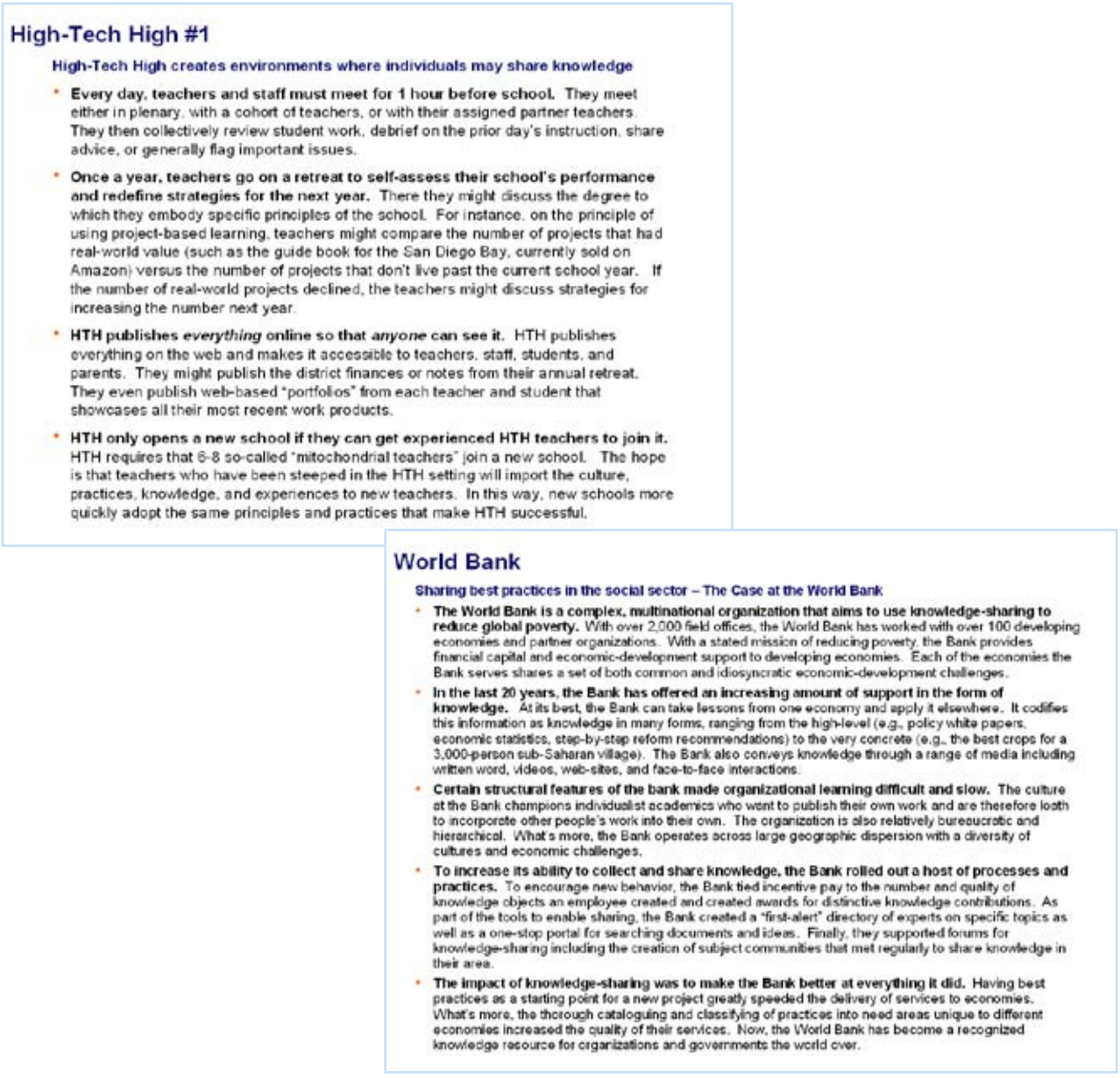
However, basic tracking data can also prove useful for decision-making. The National Student Clearinghouse case study illustrates an example of this, and provides a model for a powerful voluntary data-sharing platform.

National Student Clearinghouse

Verifying, analyzing, and sharing student information across schools and districts

- **The National Student Clearinghouse (NSC) was founded in 1993**, with an original focus on simplifying the administrative burden of verifying student enrollment for education-loan lenders. The core of its offering was a database of basic student data (e.g., enrollment, course of study) that was longitudinal and could track students from institution to institution.
- **The analytical potential offered by this data became apparent as the number of participating schools grew.** Whereas NSC was once limited to a few schools, it now covers the vast majority of college students across the country. High schools are also now allowed to join, and are doing so in growing numbers. In addition, the data collected by NSC has grown to include critical elements such as information from student transcripts. As a result, NSC offers a model of a highly successful, voluntary platform that allows meaningful analyses to drive decision-making. For example, through NSC, high schools can answer the questions that allow them to diagnose their own course offerings—where students enroll and transfer, whether they graduate, how long they pursue education, what they study, and what degrees they earn.
- **In 2008, the Consortium on Chicago School Research (CCSR) at the University of Chicago used NSC to investigate the ability of Chicago Public Schools to prepare its students for higher education.** CCSR found that of 10th-grade students who aspired to a four-year degree or higher, only 41% ended up enrolling in a four-year institution. Because of the data available through NSC, CCSR was able to track the points at which the other 59% digressed from their intended path, and was able to determine specific remedies—such as programs that helped students to fill out the Free Application for Federal Student Aid (FAFSA)—that would help improve the results.
- **In 2007, Nebraska's Coordinating Commission for Postsecondary Education (CCPE) used NSC to measure the state's performance against its three higher-education priorities.** Through NSC data, CCPE determined several important trends that otherwise would not have been apparent, including an 8.5% decline in first-time freshman students from 2003-2005, and a net out-migration of students with higher degrees. As in the Chicago example above, these findings and others like them allowed CCPE to tailor its approach toward its goals.
- **Another demonstration of the potential of NSC was provided by Hurricane Katrina in 2005.** NSC was uniquely able to track the academic paths of most of the displaced students when they enrolled in schools in Louisiana and other states. In addition to allowing affected students to transfer their academic records more easily, NSC was able to track the subsequent decisions of students regarding returning to their original schools, which gave those schools vital planning information.

2. Sharing best practices



High-Tech High #1

High-Tech High creates environments where individuals may share knowledge

- **Every day, teachers and staff must meet for 1 hour before school.** They meet either in plenary, with a cohort of teachers, or with their assigned partner teachers. They then collectively review student work, debrief on the prior day's instruction, share advice, or generally flag important issues.
- **Once a year, teachers go on a retreat to self-assess their school's performance and redefine strategies for the next year.** There they might discuss the degree to which they embody specific principles of the school. For instance, on the principle of using project-based learning, teachers might compare the number of projects that had real-world value (such as the guide book for the San Diego Bay, currently sold on Amazon) versus the number of projects that don't live past the current school year. If the number of real-world projects declined, the teachers might discuss strategies for increasing the number next year.
- **HTH publishes *everything* online so that *anyone* can see it.** HTH publishes everything on the web and makes it accessible to teachers, staff, students, and parents. They might publish the district finances or notes from their annual retreat. They even publish web-based "portfolios" from each teacher and student that showcases all their most recent work products.
- **HTH only opens a new school if they can get experienced HTH teachers to join it.** HTH requires that 6-8 so-called "mitochondrial teachers" join a new school. The hope is that teachers who have been steeped in the HTH setting will import the culture, practices, knowledge, and experiences to new teachers. In this way, new schools more quickly adopt the same principles and practices that make HTH successful.

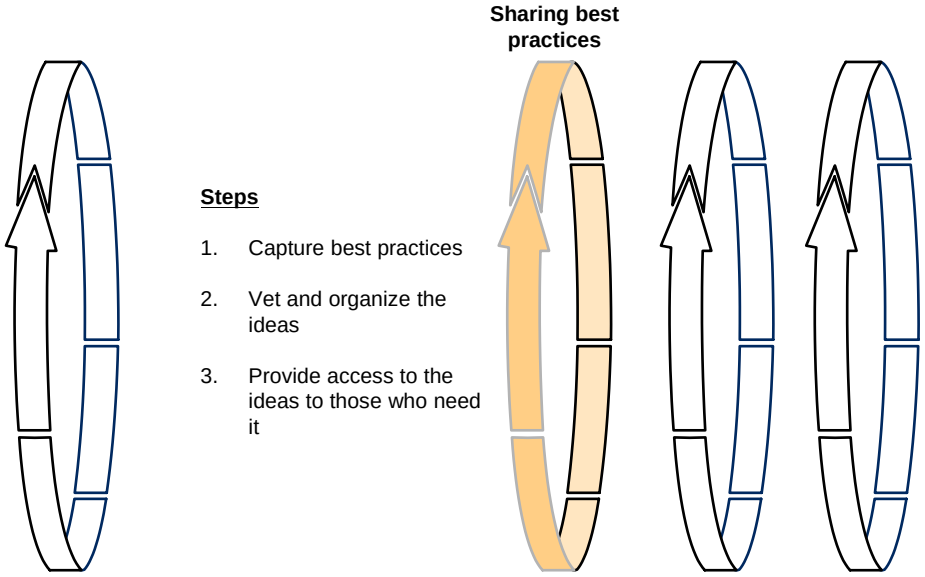
World Bank

Sharing best practices in the social sector – The Case at the World Bank

- **The World Bank is a complex, multinational organization that aims to use knowledge-sharing to reduce global poverty.** With over 2,000 field offices, the World Bank has worked with over 100 developing economies and partner organizations. With a stated mission of reducing poverty, the Bank provides financial capital and economic-development support to developing economies. Each of the economies the Bank serves shares a set of both common and idiosyncratic economic-development challenges.
- **In the last 20 years, the Bank has offered an increasing amount of support in the form of knowledge.** At its best, the Bank can take lessons from one economy and apply it elsewhere. It codifies this information as knowledge in many forms, ranging from the high-level (e.g., policy white papers, economic statistics, step-by-step reform recommendations) to the very concrete (e.g., the best crops for a 3,000-person sub-Saharan village). The Bank also conveys knowledge through a range of media including written word, videos, web-sites, and face-to-face interactions.
- **Certain structural features of the bank made organizational learning difficult and slow.** The culture at the Bank champions individualist academics who want to publish their own work and are therefore loath to incorporate other people's work into their own. The organization is also relatively bureaucratic and hierarchical. What's more, the Bank operates across large geographic dispersion with a diversity of cultures and economic challenges.
- **To increase its ability to collect and share knowledge, the Bank rolled out a host of processes and practices.** To encourage new behavior, the Bank tied incentive pay to the number and quality of knowledge objects an employee created and created awards for distinctive knowledge contributions. As part of the tools to enable sharing, the Bank created a "first-alert" directory of experts on specific topics as well as a one-stop portal for searching documents and ideas. Finally, they supported forums for knowledge-sharing including the creation of subject communities that met regularly to share knowledge in their area.
- **The impact of knowledge-sharing was to make the Bank better at everything it did.** Having best practices as a starting point for a new project greatly speeded the delivery of services to economies. What's more, the thorough cataloguing and classifying of practices into need areas unique to different economies increased the quality of their services. Now, the World Bank has become a recognized knowledge resource for organizations and governments the world over.

We will repeat an important caveat about this practice here: It is often impossible to simply transfer best practices from one location to another. That said, it is unarguable that educators, like professionals in any industry, can learn much of what they need to know on-the-job from others.

The guiding question for this practice is: "How do we make sure that people who need a piece of knowledge have access to it?" Research on sharing knowledge suggests three critical steps. The first step is capturing the knowledge in a form that others can use and that can be easily exchanged. Basic examples include a scanned lesson plan, a generic school-finance model in Excel, or just talking points jotted into a word processor; one can also imagine more advance media like video or advance computer-based presentations. Second, knowledge needs to be organized and vetted. Third, individuals need access to the knowledge when they need it and through a means that is relatively easy to use.



Technology can greatly facilitate the sharing of best practices. Of course, educators share knowledge today. Districts or other organizations often convene people with like interests and allow them to talk with each other. Within its limits, this is a highly effective method. However, we aspire to greater levels of flexibility and capability, and for examples of more sophisticated knowledge management, one needs to look outside the education sector. For example, BP recently implemented a "Virtual Team Network" to enable employees to work cooperatively and share knowledge quickly and easily regardless of distance and organizational boundaries. Employees can work together over the network as if they were in the same room: each PC has videoconferencing capability and access to electronic blackboards, scanners, and fax machines. Top management asked every division to be responsible for collecting and vetting its most important knowledge items within itself, thus decentralizing the collection and vetting of the knowledge. The system included specially designated pages detailing specialists' knowledge and experience, so that employees would have access to actual people with the expertise they sought in addition to documents and other knowledge items.

Though BP (along with the World Bank, as described in the case study) represents an extreme level of functionality that may never be attained or needed by California's education system, the hunger for some system is present. This desire is demonstrated by the creative ways educators find to share knowledge in the absence of a comprehensive system. For example, administrators in the San Francisco Unified School District have used public web pages as a source, meticulously combing through, printing, and categorizing each page of select other districts' websites. They do this because they are quite serious about learning from the experiences of others; however, the process is inefficient.

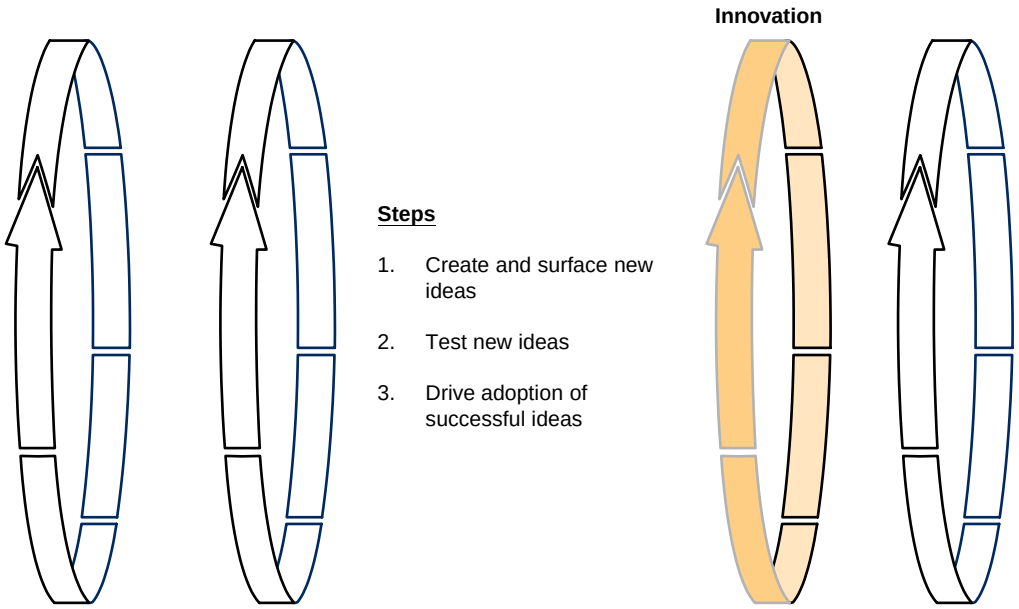
3. Innovation

High-Tech High #2

Innovations requires people to risk failure and then when failure happens, to learn from it. Story at High-Tech High

- **In 2006, High-Tech High sought to expand.** While looking for a site outside of San Diego, the full staff at a school in the Bay Area reached out and offered to join their network. While this went against the HTH model, of seeding each new school with 6-8 teachers – "mitochondrial teachers" as they call them – familiar with the HTH culture, they ultimately agreed to the partnership.
- **The collaboration failed.** Without the mitochondrial teachers, the school struggled to fully adopt HTH practices. The large distance made it difficult for any staff to intervene. Ultimately, HTH had to abandon the effort.
- **HTH learned a valuable lesson from their failure.** When they next sought to expand, they decided on a site only 50 miles from the original HTH site. What's more, they were determined to seed the new school with mitochondrial teachers.
- **They soon encountered a new roadblock.** None of the existing mitochondrial teachers wanted to move to the new site. Having gone through the failed experience with the Bay Area school, HTH decided they were unwilling to open the new site without mitochondrial teachers.
- **Previous experience helped them identify a new solution.** Unwilling to break ground without mitochondrial teachers, the district offered $20,000 stipends to each teacher that opted to relocate. Another school might opt to use new teachers rather than spend an extra $20,000 per teacher. HTH's experience with the failed Bay Area school gave them sufficient perspective to re-evaluate the importance of sticking to their processes. The new school opened and performed successfully.

While data-driven decision-making results in a steady stream of small improvements—and this steady stream accounts for most of the value of a continuous learning system—sometimes improvements come in larger steps, through more major innovations. A hallmark of a well-designed continuous-learning environment is that innovation is ingrained in the culture so that it is not limited to accidental or reactive contexts. In order to achieve this, an organization needs to be thoughtful about the creating, testing and scaling new ideas.



Creating and surfacing new ideas requires an environment that purposefully encourages thinking differently. Anthony Bryk of Stanford gives a description of what a dedicated research and development function might look like in a school—imagine reproducing some of the characteristics of a pharmaceutical or technology company's R&D department in a school system. He modifies the idea by describing an environment in which researchers and entrepreneurs partner with schools to develop new ideas, but the basic philosophy remains the same. Specifically, in his description a dedicated team is tasked with developing new ideas.

That is a highly formalized way to ensure that new ideas are created and surfaced. One can also imagine a much less formal approach, which does not rely on a separate department. After all, one might expect that the people most able to innovate effectively might be the people doing the work that needs innovation; they just need time, space, and motivation to do so. Here, too, lessons may be drawn from the most innovative companies in the private sector. We can find examples of organizations that encourage all workers—not just designated R&D personnel—to look for new ways of doing things by rewarding all new ideas, whether they are good or bad. Toyota and 3M are well-known for this attitude toward innovation, and many of their most valuable inventions were created as a result of their open policies. Post-it Notes, for example, are the result of a brainstorm of one of 3M's employees. Another approach to cultivating new ideas is to give employees resources to be creative. Google is well known for reserving a small percentage of its engineers' time for personal projects, and some of their most popular services are offshoots of those. The same kinds of less formalized approaches may be tried in the education system: For example, a district may simply introduce a norm that new innovations at the central office are to be encouraged, and give monthly awards to the creators of the best ones.

The testing and validation of new ideas requires an awareness of what each innovation is meant to accomplish, and a method of measuring that desired outcome. Here it shares some attributes with data-driven decision-making; namely, questions must be asked and data must be collected and analyzed to answer those questions.

4. Meaningful professional development (PD)

Note that when we talk about professional development in this paper, we mean more than what educators might normally mean when they say "PD." Whereas the term "PD" is commonly limited to in-service learning for teachers and principals, we also include pre-service learning and career preparation and advancement. We also extend the scope to non-instructors in the system, such as state or local central office staff, and state policymakers.

At its heart, PD is the set of activities organized by the education system that enables educators to continue to improve their practice. The wide range of activities includes: district-wide workshops; eLearning or self-paced learning modules; individual coaching sessions; networking events within a broader education community; university courses; and more. Among the four practices included in the description of continuous learning, PD uniquely has a large amount of overlap with the others. In fact, it is natural to say that each of the other practices requires a good professional-development program to build the capacity of people to carry the practices out. We can identify five main characteristics of good professional development on the basis of ample research on the subject (for example, Hassel 1999; Porter et. al. 2000; Smylie 2001). These are:

- Clear goals and content. In many cases, the participants of a professional-development workshop do not know the objectives of that workshop until they get there. In the ideal case, participants in any professional-development program would know of, agree with, and be prepared for the purpose of that program well ahead of time.

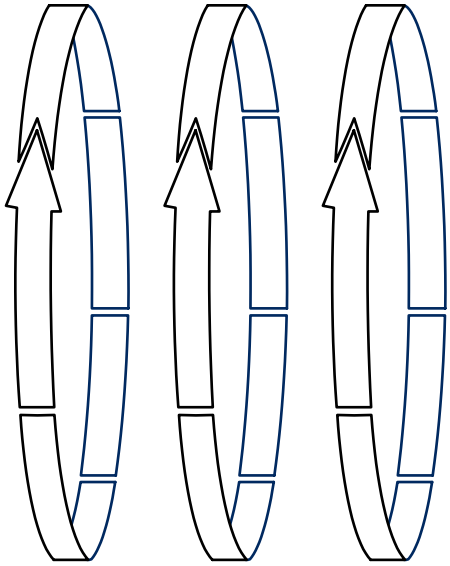
  In addition, it is critical that the content be not only clear, but *effective*. The right content to include in professional development is not within the scope of this project, but some of the recommendations may lead to better ways to determine what is effective, if implemented with rigor.

- Connection to broader strategy. Whereas it is possible that school staff might receive training on a new district-provided mathematics support program with no reference to the math standards, ideally any academic program always references the relevant content standards and an agreed-upon instructional approach. In this way, different professional-development efforts support each other.

- Measured outcomes. In this characteristic, the importance of data becomes clear once more. For example, if the principal of a school is introduced to a new function on the district website that allows him to publish school news for parents, the IT department should track whether use of the website increases at that school. If the trainers find that use of the website does not increase, the data-driven decision-making cycle should be triggered, with the question, "are these trainings effectively sharing the new website feature?"

- Community and collaboration. Too often, PD sessions use a traditional lecture format in which the audience is largely silent. Educators, like students of all ages, learn through conversation, participation, and other modes. Additionally, they benefit from time to share knowledge with each other about the impact of their practices and how difficulties are surfaced and resolved.

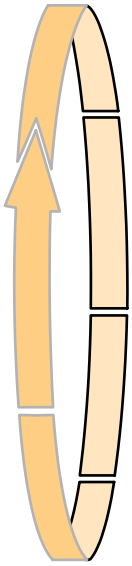
- Continuity. Often, PD programs include singular sessions that may jump from one topic to the next on a weekly basis, with no follow-up. Research (such as Joyce and Showers, 1995) demonstrates that this is not the way to impact what actually happens in the classroom. Rather, teachers need to revisit new ideas repeatedly (for example, through coaching or peer visits) in order for those ideas to be adopted.



Characteristics

1. Clear goals and content
2. Connection to broader strategy
3. Measured outcomes
4. Community and collaboration
5. Continuity

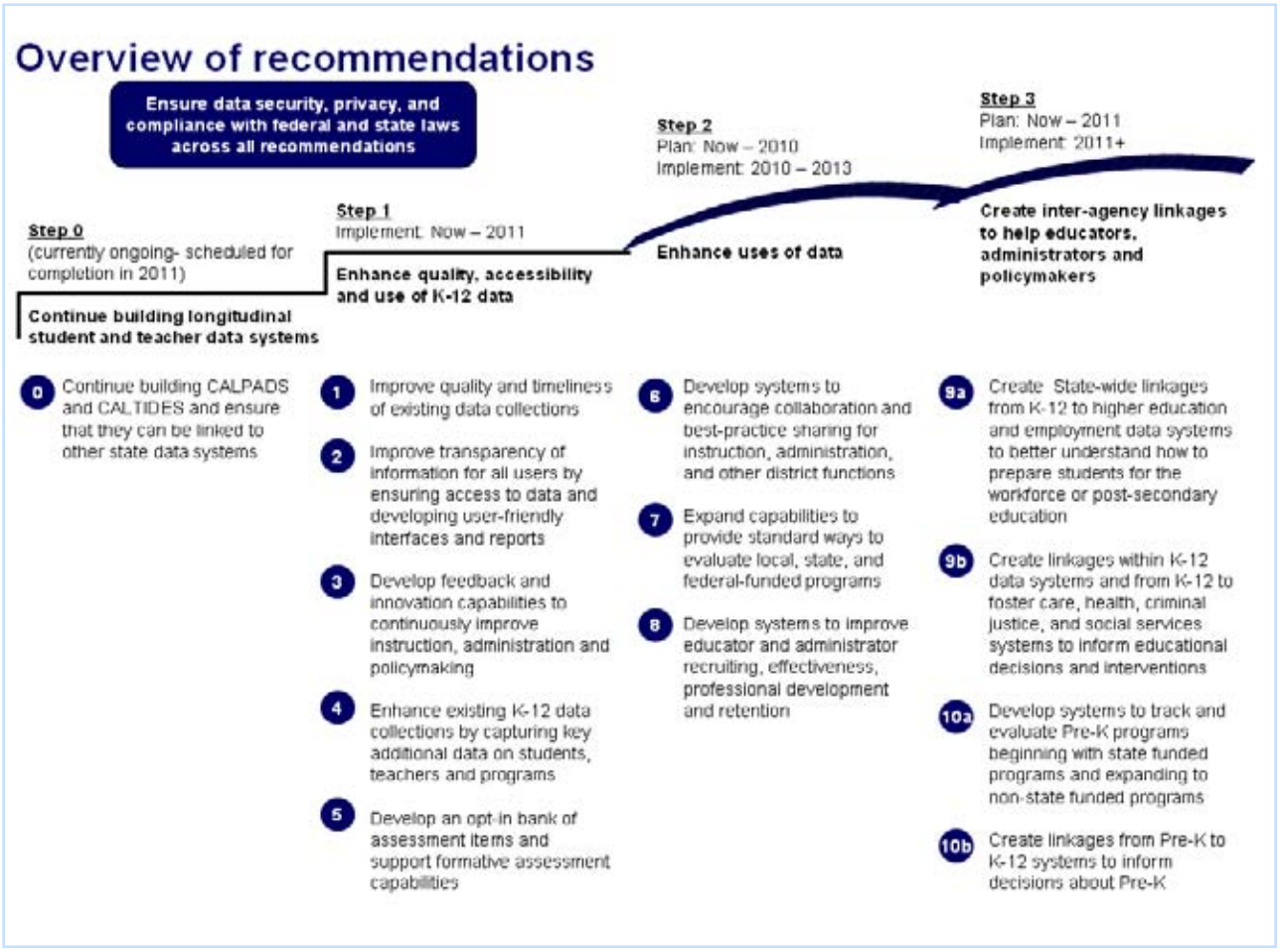
Professional development



Summary

The framework presented above is certainly not the only one that might be used to describe high-performing schools, districts, and organizations. It is presented in this paper for two reasons: the framework is useful for tying together the relevant published research, and, more importantly, because it resonated with the stakeholders interviewed for this project. The recommendations contained in this paper are the result of asking stakeholders in California's education system to describe the kinds of enablers that support the continuous-learning practices and describe how the state can approach putting these supports in place.

Appendix B:
Full list of recommendations



1. Improve quality and timeliness of existing data collections

Initiatives

Information and technology

1.1 Provide additional advanced data-quality tools to schools, districts, and county offices of education to improve data at source for key state-level collections
- Embed data quality tools in local interfaces of state collections covering all modes of submission, including File Transfer Protocol , CD-sharing, and locally-based inter-school servers (e.g., SIF ZIS servers)
- Include data profiling and reasonability checks apart from data validation; include functions for 'Auto-fill' and 'Auto-suggest'
- Introduce web-based user-interfaces to enable districts to rapidly incorporate quality updates to collections
- E.g., New Mexico provides automated tools to districts to check data quality at source and a web portal to make changes directly to their student data system. Tennessee offers a web-based validation tool to districts for the student data system

1.2 Develop a common data dictionary for core education-specific elements for P20 and non-education state systems
- Include data definitions and descriptions, business rules, data structure and relationship
- E.g., Tennessee uses integrated metadata tool to synchronize student data collection with other collections

Governance and funding

1.3 Develop cross-agency data management organization. Key roles and responsibilities include:
- Making recommendations to the legislature on cross-agency data sharing, access and identity management (e.g., Tennessee's Data Policy Committee, Florida's Div. of Assessments and Accountability, Washington's K20 Educ. Network)
- Engaging state agencies in policy execution
- Develops reports based on data from multiple agencies
- Locally-based data coaches and stewards

1.4 Enhance data audit field visits for all collections using a sampling methodology
- Involve existing intermediary governance bodies (e.g., counties for K-12, CSU/CCC/UC for Higher Ed) to guide districts on ways to further improve data quality e.g., TX, MI, MN, NC, NY, OH perform audits before submitting data to state

1.5 Provide districts and counties with an integrated calendar of data collections
- Cross agency body takes a lead in development integrated calendar across all collections
- Each individual state agency takes a lead for their own collections

1.6 Invest adequate resources for data-quality initiatives

Culture, training and incentives

1.7 Provide analytical reports back to the districts and schools as a key incentive to improve data quality

1.8 Develop rewards and appropriate consequences for schools, districts, and county offices of education that promote maintenance of good quality data
- E.g., public recognition and state awards for ensuring good data quality, eligibility for funds

1.9 Develop effective modes of data-quality certification and training
- Offer data quality certifications programs (e.g., Kansas offers KIDS DQ certification and role-based training)

1.10 Integrate data training into pre-service and ongoing educator and administrator professional development

Source: Team analysis, Data Quality Campaign, RAND, TN DOE, NMDOE,

2. Improve transparency of information for all users by ensuring access to data and developing user-friendly interfaces and reports

Initiatives

Information and technology

2.1 Consolidate existing state education reports into a state wide education portal including:
- User role-based access
- Links to existing standard reports (e.g., Data Quest) and advanced query and reporting capabilities
- Key measurements of educational performance
- Personalization (e.g., a user can login to compare their own data with school, district and state data or request data from areas of the state that have similar demographics)
- Interfaces to researchers and companies to access public data, in compliance with data security mandates

2.2 Improve the accessibility of the School Accountability Report Card (SARC)
- Support districts in providing tailored reports for parents and community members by providing simplified templates
- Make the report available in various formats, including paper and web based
- Launch interactive school reports with feedback from surveys and comments from stakeholders

2.3 Ensure that individual school, district, and state performance is reported by subject (i.e., math, ELA) **and by subgroup**

2.4 Standardize the "look and feel" of education reports by developing format standards, interactivity and common data definitions for education data reports and school data websites (opt-in)

2.5 Support ongoing last mile network upgrade effort for remote and capacity constrained schools and districts**
- Upgrade ~100 schools to T1or 54kbps wireless connection and ~500-1000 schools to T3 connection
- This enhancement is in addition to upgrade planned by K12 HSN project

2.6 Translate all state data reports and websites into the languages most spoken in California

Governance and funding

2.7 Ensure access to non-identifiable raw education data for all stakeholders (e.g., STAR header sheets) and to identifiable data based on user's access privileges

2.8 Create a process to **review inter-agency data sharing requests** across data systems

2.9 Invest adequate resources for improving data accessibility

Culture, training and incentives

2.10 Provide professional development and data training at all levels to increase awareness and use of existing data
- Data education workshops for educators, administrators and parents
- Web-based presentations about available data at school, district and state level
- E.g., Michigan Center for Educational Performance and Information

2.11 Provide seminars and workshop trainings to increase educator and administrator computer and internet usage

* Currently over 50% of computers are more than 4 years old
** These schools will not be a part of K12HSN's 3 year network refresh project
Source:Team analysis, K12HSN.org, NYCDOE

3. Develop feedback and innovation capabilities to continuously improve instruction, administration and policymaking

Initiatives

Information and technology

3.1 **Include feedback capabilities in the integrated state-wide education portal,** as described in recommendation 2.1
- Create ability to track, in real-time, school and student progress against targets
- Develop standardized, dynamic longitudinal "grade books"
- Build ability to generate alerts that highlight best-practice materials-based performance
- Enable real-time online discussions and messaging
- Make reports more interactive and user-feedback-driven, as mentioned in recommendation 2.2

3.2 **Enhance the ability of schools and districts to assess effectiveness of local initiatives using models like Cal-PASS or the National Student Clearinghouse**
- Develop linkages from CALPADS to local initiative effective models to avoid duplicate data collection
- Enhance a Cal-PASS-like portal to provide end users access to advanced analytic capabilities on their own data
- Enhance local system linkages to include local financial and HR (opt-in) in addition to data on students and programs

3.3 **Provide assessment tools for local counties, districts, and schools to support more frequent identification, classification, and reclassification** of students (e.g., EL students) (opt-in)

3.4 **Make available survey platforms and items to districts and schools so that they could customize (as needed), administer and analyze results to track effectiveness in developing a climate of teaching and learning**
- Survey item areas to include feedback on educators and administrators, school facilities, and service areas like finance, assessments and accountability, and human resources
- Survey instruments to be both offline paper based and electronic web based
- Explore offering state-wide access to a SurveyMonkey-like platform

Governance and funding

3.5 **Encourage local capacity to design, run and track pilots**
- Pilot teams would include representation from educators, local IT staff, and data coaches
- Pilot teams would define their goals and would provide data to a Cal-PASS-like system, for analysis in order to inform decisions about the pilot

3.6 **Invest adequate resources for initiatives on feedback and experimentation capabilities**

Culture, training and incentives

3.7 **Encourage schools and districts** to pilot and track effectiveness of new initiatives. Rewards could take the form of flexibility in use of funds, superintendents' awards, public recognition on CDE website, etc.

* Some basic OLAP cubes are being developed and will be made available on a subscription basis

Source: Team analysis, CAL-Pass, interviews, NHDOE, SCDOE

4. Enhance existing K-12 data collections by capturing key additional data on students, teachers and programs

Initiatives

Information and technology

4.1 **Collect ~20 core additional data elements (currently not planned or collected) in K-12** education data systems in order to analyze aggregate data to inform state-wide programs and policy changes. Additional data to include…
- **Student characteristics** (e.g., reasons for drop-outs; attendance and tardiness; college readiness including Early Assessment Program scores or scores like SAT/ACT as alternatives)
- **Educators and administrator characteristics** (e.g., absences; causes for attrition; teacher qualifications such as credentials and credentialing requirements, National Board Certification, instructional materials used)
- **Program characteristics** (e.g., categorizations for programs; names and content categorical programs, federal or privately funded local programs; measurements of program effectiveness; funding including funds received by site)

4.2 **Reinforce additional optional elements for local systems that are already collecting them.** These additional elements would not be rolled-out to other local systems. This could include providing guidance on definitions and collection capability for elements such as:
- **E.g., assessment characteristics (optional)** (i.e., alignment of local assessments with state standards and instructional materials)

4.3 **Determine the optimal sourcing strategy** to avoid duplicate data collections in K-12 state data systems (e.g., CALPADS, CASEMIS, Migrant, CAL-Pass)

Governance and funding

4.4 **Invest adequate resources for key collections**

4.5 **Create a process to periodically revisit data collections** to assess whether elements are meeting user needs

Culture, training and incentives

4.6 **Incorporate training on the definitions and use of core data elements in professional development offerings for educators, administrators, and others**

Source:Team analysis, El Grove USD, SCDOE, NMDOE, Kentucky Jefferson County

5. Develop an opt-in bank of assessment items and support formative assessment capabilities

Initiatives

Information and technology

5.1 **Provide formative assessment capabilities to districts and schools on an opt-in basis.** This includes…
- **A system to make test administration easier at the district and school level**
- **An item bank that locals could download and develop their assessments. The item bank** could be developed either internally by the State based on items from state*, districts and school assessments, or be contracted out to a 3rd party vendors
- **Providing the ability for local analysis of formative data across the state (results are not reported at the state level) to enable:**
  - Student level comparison of formative and state assessment results
  - Cross-district cohort comparison of aggregated assessment results
  - Tracking of local assessment results for students as they move across grades or schools
- E.g., South Carolina has a student data warehouse that captures both formative (opt-in) and state-wide assessment results. New Hampshire has contracted to Performance Pathways development of a state wide item bank (opt-in) as well as a data warehouse (for state, national and local formative assessments)

5.2 **Provide links between formative assessments, standards, and best practices that are related to the content of the items and assessments**

Governance and funding

5.3 **Have item and assessment analysis groups meet periodically** to review the content in the formative item bank system (e.g., groups could submit content for certification by the State board or other entities)

5.4 **Invest adequate resources** to acquire vendor-provided assessments and items at bulk license rates

5.5 **Invest adequate resources for holding off-schedule workshops for educators** to convene and provide items and assessments to the system (e.g., this is the model used by Kentucky's Jefferson County School District)

Culture, training and incentives

5.6 **Integrate "walk-through" training for using assessment system to support formative assessment** into existing professional development programs
- Support the appropriate use of the system and demonstrate how it can facilitate the formative assessment process

5.7 **Launch web-based and video-conference training series** for experienced educator and administrator professional development

5.8 **Communicate widely the success stories from using formative assessments**

* State releases ~25% of its assessment items annually

Source: Team analysis, El Grove USD, SCDOE, NMDOE, Kentucky Jefferson County

6. Develop systems to encourage collaboration and best-practice sharing for instruction, administration, and other district functions

Initiatives

Information and technology

6.1 **Create a best practice sharing system** that:
- Allows educators, administrators, and other stakeholders to upload existing materials (whether user-generated, state-provided, our sourced from third parties) and create new materials
- Categorizes the content with the support of a robust data taxonomy and tools such as tags
- Differentiates content quality in a transparent way through a variety of means such as research base, expert review, usage statistics, and user ratings
- Provides search capability across all content areas and media types using parameters such as subject area, target student population, standards, and sources
- Launch specific communities focused on sub-groups of users

6.2 **Develop collaboration tools** within the best practice sharing system that allow educators and administrators to
- Create communities of 'trusted' colleagues (e.g., based on with similar student populations or interest areas, like LearnCanada and the Curriculum Web in Bellevue, WA)
- Work together (through wikis, blogs, online chats, etc.) to create new material and customize practices to individual classrooms
- Share information with parents, students and community

6.3 **Develop tools to "push" content to users** such as alert e-mails, auto suggestions, and e-mail subscriptions within the best practice sharing system
- E.g., alerts when a "trusted" colleague reviews a best practice (similar to Facebook's "book review alert") and optional suggestions on content (similar to Amazon's/CNET's suggestions "users who bought X, also bought Y")

Governance and funding

6.4 **Establish processes to determine and publish content quality**

6.5 **Establish processes to continually review system functionality,** adding or deleting functionality over time based on user statistics

6.6 **Invest adequate resources from multiple sources** such as the state, foundations, businesses, etc.

Culture, training and incentives

6.7 **Develop a system roll-out strategy,** adding functionality and user groups in phases and establishing a critical mass of content, users, and networks at each phase

6.8 **Build best practice sharing networks off-line** (through established relationships, workshops, etc.), expanding to on-line

6.9 **Develop a communication plan** at all levels (state, county, districts, and schools)

Source: Team analysis, Peer Review Anew, Texas EA, FI Community Colleges, NYLearns, WA Learns, ECS, SCDoE

7. Expand capabilities to provide standard ways to evaluate local, state, and federal-funded programs

	Initiatives
Information and technology	**7.1** **Build interfaces from CALPADS to program information systems** (e.g., ConApp, Cal-PASS) to enable tracking of student level program data by collecting enrollment in state (ConApp), federal (opt-in) and local programs (in CAL-Pass) • At the combined level, this data would support sub-group and cohort comparisons for programs • At the individual level, the data could indicate correlations of student participation with outcomes
	7.2 **Build interfaces from CALTIDES to program information systems** (e.g., ConApp, Cal-PASS) to track educator level program data by collecting educator IDs for state (Con-App), federal (opt-in) and local programs (in CAL-Pass)
	7.3 **Use web-based forms for Consolidated Application Data System** (CADS) application to streamline data collection for state, federal and local programs
	7.4 **Standardize a core set of data elements** collected across all programs and collect additional data elements identified in recommendation 4.1
	7.5 **Launch sections on the best practice sharing system** that describe high quality programs that address various needs
	7.6 **As mentioned in 3.1 and 3.2, develop a CalPASS like system** to track effectiveness of local initiatives as well as develop **survey instruments** to track effectiveness in developing a climate of teaching and learning
Governance and funding	**7.7** **Establish program evaluation research groups (within CDE or external) to:** • Set program standards by program type • Review system-wide programs and local programs • Build awareness for effective and ineffective programs • E.g., Texas Education Agency Program Evaluation evaluates the effectiveness of state and federally funded grant programs
	7.8 **Invest adequate resources for the rigorous evaluation of programs at all levels**
Culture, training and incentives	**7.9** **Creative incentives for voluntary submission of detailed program information and outcomes** (e.g., additional priority for funds based on submission of data)
	7.10 **Offer awards to schools and districts who demonstrate innovation** by • Creating new programs • Testing new programs • Adopting and implementing proven programs

Source: Team analysis, CAL-Pass, Oregon PK-20 Redesign, DQC

8. Develop systems to improve educators and administrator recruiting, effectiveness, professional development and retention

	Initiatives
Information and technology	**8.1** **Create a web-based self-directed professional development (PD) system** • Provide "search" capability that links to off-line and on-line course offerings • Include "auto suggestion" capability to recommend PD offerings based factors such as prior PD taken, subject-matter expertise, tenure, etc.
	8.2 **Provide analysis tools (opt-in) to districts and schools to evaluate and improve effectiveness of PD programs** using a variety of non-identifiable data sources
	8.3 **Create a common data dictionary for educator and administrator data**
	8.4 As mentioned in 4.1, **enhance scope of CALTIDES**
	8.5 **Provide districts with web-enabled opt-in survey templates, administration, and analysis tools,** (e.g., POET at Elk Grove, survey templates at the Ventura County Office of Education)
	8.6 **Enhance existing systems (e.g., EdJoin) that match teacher candidates with open positions** • Enhance quality of administrator portfolios, enable upload of candidate transcripts and job profile spreadsheets, enable search function on school profiles • Develop linkages with CCTC (for auto upload of teacher credentials), CALTIDES (transfer of transcripts), and higher education (candidate transcripts)
Govern-ance and funding	**8.7** **Establish a state level support mechanism for the new PD system** as well as **district level support for analytic tools**
	8.8 **Invest adequate resources** for professional development and professional development tools at all levels
Culture, training and incentives	**8.9** **Link eligibility for PD program funds to the use of the PD system as well as to the quality of data collections**, as mentioned in recommendation 1.8
	8.10 Motivate **educators and administrators to leverage data-based decision making** • Identify and recognize educators and administrators through state and local awards, invitations into mentorship roles through various mechanisms including traveling road shows, video sharing • Promote peer to peer learning through classroom based observation of data usage best practices • Highlight successful mentorship case • Integrate elements of mentorship into educator and administrator PD plans and evaluations (e.g., TeachFirst in San Diego Redlands USD)

Source: Team analysis, El Grove USD, CFTL, WA State, DQC TeachFirst, Connecticut Accountability for Learning Initiative, MA Educator Licensor and Recruitment

9a, 9b. Create linkages from K-12 to other systems

		Initiatives
Information and technology	9.1	**Link K-12 databases with other agencies. This includes links within K-12 data as well as with Cal-PASS, higher education and employment (EDD), social services, criminal justice, and health services** Ensure that the integration layer is based on open standards (i.e., Service Oriented Architecture) and has: • Global 'translation table' for different identifiers • Identity management "black box" to ensure user role based data privacy and access • Capabilities for service definition, discovery and message transmission • Hold off from development of a data warehouse unless there are sever performance issues with this approach
	9.2	**Develop 'translatable' identifiers in all state systems to enable them to link in the data service layer** • Ensure that each participating system has a record identifier that is based on common fields that enable its translation to other systems. It is not necessary to capture SSN in all participating systems
	9.3	**Ensure that the 'integrated state-wide portal', described in recommendation 2.1, with role-based accessibility, interfaces with the underlying data systems mentioned in recommendation 9.1 and** reporting applications like SARC, DataQuest, etc. as well as best practice sharing and collaboration systems
	9.4	**Include a common data dictionary for relevant data elements starting with the core elements of the P-20 systems, as described in recommendation 1.4.** Develop this dictionary in a phased manner as linkages are developed for non-state education systems
Governance and funding	9.5	**Establish a cross-agency data management structure, as described in recommendation 1.4** • Ensure that there is a policy setting body for developing data sharing policies, agency leads for ownership of each participating system, and technical services leads for managing the data layer including the identity management black-box • Ensure agencies maintain control of their own data
	9.6	**Invest adequate resources for the development and ongoing maintenance of SOA data layer, unified online portal and governance bodies**
	9.7	**Establish state-wide data sharing agreements and provide models** for local counties, districts and schools to build partnerships with local organizations that can provide support services (e.g., Redwood City District shares data with Boys and Girls Club)
Culture, training and incentives	9.8	**Motivate users to share and use data across agencies** • Emphasize benefits from data linkages through role-modeling (e.g., Youth Data Archive project in CA or benefits achieved by other states such as FL, OH) • Adopt an evolutionary approach (i.e., develop data layer in phases)

Source: Team analysis, NM DOE, DQC, Kansas KIDS, OR DoE, NC CEDARS, SC DOE, ECS

10a, 10b. Develop and link Pre-K data systems

		Initiatives
Information and technology	10.1	**Enhance existing Pre-K collections for state and non-state funded programs** • Make SSIDs mandatory. Use the same SSID from K-12 e.g., MN and TX • Enhance existing Pre-K collections (CDMIS that includes CD-801A, CD-801B and CD-9600) to include data elements such as student ID, race, ethnicity, gender, protective services, child health
	10.2	**Develop easy-to-use standardized state-wide assessments on kindergarten readiness for children coming from various Pre-K programs** (state, federal or local private)
	10.3	**Develop linkages from Pre-K to CALPADS for core elements** mentioned above
	10.4	**Enhance the best practice sharing system vision**, as described in recommendation 6.1 to include portals for Pre-K educators; these have specific content and links to 3rd party pre-existing collaboration and knowledge-sharing portals (e.g., 'Plan4Preschool' portal)
Governance and funding	10.5	**Invest adequate resources for enhanced data collection, coaching and additional local capacity** for SSID and other Pre-K data collections
	10.6	**Develop shared data-collection centres for non-state funded Pre-K programs** (e.g., for private schools)
	10.7	**Establish a Pre-K data management structure** as a part of the overall education data organization • State level data stewards in CDE train county staff on improving data quality • County level/ K-3 grade school level stewards and coaches train Pre-K school level coaches
Culture, training and incentives	10.8	**Motivate collection and usage of data at Pre-K level** • Provide incentives to schools that track program quality and leverage data-based decision making – Develop relevant reports and analysis to aid teachers in decision making – Offer public recognition – Allow flexibility to use funds – Provide access to professional development

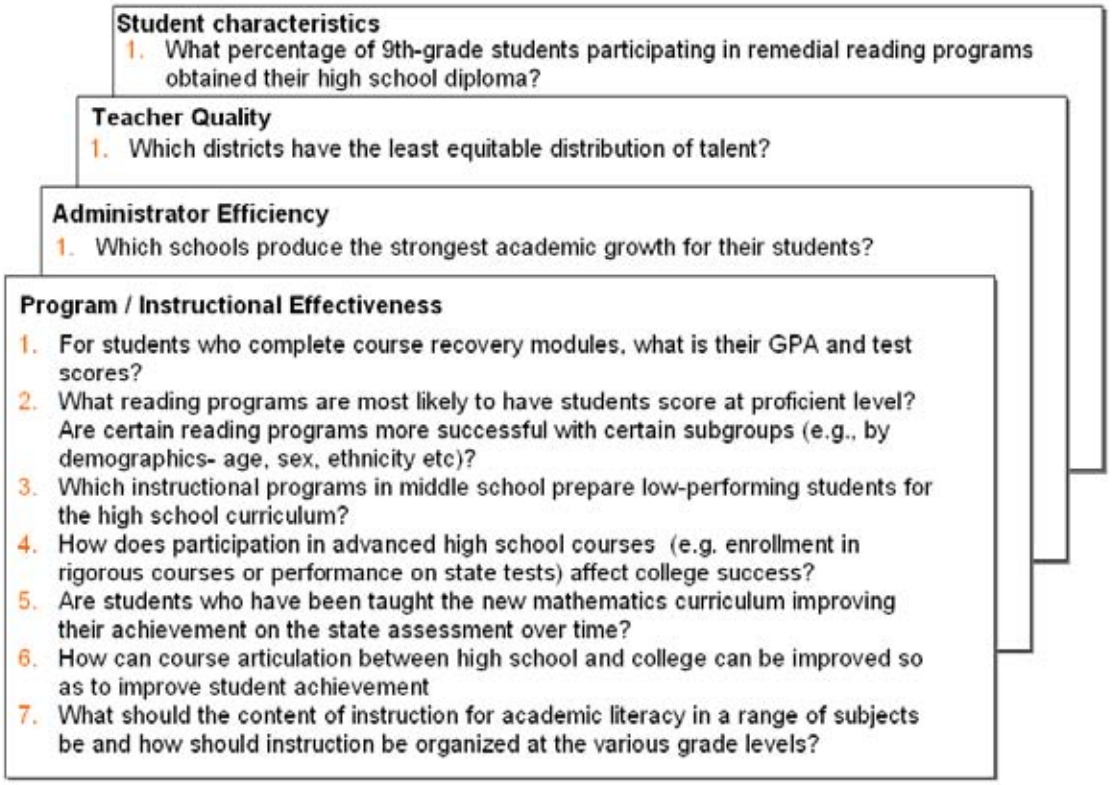
Source: Team analysis, FLDoE, RAND, OR DoE, WDIS FL, Texas TEEM, Pre-K Now, Information Alliance, Preschool California

Appendix C:
List of additional recommended data elements

We adopted a five-step process to identify the missing data elements

1. Collected 120+ questions for the education data system from
   - 100+ user interviews with parents, educators, administrators, policymakers, and researchers
   - 40+ publications on data systems, including best practice case examples, research publications, and NCES data models
2. Develop a prioritized shortlist of questions based on interviews with stakeholders
3. Detailed the data elements required to answer the shortlist of questions
4. Identified 60+ missing data elements for questions that could not be answered from current and planned state data systems
5. Prioritized ~30 core of the most important missing data elements based on discussions with stakeholders

Sample questions for the data system



Questions that can be addressed by data systems today ILLUSTRATIVE

Question	Data system	Illustrative set of data elements collected
• How are our students performing on various assessments? How does their performance vary by sub-groups? What factors impact their performance?	• Assessment systems	• Assessment performance level and scale score for each student on various assessments like CST, NRT, CAPA, CAHSEE
	• Assessment system (headers sheets and answer documents)	• Student grade level; gender; race/ethnicity; disability status; English proficiency status by subgroups; migrant status; district of residence if different than district of service; period of continuous enrollment
• Why do students dropout? What are some early indicators of dropping out?	• CBEDS	• Student grade level, average class size, % teachers fully/ emergency credentialed, % students EL • For CSIS LEAs only, information on annual enrollment status of each student for each school in grades 9 –12; dropout rationale for students in grades 7-12
	• California Healthy Kids Survey • ConApp	• Violence and drug prevention programs provided; incidence, prevalence, and perceptions of drug use and violence • No of students meeting truancy Education Code criteria; No of students suspended and/or expelled for violence or drug use, by Education Code section; student referred to Alternative program etc.
• Are the schools adequately preparing, training, and recruiting Highly Qualified Teachers?	• CBEDS	• Teacher is teaching a 'core academic' course under NCLB; teacher has met NCLB requirements for core course flag; fully credentialed flag
	• Con App	• For each school, average class size; multi-track, year-round educational program; poverty rate; no of teachers teaching core academic courses; no of teachers who received high quality professional development; receives Title I funding; no of paraprofessionals who assisted in instruction in Title I funded programs and meet NCLB requirements

Questions that will be addressed by CALPADS and CALTIDES

ILLUSTRATIVE

Question	Data system	Approach to address the question
• How are our students performing in various assessments? How does their performance vary by subgroups? What factors impact their performance? Why do students dropout and what happens to them afterwards? • How does the performance of subgroups vary over time?	• CALPADS	• Graduation and drop out rates through a unique student identifier to better account for students who transfer across districts, transfer to a private school, matriculate to junior college, or leave the state; dropout rationale code • Improved tracking of subgroups to meet NCLB requirements by having a student identifier and longitudinal data comparing the CELDT scores of each English Learner (EL) in prior years. In addition, ELs are counted as ELs in assessment results, even after they have been re-designated as RFEPs (re-designated fully English proficient), until they score proficient on the English language arts CSTs for three years
• How many newly credentialed teachers take teaching jobs and where they take them? • How many former teachers hold valid credentials but no longer teach? How many former teachers re-enter the profession each year and the average length of time they are out of the profession. • Which teachers are participating in state-funded programs to support teachers? Dis-aggregations by teacher characteristic • What are the impacts of participation on teacher retention and other program goals?	• CALTIDES	• Enabled through linked dataset from participating longitudinal collections e.g., CCTC, SRRTS, CBEDS. Data types collected include – Teacher recruitment – Education – Quality – Experience – Retention – Professional development – Instructional improvement

Recommended additional core data elements (1/2)

Question	Missing data elements	Rationale
Student characteristics		
• Why do students dropout and what happens to them afterwards? What are some early indicators of dropping out?	• No. of days of attendance or tardy/absent	• Attendance as an option to identify potential dropouts. CALPADS will capture Exit/Withdrawal Codes
• What is the level of college readiness of our students? Do they need admission into remedial courses?	• SAT/ACT scores	• EAP developed by SBE, CDE and, CST to assess readiness for CSU. SAT/ACT are measures that are used outside California
Educator/administrator characteristics		
• What are teacher and administrator attendance rates? Why do they leave? Where do they join?	• No. of days absent • Attrition reason	• Currently not collected at state level • Attrition reason to be captured in exit interview
• What are the characteristics of high quality teachers? What instructional materials do teachers use?	• National Board Certification for in-service and TPA/ PACT for beginning teachers • Supplemental instructional materials	• National Board Certification as one of the measures of teacher quality. For beginning teachers, TPA will become a requirement from 2008-09 and might be collected in CALTIDES
PreK student and educator characteristics		
• Who are our Pre-K students, and where are they receiving Pre-K services?	• Student ID • Student race • Ethnicity • Gender	• This information is collected by state for a sample of 200 families (CD801B). Quality measures are administered for all children but collected by state for children with IEPs only
• What are the characteristics of Pre-K teachers?	• SEID • Ethnicity • Credentials • No. of years of experience	• Currently this data is not captured by CDD collections 801A and 801B

Recommended additional core data elements (2/2)

Question	Missing data elements	Rationale
Program characteristics (opt-in for Fed/ private funded programs)		
• What are the various ongoing programs? What are the funding sources for different programs?	• Program ID • Name • Content code	• A common data taxonomy needs to be developed to enable consistency in description of programs across the state. While ConApp has the information for categorical programs, Fed or privately funded local programs have their own descriptions
• How effective are these programs in meeting their objectives?	• Results (student achievement) • Attendance • For PreK programs, parent survey rating on quality of programs	• Need to develop program effectiveness assessment mechanisms e.g., surveys or analysis of performance of program takers
• What is the extent of funding for programs? What are the additional sources of funds besides state?	• Funds received, by site • Funds received, by student • Funding source	• To develop better understanding of additional sources and uses of funds e.g., for categorical programs
Facilities		
• In what condition are the educational facilities used by students?	• Age of building (linked to student attending) • Last date of modernization	• There is currently no state-wide collection of data on school facilities
• How does the physical capacity of the site compare to its occupancy?	• Maximum student population • Acreage of school site • Ratio of permanent to portable classrooms	• The overall condition of a facility as well as its proper operation and use—including not overcrowding—can impact learning climate within and the effectiveness of instruction
• What is the extent of funding for programs? What are the additional sources of funds besides state?	• Presence of media center/library • Presence of Pre-K facilities • Presence of Career Technical facilities	• Certain educational priorities, for example Career Technical Education, require specialized facilities in order to be effectively implemented

Additional data elements not recommended as core (1/3)

Question	Missing data element	Rationale/ descriptions
Student characteristics		
• How different adequacy gap students' needs differ?	• No of languages spoken • Rural or urban origin	• CALPADS plans to collect primary language but many ELs speak multiple dialects/ languages • CALPADS plans to collect country of origin but additional granularity is needed with the simplest breakout implying rural and urban
• What is the impact of variables like students' nutritional status, busing etc. on student achievement?	• No of meals per day • Distance transported to school • Internet connected home computer	• CALPADS only captures participation in National School Lunch Program
• What are some early indicators of dropping out?	• Absent reason code	• No. of days of attendance or tardy/absent is in the list of core elements
• What is the level of college readiness of our students?	• Colleges applied/ admitted • Colleges enrolled	• Ability to track the students that drop out of the college process from application to enrollment
Educator/administrator characteristics		
• What are the characteristics of educators that are effective in meeting the needs of specific cultural sub-group?	• Cultural competency credentials (e.g., Cross-Cultural, Language and Academic Development, trainings to teach children from different cultural subgroups?)	• Social work and health services often offer cultural competency credentials. This should be recorded and hence valued as a corollary to the planned CALPADS element 'Authorized to provide instructional services to English learners.'
	• Languages (i.e., other languages that teacher know and is helpful to them in instruction)	• CALPADS plans to collect language of instruction but many teachers speak multiple languages/ dialects
	• Areas of informal qualification (optional)	• Particularly for non-teaching work experience and informal roles which might have correlation with student achievement e.g., athletics, volunteer

Additional data elements not recommended as core (2/3)

Question	Missing data element	Rationale/ descriptions
Program characteristics		
• What programs/interventions should a particular student be enrolled? Are these program meeting their stated objectives?	• Goal (s) or purpose • Availability • Beginning date • Ending date • Target area • Delivery structure • Frequency • Intensity i.e., beginning, advance or remedial program	• Consolidated Application (ConApp) collects information on participation in categorical programs e.g., Title I, II, V etc. • ConApp has information on program participation, LEA authorization date, agency details, Immigrant, LEP, funding model, charter status, Gradespan, participants • Missing data elements mentioned here are opt-in for non-State funded programs
PreK characteristics		
• What factors impact a child's readiness to kindergarten?	• Child protective services • Child health	• CD 801A and B contains basic information on child including name, date of birth, IEP etc.
• What certification programs has a teacher enrolled in? • How effective are our pre-school programs?	• Highest level of Pre-K certification • Address • Days of operation • Service delivery mode • Fee schedules • Licensed places • Parent survey rating on quality of facilities	• Currently collects information on type of care, program code, total hours of care etc
Assessment characteristics		
• What local formative and diagnostic assessments are administered?	• Assessment reporting method • Score interpretation information	• State will not collect information on local formative assessment results. However, these elements will form the basis of comparison of assessment data
• Are the local summative and formative tests psychometrically valid and aligned to state standards?	• Alignment with state standards	• A state level oversight body needs to be established for oversight to determine consistency of tests with state standards
• What supplemental materials are used at the local level?	• Instructional materials	• To determine which materials are used by various districts and schools

Additional data elements not recommended as core (3/3)

Question	Missing data element	Rationale/ descriptions
Parents characteristics		
• What parent characteristics impact student performance?	• Number of college years • Assets • Number of languages spoken at home • Date of birth • Marital status • Family size • Disabilities • Literacy, numeracy • Income range	• These accuracy of several of these elements would **depend heavily on the collection method**
Operational characteristics		
• What is the impact of infrastructure quality on student performance? What student scores result from a high number of computers in the school?	• Facilities code • Facilities quality rating	• Facility quality could be analyzed based on a stakeholder survey. Several surveys e.g., on IT infrastructure and health services are already administered

Appendix D:
Technical Specifications

Overview

- The Continuous Learning/ Improvement paper and McKinsey education pedagogy are the foundations of this effort. McKinsey & Company has identified the key characteristics of world-class education data systems as guiding principles for this effort.

- To understand the scope and limitations of the current systems, it is important to agree on “what is being measured” and “for what purpose”. McKinsey & Company has analyzed data needs and current gaps for a number of stakeholders. It has assessed the capabilities of the current and planned state and local level data systems.

- Based on current systems, data gaps and best practices, McKinsey & Company has developed 10 recommendations. Each of our recommendations presents different technology choices across the layers of architecture**.** The team has developed a framework to sequence these solutions and transition from the current state

Guiding principles for this data management blueprint

- **Relentlessly focus on value creation for California education system**
- **Drive clarity on business needs** among multiple stakeholders (i.e., educators, administrators, policymakers, students, parents and community members)
- **Leverage existing investments in architecture,** avoiding as far as possible, the need for any large scale system overhaul
- **Target data elements to clear improvements needed in decision making** rather than an indiscriminate, costly and impractical approach of comprehensive data collection not linked to any specific business need
- **Identify architectural break points** with clear cost, complexity, and time to implement trade-offs rather than suggest building a massive & monolithic system or result in significant additional local reporting burden
- **Adopt a** "**managed evolution approach**" to get from today to a longer term solution. Achieve a balance between **'pure technology' driven approach** and a '**pure business**' driven approach

This blueprint is not a recommendation or commentary on any vendor offering. However, it may be useful in writing a statement of work for vendor selection

Contents

Major end-user needs have been identified

NOT EXHAUSTIVE

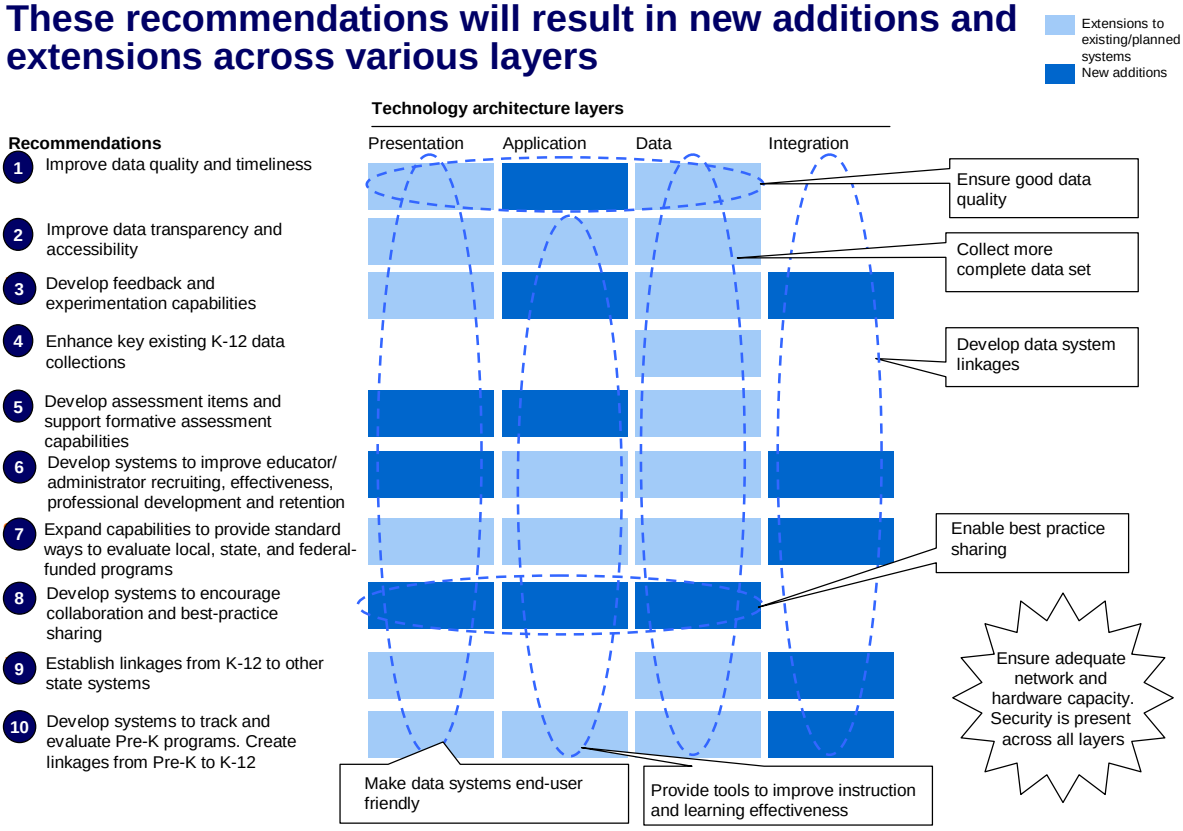
Users	Examples of user needs
Students and parents	• **Access** information about local schools with greater ease and more certainty about accuracy
Teachers, principals and school staff	• Draw on a **bank of assessment questions** tied to the standards and based on the district's strategic plan • Access **instructional best practices** across the state
District and LEA leaders and staff	• Ensure that employee **skills match local needs** • **Track students** that move within the state
Policymakers	• Measure the **effectiveness of programs** of all types • Promote **financial efficiency** throughout the system
Taxpayers	• Have more **visibility** into the education systems' operations and successes
Researchers and advocacy groups	• Research questions related to **college and work readiness**
Businesses	• Have education system be more **responsive** to future economic needs

Major end-user needs

- Ensure good data quality
- Collect more complete data set
- Make data systems end-user friendly
- Provide tools to provide feedback to improve instruction and learning effectiveness
- Enable best practice sharing
- Develop data system linkages

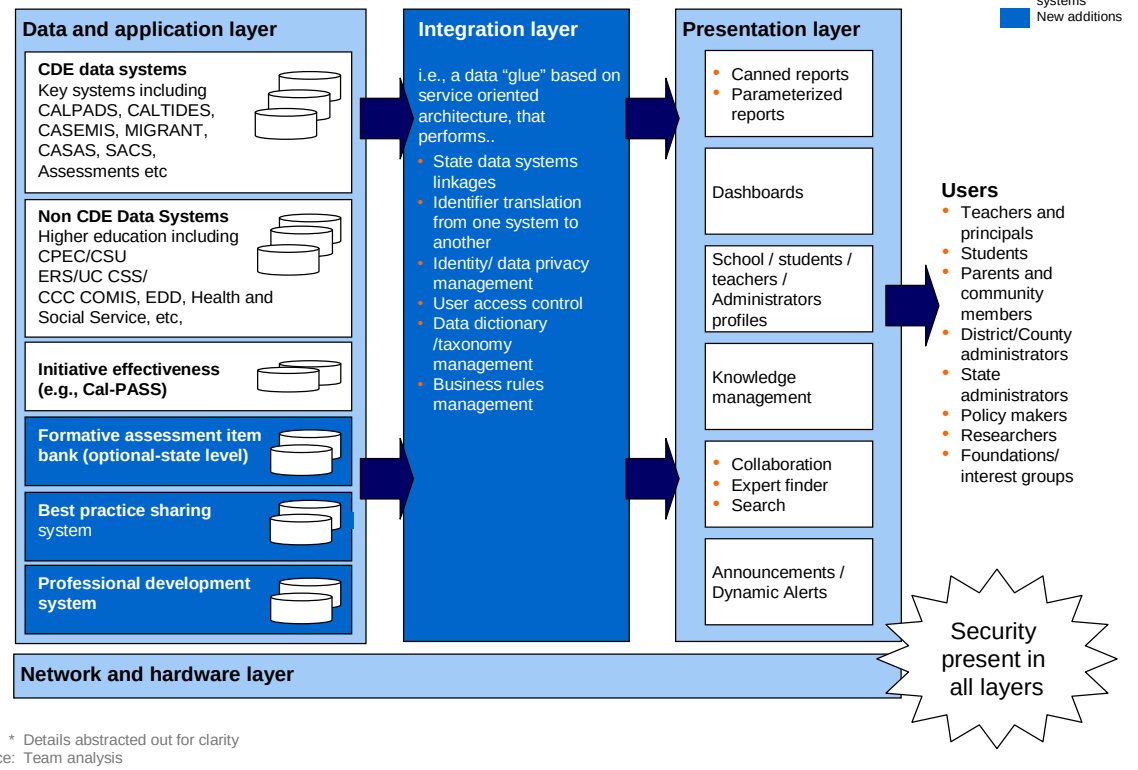
Source: Stakeholder interviews; team analysis

These recommendations will result in new additions and extensions across various layers



The new additions & extensions will result in the following conceptual blueprint for State of CA Education

ILLUSTRATIVE



* Details abstracted out for clarity

Source: Team analysis

Our recommendations build on the current plans

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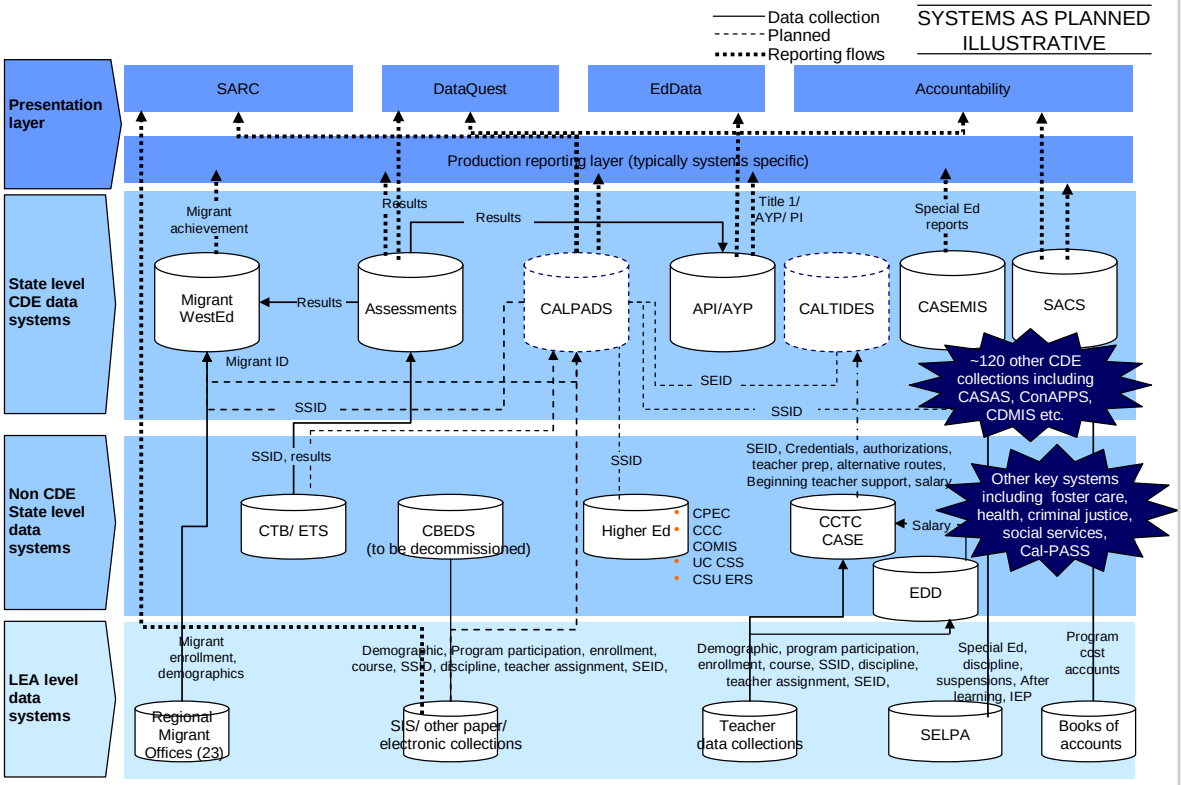
1. Existing projects e.g., CALPADS, CALTIDES would be implemented within scope and time, as planned. These systems will include unique student and educator ID would be collected in CALPADS/ CALTIDES
2. Brokers of expertise to be developed as planned in the vision laid down by Superintendent in his state of Ed address
3. Each agency at the state and local levels as well as higher education campuses will continue to be responsible for maintaining the quality of their respective data collections
4. State data collections will continue to include data validation and verification methods
5. Data coaches at various levels continue to play a key role in educating users on delivering training on use of data for decision making

Contents

- Overview of technology recommendations
- **Existing architecture**
- Detailed recommendations

Current data / information architecture



Source: Data system expert interviews; team analysis

Current information architecture* has several challenges in addressing the user needs

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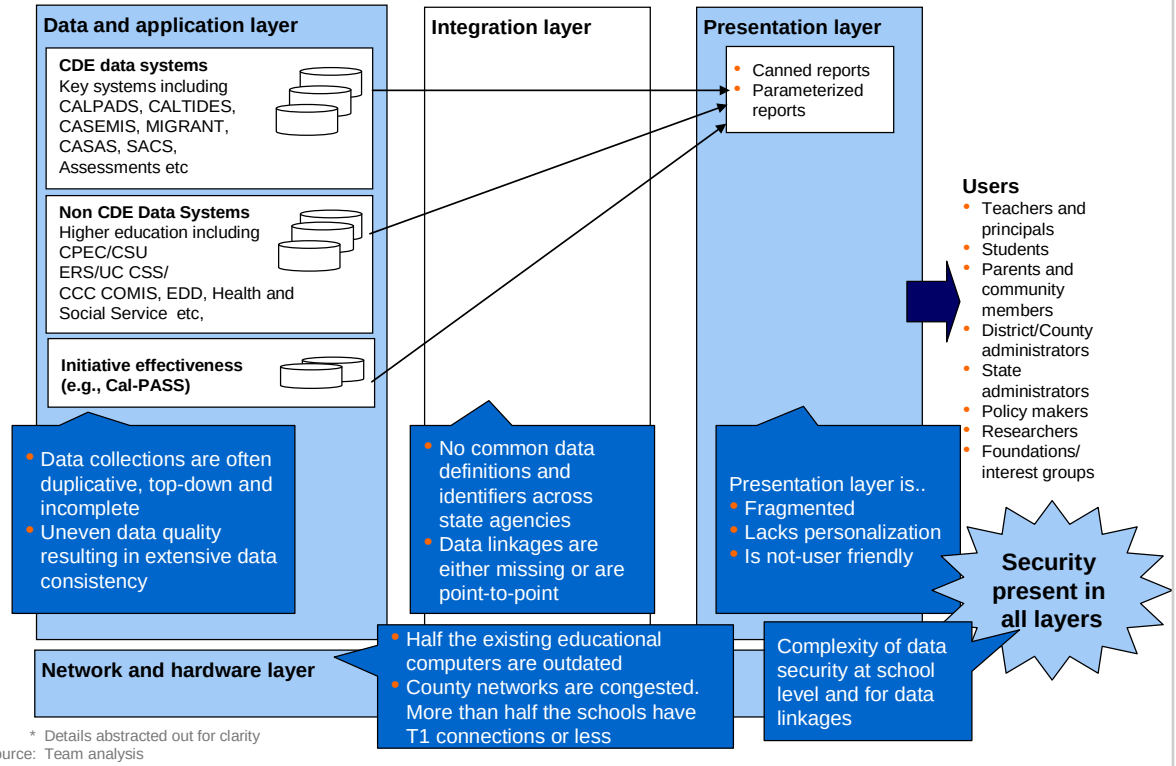


* Details abstracted out for clarity

Source: Team analysis

Current challenges and ongoing initiatives: presentation layer

- **The presentation layer is fragmented**
  - Each state agency has its own reporting systems/ user interface. Moreover, there are presented through separate front ends for various reports within an agency e.g., DataQuest, SARC, Accountability reports are available through different front-ends
  - There is a lack of conceptualization of an end-state integrated reporting, best practice sharing and collaboration architecture vision
- **The layer lacks personalization and is not user friendly, however, there are some efforts to revise SARC periodically**
  - There is limited capability to browse, search, and collaborate
  - Data formats across various reports and websites are not standardized
  - Data presentation cannot be personalized based on roles

Source: User interviews, data system expert interviews, RAND, McKinsey Analysis

Current challenges and ongoing initiatives: application and data layer

- **Data collected is duplicative across state systems**. However, there are ongoing efforts to consolidate systems e.g., CALPADS will consolidate many underlying collections include CBEDS, ConApps, CBEDS, Language Census, Student National Origin Report and select Consolidated Application
- **Requirements are defined by legislative mandates** instead of being end-user driven
- **Data collections are often incomplete**
  - Key data on students, teachers, programs is not collected*
  - Unlike K-12, key data on PreK students is either not collected or not stored centrally
    - Prek students: student ID, race, ethnicity, gender, child protective services, etc.
    - Program: program address, days of operation, service delivery mode, fee schedules, etc.
    - Teachers: demographics and credentials, total experience in current and prior service, etc.
- **Lack of adequate quality checks.** Field audit checks of data sources are missing, although consistency checks are performed for most data systems
- **Data definitions are often inconsistent** across P-20, although for K12 a 'Common Data Architecture' is being developed
- **No flexibility for LEAs to provide data partially** (iterative method) for most collections. However, new systems e.g., CALPADS would address this issue

* Please refer appendix for a list of missing date elements
Source:User interviews, data system expert interviews, RAND, McKinsey Analysis

Current challenges and ongoing initiatives: integration layer

- **Most of the existing data collections are shared through FTP file transfer/ CD sharing/ manual**, rather than through data integration technologies. However, for CALPADS, an online collection tool would be provided to districts
- **No common student identifier** across different state systems
  - CALPADS, CASEMIS, Assessments etc. use SSID
  - SACS, Consolidation Applications, AYP/API use CDS code
  - Migrant uses Migrant ID, COE number, CDS code
  - CASAS uses ADA ID, SSID, CASAS no
  - Higher Ed has a mix of SSN and other IDs e.g., UC, CSU have SSN while CCC and CPEC have SSN aswell as their own IDs
  - Health Services has a random ID generated based on case ID, location, demographic
  - EDD has an ID based of SSN

Source: User interviews, data system expert interviews, RAND, McKinsey Analysis

Current challenges and ongoing initiatives: network and hardware layer

- **Computer and PDA penetration is low** and almost 50% of existing educational computers are outdated (>4 years old)
- More than **50% of schools have a T1 connection or less.** These are primarily schools in low-income areas. However, only 1% or ~120 remote small schools are not connected to CalRen and have limited or no last mile connectivity
- Currently **many county networks are congested** and experience routing failures due to bandwidth peaks. Existing network connectivity for various county level network nodes has been provided as a part of the Cal-REN effort. A six phase 3 year technology refresh plan is in place to improve connectivity:
  - Upgrade network equipment/ software e.g., CISCO 7507 routers
  - Support for IPv6 routing and services
  - Improve QoS monitoring
- There is a lack of a robust, easy-to-use **technological infrastructure** for data collection, aggregation and reporting for PreK e.g., for private schools

Current challenges and ongoing initiatives: security layer

- While **district level user authentication/ authorization** has been provided for state systems, providing the **same level of security to users at the school level has been unmanageable**
- There is complexity in ensuring **identity management for data linkages** across state systems (CDE and non CDE). This is more so for systems that capture sensitive student / teacher level data including SSN
- **Access rights are unclear and granularity of access** not always defined

Contents

Presentation layer recommendations

NOT EXHAUSTIVE

Key recommendations

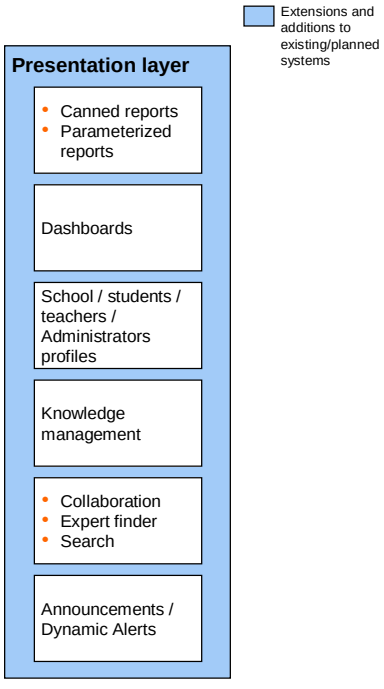
Extend transparency and personalization for parents, community members and educators for existing CDE website/ reporting capabilities

- Improve the accessibility of the School Accountability Report Card (SARC)
- Link CDE reports to 3rd party portal content
- Standardize education report 'look & feel' by developing format standards, user interactivity and common data definitions (opt-in)

Develop new capabilities to include secure, personalized, role-based web-access

- Integrated state-wide education portal infrastructure that enables user role based access
- Initial development to include...
  - Basic functionality including canned reports, dashboards and student/educator/administrator profiles
  - Content/select back-end application integration
  - Develop standardized, dynamic longitudinal "grade books"

- End-state to include..
  - Advanced functionality including advanced reporting, best practice sharing, collaboration capabilities and real-time alerts
  - Unified front and back end integration with single sign on
  - Personalize reporting capabilities via role specific portals
  - Relevant KPIs and content available for each portal
  - Links to specific applications and reports, based on user access privileges



Functionality required: integrated portal that offers assessments, analytics/reporting and innovation/ best practice sharing

1 Best in class assessment items

- **Standardized assessment results**
  - CAHSEE
  - START
  - CELDT
- **Formative assessments item bank container** for school- or district-created, 3rd party vendor provided assessments, that includes..
  - Library of item banks
  - Upload of data into analysis and reporting

2 Analysis and reporting

- Canned and customized reports
- Drill-down, roll-up, filtering
- Ad-hoc queries
- User-generated databases
- Adding new data to central repository
- Data viewing in 3rd party tools (e.g., Excel)
- Advanced statistics
- Pattern detection for target setting

3 Innovation and sharing of best practice

- **Brokers of Expertise**
  - Library of templates for different document types (e.g., lesson plans, curriculums,)
  - Document creation and upload to repository, tagging, seach, collaborative document creation
  - Publishing approval
  - Document linking to reporting (surveys)

Supporting functionalities

Adaptive real time experimentation and feedback

- Posting announcements; setting alerts
- Online discussions; online messaging
- Custom workspaces, integration with email

Personalization

- Pre-defined and customizable home page based on user role

1. Enabling best in class assessments

Capabilities	Description	Use case
Library of templates/item bank and 3rd party integration	• Central repository of templates / in-use assessment rubrics and items • Upload / download access for multiple sources: – School professionals – District DOE – Third-party vendors (through standardized APIs) • Structured template for creating custom assessment rubrics, including roll-up detailed evaluation into set of scores for quantitative analysis and reporting in data warehouse	• School uses structured template to create new rubric for assessing language skills based on multiple performance dimensions and proficiency levels and uploads to rubric bank
Test creation and upload	• Structured templates for mixing and matching content and rubrics from library / idea bank... – Standardized tests by specifying strands, skills and individual questions/answers – Rubric-based tests by textually describing question	• High-school teacher uses structured template to creates new standardized questions to test differential calculus and upload to item bank
Approval process	• Based on psychometric validation, workflow management to review and approve, reject, or modify proposed... – Items – Custom rubric	• Elementary school teacher creates two types of customized tests: a multiple choice Math standardized test, and essay-based English rubric test
Test administering and scoring	• Online administration of standardized and rubric tests • Automated scoring (raw, scaled, proficiency level) of standardized tests	• Teacher schedules tests to be administered online at specified period in following week – Standardized Math test automatically scored – Teacher manually assesses English test and uploads scores
Upload of data into reporting and analysis	• Automated upload of data such as scores into reporting/analysis part of the solution to enable users to analyze the data	• Teacher performs analysis on latest formative assessment to identify improvements / gaps

2. Generating reports and analyzing the data

Capabilities	Description	Use case
Canned reports	• Readily access pre-defined graphical reports. • Save and access snapshots of report results.	• On log-on teacher is presented with results of latest formative assessments by strand
Drill-down, roll-up, filter	• Perform drill-down / roll-up on canned reports at all levels of hierarchy (e.g., system-wide, region, network, school, grade, teacher, student, assessment, item-level etc.)	• Teacher clicks on strand with lowest performance to see individual questions
Ad-hoc queries	• Intuitive interface to capture complex queries • SQL Queries • Create new data cubes	• Teacher uses query wizard to compare scores for lowest performance subgroup against horizon school for same subgroup
Customized reports	Graphically save/name/regenerate new reports based on... • Drill-down/roll-up/filter of pre-existing (canned or custom) reports • Ad-hoc queries • New business rules	• Principal customizes attendance report update weekly and chart lowest performing subgroup
Extensibility	• Create own databases/tables, enable other users to access the database under the same user interface	• Principal creates table to capture varsity status to measure performance of student athletes compared to other subgroups
Advanced analysis	• Statistical toolbox containing functionality such as multiple regression, single- and multi-variate analysis • Compare data across various data elements (e.g., schools) and across different time periods to detect trends, analyze root cause for problems, and set future targets for schools • Integration with third-party statistical toolboxes	• Enhance reports based on increased knowledge over years

3. Innovation and sharing of best practices

Capabilities		Description	Use case
Knowledge and plan management	**Library of templates/idea bank and 3rd party integration**	• Structured templates for creating/uploading documents in multiple media formats	• Teacher uses template to create curriculum plan for teaching fractions
	Document creation and approval	• Document creation and upload to repository • Collaborative creation of document allowing other users to edit created documents • Document tagging with pre-defined taxonomy • Workflow process for publishing approval • Embedding links in reports to documents	• Teacher tags document as "third grade", "Math", "fraction", "curriculum" • DAA approves curriculum with some changes for wider circulation • One teacher creates document on teaching fractions and another teacher extends the document with her experience
	Searching and viewing	• Search for documents across repository • Viewing and download of documents in different formats • Pattern analysis across text documents based on user criteria	• Teacher enters keywords "third-grade", "math", "fractions", "curriculum plan" into search engine to retrieve and download relevant best-practice documents
Collaboration	**Posting announcements/ alerts**	• Posting announcements by both administrator and users • Generate alerts automatically to display on user homepage	• Principal automates alert on teacher homepages whenever scores on latest formative tests falls 10% below similar for horizon school
	Online discussion and messaging	• Provide a forum for online discussions on specific topics • Instant messaging, for select users allow for voice and video chat	• Teacher uses IM to contact peer from horizon school on best practices for teaching fractions
	Calendaring	• Provide the capability to add new events	• Principal uses portal to schedule meetings on all 6th grade teachers' using underlying Exchange server

Choice points: Functional and technology choices shape our recommendations on portal servers

Choice point	Options	Guiding principles
Basic vs. advanced functionality	1. **Basic:** canned reports, ad hoc queries, School/ Students/ teachers/ administrator profiles, Context specific help 2. **Advanced**: advanced reporting; integrated reporting, best practice sharing system; dynamic alerts, real-time collaboration, search	• Make available 'basic' reporting capability to the maximum number of users i.e., teachers, principals • Advanced capability that are required by power users (e.g., assessment/ accountability staff in districts) could be provided in subsequent phases
Level of integration	1. **Content aggregation** with Content management, search and explicit personalization capabilities 2. **Selective application integration** with common data taxonomies and proprietary portlets as primary back-end integration mechanism 3. **Unified front end integration** with Single Sign on, process integration	• Start with either content aggregation/ selective application integration that are relatively easier and cost effective to accomplish (vs. a unified front-end). With selective application integration, users will be able to access links to applications • In the longer term, a unified front-end application integration could be developed. However, it is complex and time-consuming to execute
Portal server technology	1. **Commercial:** Microsoft Sharepoint, BEA weblogic, IBM Websphere portal, Oracle AS portal, Vignette 2. **Open Source**: Apache Jetspeed, Sun Java System portal Server	• Choose open source when 1) considering deploying basic portal functionality, 2) with content level integration, 3) having a flexible technical architecture, 4) at a low price point • However, for 1) advanced enterprise level portals involving 2) front-end and back end integration, consider commercial vendors

Recommendations: Functional and technical capability needs to be developed in phases

	Basic	Advanced
Functionality	• **Extend the capabilities of the existing layer,** including – Extension to current CDE Websites by including links to 3rd party portals – Improve SARC accessibility – Standardize education report 'look & feel' – Web enable Consolidated Application Data System • **Develop new state education portal layer,** that has – Links to canned and parameterized reports – Dashboards – School/ students/ educator profiles	• **Enhance state education portal capabilities,** including – Advanced analysis and reporting – Best practice sharing and collaboration – Formative (opt-in) and summative assessments as well as curriculum standards – Announcements/ dynamic alerts – Real-time online discussions/ online messaging/ collaboration – Context specific help – Render portal data/ content to user interfaces including desktops, thin client terminals, mobile, PDAs as well as IVRs
Technology	• Backend application integration ie., only links to 3rd party state level collections and portals (e.,g best practice portals) • Common (cross application) authentication directory for providing data access rights*	• Unified front and back end integration with single sign on and process level integration

* Leverage future efforts to develop state wide identity management Active Directory service

Emerging recommendations for the Presentation Layer- Extensions to existing and/or planned portals

Recommendations

Extension to current CDE Websites by including links to 3rd party portals

- **Incorporate onto the CDE website links to 3rd party knowledge sharing portals** (e.g., OER, NYLearns, selected/reviewed 600 other sites). These links to be
  - Categorized by role (teachers, principals, administrators, parents, students etc)
  - Expert reviewed
  - Available till Brokers of Expertise is implemented

Extension to current reporting systems by including personalization capability

- **Improve the accessibility of the School Accountability Report Card (SARC)**
  - Support districts in providing tailored reports for parents and community members by providing simplified templates
  - Make the report available in various formats, including paper and web based.
  - Launch interactive school reports with feedback from surveys and comments from stakeholders
- **Develop user role based personalization capabilities**
  - Role specific portals access
  - Relevant KPIs and content available for each portlet
  - Links to specific applications and reports, based on user access privileges

Extension to planned activities e.g., for best practice sharing and collaboration

Enhance the vision of 'Brokers of Expertise'

- Linkages between assessments, formative (opt-in) and summative, as well as content e.g., standards (curriculum)
  - E.g., based on assessment results, provide ability to identify relevant best practice knowledge and collaborate with experts to create suitable interventions
- Recognition awards for innovation and best practice success stories
- Links to 3rd party best practice sharing portals

Emerging recommendations for the Presentation Layer – New Additions (1/2)

Recommendations

Basic functionalities Canned reports, dashboards, profiles

- **Develop an integrated state-wide education portal layer with user role based access, having..**
  - Canned reports, including Accountability, EdData, Data Quest, SARC, school progress reports against AYP/API targets
  - Parameterized reports and dashboards
  - School/ Students/ teachers/ administrator profiles
  - Context specific help

Advanced functionalities Advanced reporting, alerts, best practice sharing system, collaboration

- **Include advanced analysis and reporting**
  - Perform drill-down / roll-up on canned reports at all levels of hierarchy (e.g., State-wide, county, district, school, grade, teacher, student, assessment, item-level etc.)
  - Intuitive interface to capture more complex ad-hoc queries
  - Advanced statistics and modeling, including multiple regression, single- and multivariate analysis, Pattern detection for performance target setting
- **Include best practice sharing and collaboration** capabilities that are linked to the formative (opt-in) and summative assessments as well as curriculum standards
- **Enable announcements/ dynamic alerts** (e.g., for schools on their progress on key indicators)
- **Enable real-time online discussions**/ online messaging/ collaboration

Emerging recommendations for the Presentation Layer – New Additions (2/2)

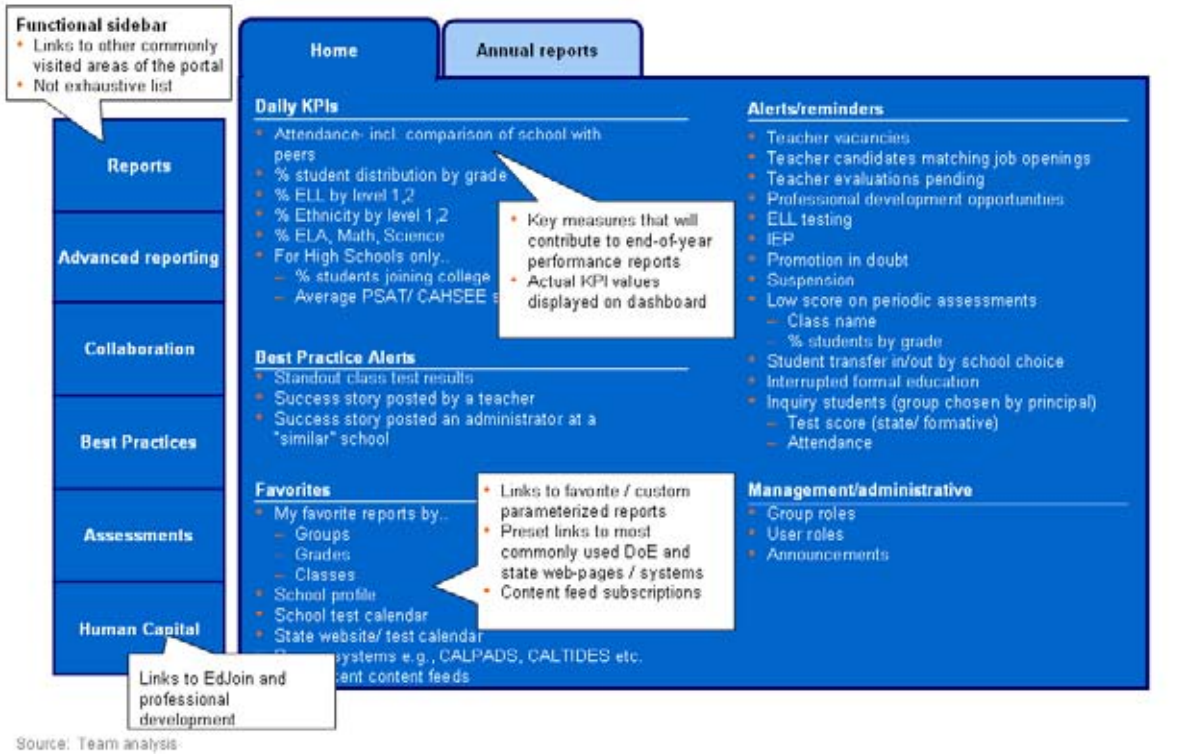
Advanced functionalities
- Links to multiple CDE/ non CDE systems
- Content/ back end integration vs. front and back end integration
- Multi-user interfaces

Recommendations

- **Data and content reporting from CDE and linked non CDE state systems**, formative assessment container, Cal-PASS micro-decisions container, web-based surveys as well as Best Practice Sharing system
- **Content/ back end application integration with links to state/ district data systems** depending on user's access privileges
- **In the long term, front-end and back-end integration with** a single sign-on capability (for state level data systems) so that users could be authenticated once and access multiple systems depending on their access rights
- **Render portal data/ content to various user interfaces** including desktops, thin client terminals, mobile (e.g., SMS), PDAs as well as Interactive Voice Recognition (IVR) systems

Conceptual end-state Principal dashboard in State education portal

ILLUSTRATIVE



Source: Team analysis

Contents

Integration layer recommendations

NOT EXHAUSTIVE

New additions

Key recommendations

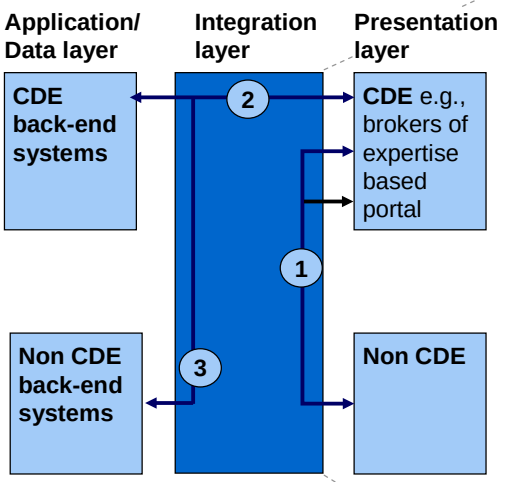
- **Enhance existing capabilities**
  - Develop IDs based on common translatable attributes across CDE/non CDE systems
- **Develop a SOA based data service layer for system integration**, as opposed to existing FTP file transfers/ CD ROM data sharing
  - Design a 'pilot' SOA data layer connecting K-12 State data systems
  - Roll out this layer from K-12 State data systems to other non-CDE State level data systems e.g., Higher Education, EDD, social service (foster care, juvenile justice), health service
  - Do not develop a data warehouse unless there are performance issues with the SOA data layer

Integration layer

i.e., a data "glue" based on service oriented architecture, that performs..

- State data systems linkages
- Identifier translation from one system to another
- Identity/ data privacy management
- User access control
- Data dictionary /taxonomy management
- Business rules management

Functionality required: data integration, translation and message delivery between application/data and presentation layers



Key functionality

- Access **multi-source**, **multi-format** data
- **Translate** between heterogeneous environments (different DBMSs, protocols, messaging systems, etc.)
- **Manage**, **transform**, **route** and **store messages** between applications. Guarantee **one-time delivery**

Levels of integration

1. Front-end to front-end presentation layer integration within or outside CDE
2. Front-end presentation to back-end application/data layer integration within CDE
3. Front-end presentation to back-end application/data layer integration within and outside of CDE

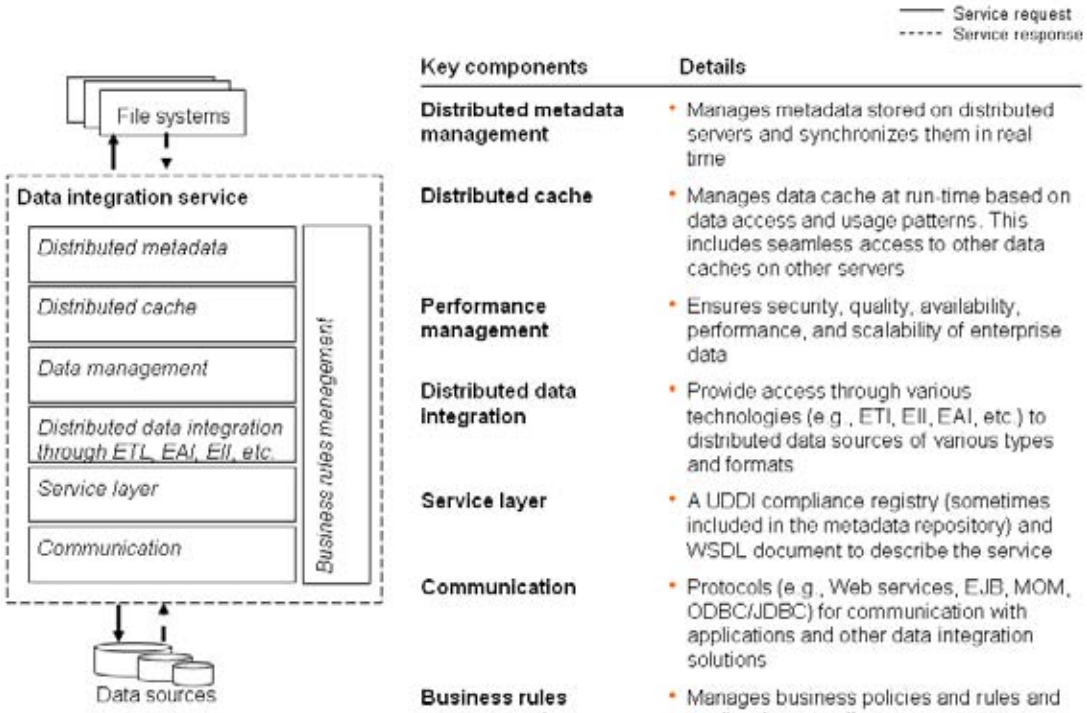
Choice points: 3 technology options for integration

Recommended option

Select options	Functionality	Pros/cons	Tools (examples)
SOA data services layer	A data middleware layer that contains .. • 'Global' unique ID/ translation table' for all systems • Identity management black box • Virtual data model	(+) Source systems can be integrated incrementally (+) Maximum reuse with min additional coding (-) Longer timeline to link up legacy platforms	• Commercial: BEA (AquaLogic), Sybase (Avaki), Composite Software • Open Source: Red Hat jCAM
EAI (Enterprise Application Integration)	• A point-to-point hub and scope based connection layer that contains direct 'adapter' links between source systems	(+) Abstracts the complexity of creating, managing and changing the integration solution (-) Low flexibility (-) High risk considering big bang approach to deployment	• Commercial: BEA WebLogic, Microsoft BizTalk, Tibco, IBM • Open source: Proteus, OpenEAI, Mule, OpenAdaptor
ETL (Extract Transform Load)	• **Extract:** Pull data from multiple data sources • **Transform:** Convert raw data to desired data structure • **Load:** Load into databases and data warehouses to enable reporting	(+) Enables data cleansing before storing it in an operational data store or a warehouse staging area (+) Database environments can be tuned for variable workloads (-) Requires batch loading of data for effective cleansing	• Commercial: Ascential (DataStage), DataJunction (Integration Suite), Informatica (PowerCenter) • Open Source: KETL, Kettle, Enhydra Octopus

SOA data service layer has 7 components

CONCEPTUAL



Key components	Details
Distributed metadata management	• Manages metadata stored on distributed servers and synchronizes them in real time
Distributed cache	• Manages data cache at run-time based on data access and usage patterns. This includes seamless access to other data caches on other servers
Performance management	• Ensures security, quality, availability, performance, and scalability of enterprise data
Distributed data integration	• Provide access through various technologies (e.g., ETI, EII, EAI, etc.) to distributed data sources of various types and formats
Service layer	• A UDDI compliance registry (sometimes included in the metadata repository) and WSDL document to describe the service
Communication	• Protocols (e.g., Web services, EJB, MOM, ODBC/JDBC) for communication with applications and other data integration solutions
Business rules management	• Manages business policies and rules and applies these to all components to ensure consistency

Sources: Team analysis; GemStone; Forrester

Recommendations: integration layer functionality and technical capabilities needs to be developed in phases

	Basic	Advanced
Functionality	• **Develop IDs** based on common translatable attributes across State level data systems i.e., CDE/ non CDE systems	• **Link EdJoin to CALTIDES -** Work with standard taxonomy of electronic transcripts, strength/development area evaluations, work experience, and teaching interests (demographics, geographic location, curriculum, etc.) • **Link materials to CPDI** to integrate academic preparation and teaching readiness with professional development
Technology	**Develop new data integration layer** • Develop the SOA layer to link key K-12 data systems	• **Link K-12 data systems to State non CDE systems** like EDD, foster care, health, criminal justice, and social services systems. Ensure global translation ID, metadata and data privacy rules consistency

Emerging recommendations for the Integration layer

Enhance planned systems
- Translatable IDs across state systems
- Brokers of expertise workflows

Develop new capabilities
- SOA data serivce layer
- EdJoin-CALTIDES linkage
- Materials to CPDI

Recommendations

- Considering that many State data systems have different/ randomly generated IDs, **develop IDs in these systems** based on common translatable attributes e.g., name, demographic information

- **Develop the best practice sharing system (i.e., Brokers of Expertise) to include workflows for,**
  - Association of relevant best practice content and expertise based on performance results
  - Content approval (e.g., enabling districts to approve the formative assessment rubric and content generated by local schools or approval of best practice materials like curriculum/ lesson plans)
  - Expert rating for content uploaded on the best practice sharing system

- **Develop a common SOA based Data Services 'middleware' layer** to collect data from various State (including CDE, Higher ED, Employment, foster care, health, criminal justice, and social services systems). This layer will:
  - Abstract the business rules change logic for participating data systems
  - Enable identity management
  - Have virtual (generated at run time) business rules, common taxonomy and ensure security
  - Not store persistent data

- **Link EdJoin to CALTIDES -** Work with standard taxonomy of electronic transcripts, strength/development area evaluations, work experience, and teaching interests (demographics, geographic location, curriculum, etc.)

- **Link materials to CPDI** to integrate academic preparation and teaching readiness with professional development

Common data taxonomy discussed in data layer section

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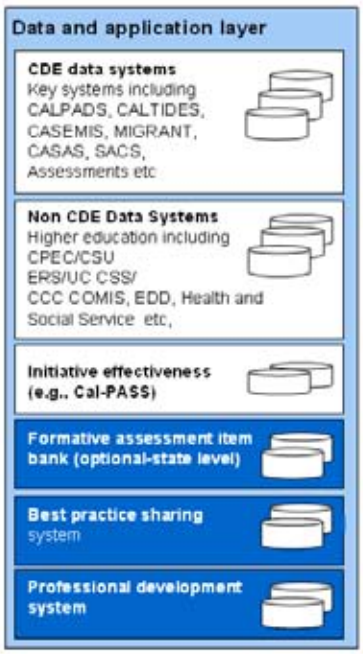
Data and application layer recommendations

NOT EXHAUSTIVE



Key recommendations

- **Enhance existing systems by collecting additional data elements & introducing web-based front-ends**
  - Ensure reporting of individual school, district, and state performance is reported by subject and by subgroup
  - Enhance tools e.g., Cal-PASS, National Student Clearinghouse to measure effectiveness of local initiatives
  - Make available survey platforms and items to districts and schools
  - Develop EdJoin to include teacher prep path programs
  - Collect more* data in CALPADS, PreK collections, ConApp, CALTIDES
  - Enhance existing K-12 Common Data Architecture taxonomy to include P20 data
- **Develop new tools**
  - Provide web-based data quality tools to districts and counties that have data profiling 'auto-fill', 'auto-suggest' capabilities. Embed these in user interfaces of State collections
  - Develop a State-wide formative assessment item bank (opt-in for districts/ counties) and support formative assessment capabilities
  - Develop advanced analytic and reporting tools and make these available through web based portal
  - Develop an integrated performance management, best practice sharing and collaboration capability
  - Create a web based self-directed professional development (PD) system
  - Provide assessment tools for local counties, districts and schools to support more frequent identification, classification, and reclassification of students

*Detailed list of elements in backup

Functional requirements: formative assessment item banks (opt-in) needs to collect content from state, district or schools

Role of the State includes:

- **Provide formative assessment capabilities to districts and schools on an opt-in basis**
  - A system to make test administration easier at the district and school level
  - An item bank that locals could download and develop their assessments. The item bank could be developed either internally by the State based on items from state*, districts and school assessments; or be contracted out to a 3rd party vendors
- **Providing the ability for local analysis of formative data across the state** (results are not reported at the state level) to enable:
  - Student level comparison of formative and state assessment results
  - Cross-district cohort comparison of aggregated assessment results
  - Tracking of local assessment results for students as they move across grades or schools

Source: Team analysis

Choice points: 3 key choice points for formative assessments container

Select choice points	Options	Guiding principles	Relevant technologies
Manual paper based vs. automated	1 **Manual paper based** assessments. However, scoring is done using Scantron 2 **Advanced electronic assessments** administration, scoring and results dissemination through a web base interface	• Paper based assessments are easy to administer, considering significant experience. However, these are more error-prone, require more ongoing investments to maintain data • Electronic web based assessments are easier to maintain and	• Manual paper based – Image recognition software – Scantrons • Electronic assessments – CTB, Princeton Review, McGraw etc.
Integration of assessments with best practice sharing content	1 **No content integration** of best practice sharing system content with assessments/ standards. Only certain links to content are provided for users to preview 2 **Tight linkage** between standards, assessments, best practice sharing system content. User gets recommendation on possible best content based on standards/assessment results	• No content integration option is faster and cost effective to execute. However, this is not as user friendly compared to tight linkage	• For developing tight linkage, content tagging, metadata definition, search and browse engine is require
Best practice sharing system item bank ownership	1 **School/ district** developed 2 **3rd party vendor** developed 3 **State** developed/ owned	• A district/ state developed/ owned item bank will have greater standardization of rubric and content. • However, local needs might remain unmet	• N/A

Functionality required: Local initiative assessment system needs to capture data from state, district and school level systems

Enhance the ability of schools and districts to assess effectiveness of local initiatives using a model like Cal-PASS

- Develop linkages from CALPADS to local systems to avoid duplicate data collection
- Enhance a Cal-PASS-like portal to provide end users access to advanced analytic capabilities on their own data
- Enhance local system linkages to include local financial and HR (opt-in) in addition to data on students and programs

Source: Team analysis

Local initiative assessment capability requires enhancing Cal-PASS and creating a new district based system for surveys

Rationale

	Functional scope	Technology
Develop Cal-PASS for assessments based Micro-decisions	• Captures student level information on local initiatives* e.g., curricula/ teaching practices, programs as well as assessments information • Stores ~10 yrs of history data and over 2 million student records • Over 4000 K12 institutions, as well as ~60 higher ed colleges participate in 49 counties across CA	• Leverage investments on existing infrastructure at state and local levels • Has developed extract utilities for local agency SIS systems, Higher Ed • Flexible data model allows local customization
+	**Other similar efforts that could be leveraged include National Student Clearinghouse, Youth Data Archive etc.**	
Make available survey platforms and items to districts and schools	• Most districts under-leverage survey based assessments • Stakeholder surveys include – Quality and value of service delivered by service areas like Finance, HR, PD, RAA etc. – Educator and administrator effectiveness	• There are typically no centralized district based data stores to collect survey results • Longitudinal analysis of survey results cannot be done today

Source:Interviews, RAND

Recommendations – the application/data layer needs to be developed in phases

	Basic	Advanced
Application	**Enhance existing capabilities*** • Performance reporting by subject and subgroup • Local initiative assessments e.g., Cal-PASS/ National Student Clearinghouse • Surveys platforms and items • EdJoin **Develop new capabilities** • Data quality tools • Tools for (re) classification of students	**Develop new capabilities*** • Formative assessments item bank • Advanced analytic tools • PD system • Integrated performance management, best practice sharing and collaboration
Data	**Enhance existing/ planned collections*, including** • K-12 data systems like CALPADS, CALTIDES, Consolidated Applications • SSID for PreK	**Develop new content/ data stores** • Formative assessments container • Data store to capture data generated by web based surveys/ forms • Develop P-20 Common Data Architecture taxonomy • Enhance ConApp, Pre-K system • Content stores for Brokers of Expertise

* Refer previous pages for details on the recommendation

Emerging recommendations for the application layer – Enhancements to existing capabilities

Enhance existing capabilities
- Reporting performance by subject and subgroup
- Local initiative assessments
- Best practice sharing
- Web based surveys
- EdJoin

Recommendations

- **Ensure that individual school, district, and state performance is reported by subject (i.e., math, ELA) and by subgroup**
- **Enhance the ability of schools and districts to assess effectiveness of local initiatives using a model like Cal-PASS, National Student Clearinghouse**
- **Enhance the best practice sharing system vision, to include** an integrated performance management, content management, learning management and collaboration capability. Provide links from performance management (assessments) to suggested knowledge (e.g., lesson plans and experts)
- **Make available survey platforms and items to districts and schools** so that they could customize (as needed), administer and analyze results to track effectiveness in developing a climate of teaching and learning
  - Survey item areas to include feedback on educators and administrators, school facilities, and service areas like finance, assessments and accountability, and human resources
  - Survey instruments to be both offline paper based and electronic web based
  - Explore offering state-wide access to a SurveyMonkey-like platform
- **Enhance scope of EdJoin** to
  - Comprehensively collect information from all teacher candidates in California in their last year of the teacher prep program
  - Include all job openings in K-12 across California (not just voluntary participation)
  - Contain strength/development area evaluations from teacher prep path programs across CA

Emerging recommendations for the application layer – new additions

Develop new capabilities
- Formative assessment container
- BI tools
- Data quality checking

Recommendations

- **Develop a state-wide formative assessment item bank**, that
  - Contains state, district & vendor provided, school customized or new school developed assessment items
  - Collects custom content and rubric as well as renders results in a web-based format
  - Has search and directory browse interface and graphical results display
  - Includes a printable assessment rubric for educators and families lacking computers/connectivity
- **Make available advanced analytic and reporting tools as part of the state education portal,** to enable OLAP cubing for drill down, slice and dice, data mining and predictive modeling for power users (e.g., district accountability staff)
- **Provide additional advanced data quality tools to counties/districts to improve data at source for key state level collections**
  - Embed data quality tools in local interfaces of state collections covering all modes of submission, including File Transfer Protocol , CD-sharing, and locally-based inter-school servers (e.g., SIF ZIS servers)
  - Include data profiling and reasonability checks apart from data validation; include functions for 'Auto-fill' and 'Auto-suggest'
  - Introduce web-based user-interfaces to enable districts to rapidly incorporate quality updates to collections
- **Create a web based self-directed professional development (PD) system**
  - Provide "search" capability that links to off-line and on-line course offerings
  - Include "auto suggestion" capability to recommend PD offerings based factors such as prior PD taken, subject-matter expertise, tenure, etc.

Emerging recommendations for the data layer (1/2)

Enhance existing/ planned State collections

Recommendations

- **Collect ~20 core additional data elements (currently not planned or collected) in K-12 education data systems in order to analyze aggregate data to inform state-wide programs and policy changes.** Additional data to include...
  - Student characteristics (e.g., reasons for drop-outs; attendance and tardiness; college readiness including Early Assessment Program scores or scores like SAT/ACT as alternatives)
  - Educators and administrator characteristics (e.g., absences; causes for attrition; teacher qualifications such as credentials and credentialing requirements, National Board Certification, instructional materials used)
  - Program characteristics (e.g., categorizations for programs; names and content categorical programs, federal or privately funded local programs; measurements of program effectiveness; funding including funds received by site)
- **Reinforce additional optional elements for local systems that are already collecting them. These additional elements would not be rolled-out to other local systems.** This could include providing guidance on definitions and collection capability for elements such as assessment characteristics (optional) (i.e., alignment of local assessments with state standards and instructional materials)
- **Determine the optimal sourcing strategy to avoid duplicate data collections in K-12 state data systems** (e.g., CALPADS, CASEMIS, Migrant, Cal-PASS)
- **Enhance existing Pre-K collections for state and non-state funded programs**
  - Make SSIDs mandatory. Use the same SSID from K-12 e.g., MN and TX
  - Enhance existing Pre-K collections (CDMIS that includes CD-801A, CD-801B and CD-9600) to include data elements such as student ID, race, ethnicity, gender, protective services, child health, ECERS score and other assessments

Emerging recommendations for the data layer (2/2)

Enhance existing capabilities
- Local initiative assessment
- Best practice sharing store
- Common Data architecture taxonomy

Develop new capabilities
- Formative assessment item bank

Recommendations

- **Enhance systems to track local initiatives like Cal-PASS** to include local financial and HR (opt-in) in addition to data on students and programs
- **Develop content stores for best practice sharing**
- **Develop a common data dictionary for core education-specific elements for P20 and non-education state systems.** Include data definitions and descriptions, business rules, data structure and relationship
- **State provided Formative Assessment (opt-in by districts)** to capture items, rubric and content from state, district formative assessment as well school created or customized assessments

Contents

Security layer recommendations

Functionality required

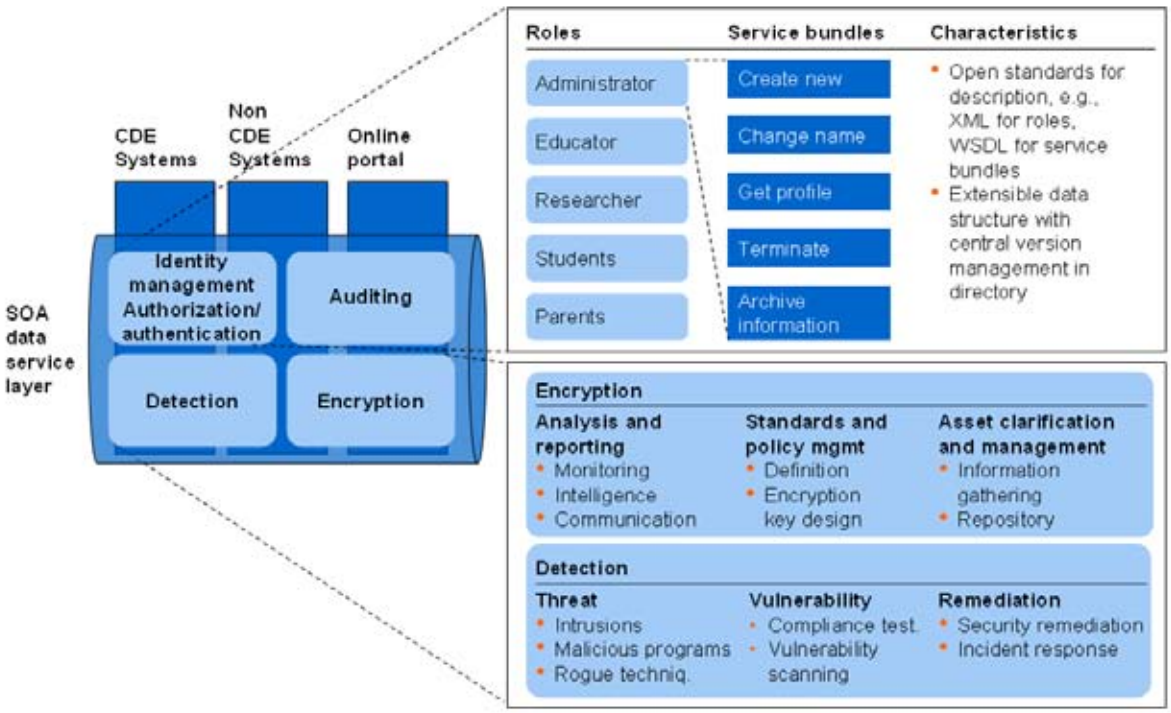
- Identity management (authentication, authorization) based on user access privileges
- Encryption of data (particularly student/ teacher identifiable), while in store or in transit
- Detection of intrusions, malicious programs, compliance tests, vulnerability scanning
- Auditing user access/control

Key recommendations

- **Enhance existing capabilities**
  - Ensure compliance of new data collections with existing security policy guidelines e.g., FERPA for each participating system
  - Encryption is typically x.509 certificate SSL3.0
  - Auditing and detection per current standards
- **Develop new capabilities**
  - Initially, have LDAP/ ADS authentication and authorization. Leverage future investments in state-wide identity management Active Directory. Over the longer term, develop web services based Federation architecture for authentication and authorization
  - Develop risk mitigation strategy based on type (criticality) of data stored

Functionality required: security architecture to offer identity management, auditing, detection, and encryption

ILLUSTRATIVE



Choice points: technical options for authentication/ authorization architecture

Recommended option for Multi-agency environments (discussed next)

Select options	Functionality	Pros/cons	Tools (examples)
eSingle Sign On	• For one given user, a 'black box' stores all the credentials for all the connected services	(-) Extremely difficult to deploy in a multi-agency set-up (-) Change password event scripts management can be difficult	• CA (CA SSO); ActivIdentity (SecureLogin); Passlogix (V-GO)
LDAP Lightweight Directory Access Protocol	• A given user's account is stored in an LDAP repository, including data such as credentials, rights	(+) Robust, mature and standard technology (-) Implementation can be difficult in a multi-agency environment (-) Compatibility issues (some systems are not compatible with LDAP authentication)	• Novell (eDirectory); SUN (SUN Directory Server); CA (CA Directory); IBM (IBM Tivoli Directory)
Federation – ID-FF/WS or SAML based	• A given user authenticates itself with the credentials valid in his organization • The organization authentication service generates an authentication token sent to service providers either in HTTP (via SAML tokens) or in a SOAP message	(+) Federation allows user authentication in a trust ring without having to create an account everywhere (+) Robust standards for web services security (-) Difficult implementation (contractual/organizational issues)	• CA (CA Siteminder Federation services); IBM (Federated Identity Manager); Novell (iChain); Microsoft (Active Directory Federation Services)

Source: McKinsey

Flow diagram for a SAML/WS federation security architecture

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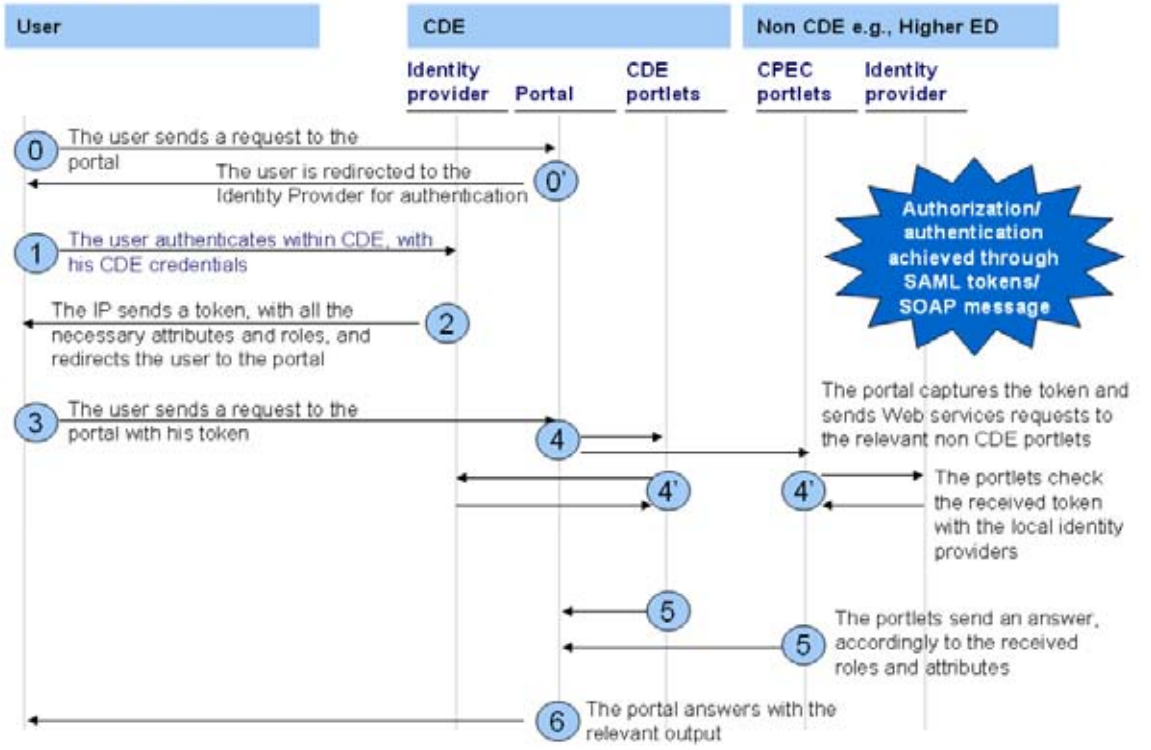


Recommendations – the security layer will be developed in phases

	Basic	Advanced
Functionality	**Enhance existing capabilities** • Existing **security policy guidelines e.g., FERPA for each participating system are complied** with • **Encryption** is typically x.509 certificate based mutual authentication implemented over SSL 3.0 protocol or a higher standard • **Auditing**: Logging and audit of system use • **Detection:** User restrictions for delegating access permissions to other users. However, if the system allows delegation, an audit log must be maintained	**Develop new capabilities** • **Develop risk mitigation strategy based on type (criticality) of data stored** in the new collections. Typically RAID 0+1 (preferred) or RAID 5 fault tolerance and Category 1 or 2 storage system backup recovery fulfill most data storage requirements • **Over the longer term, develop web services based Federation authentication architecture**
	Develop new capabilities • **Initially, have LDAP/ ADS authentication and authorization** (leverage future state investments in identity management/ active directory)	

Recommendations on security architecture

Enhance existing capabilities
- SOA data layer compliance with FERPA
- Encryption
- Auditing
- Detection

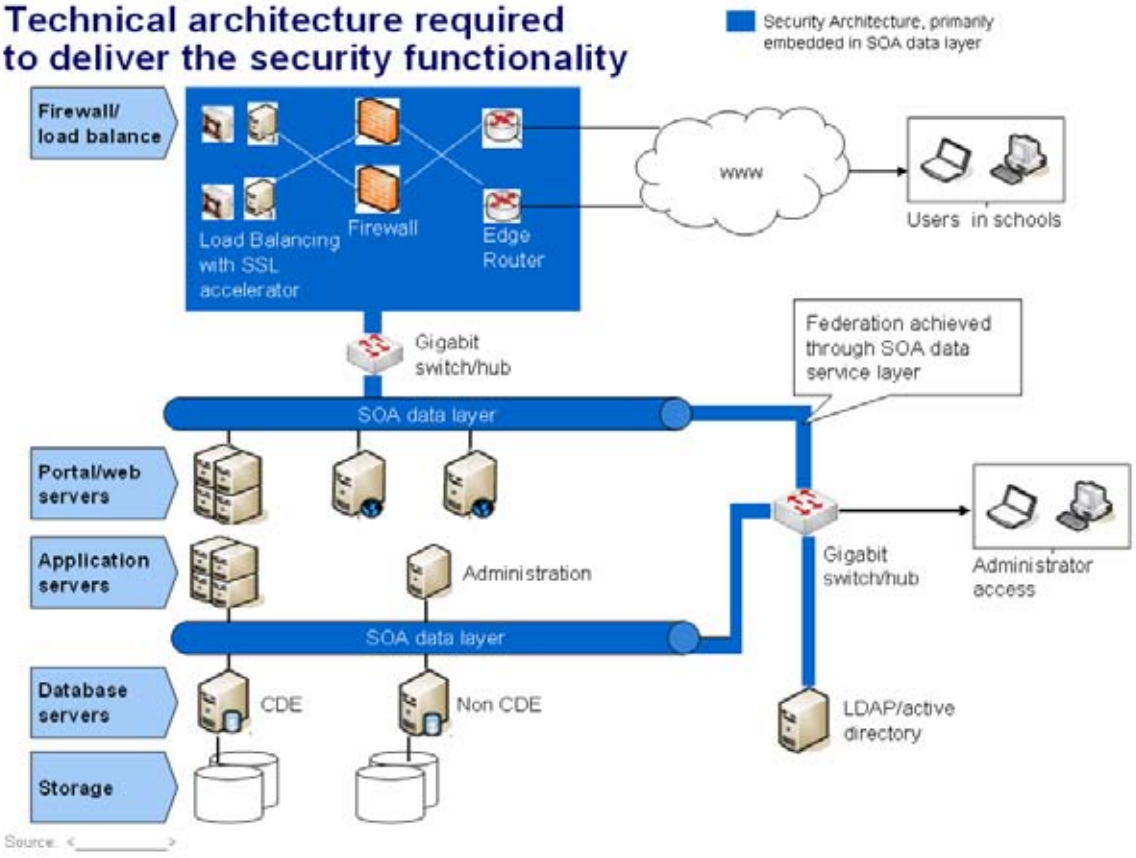
Develop new capabilities
- Initially LDAP authentication. Web server based Federation architecture in longer term
- Risk Mitigation Strategies

Recommendations

- **Overall: While developing data linkages in the SOA data service layer,** ensure..
  - Existing **security policy guidelines for each participating system are complied** with
    - Information must be secured and not disclosed without the proper authorization and following specific procedures as defined under State and Federal privacy laws
    - Federal Education Rights and Privacy Act (FERPA) security and privacy requirements are complied with
    - All information, especially personally identifiable, must be transferred securely while in transport to and from educational entities over the internet or the network infrastructure
    - Ensure access to non-identifiable raw education data for all stakeholders and identifiable data based on user's access privileges
- **Encryption** is typically x.509 certificate based mutual authentication implemented over SSL 3.0 protocol or a higher standard
- **Auditing**: Logging and audit of system use
- **Detection:** User restrictions for delegating access permissions to other users. However, if the system allows delegation, an audit log must be maintained

- **Authentication/ authorization**
  - **Initially, have LDAP/ ADS authentication and authorization** to integrate with CDE and other state agency ADS. Leverage any State efforts to develop this capability in future
  - Over the longer term, **develop web services based Federation architecture** for authentication and authorization
- **Develop risk mitigation strategy based on type (criticality) of data stored** in the new collections
  - Ensure appropriate level of **server failover and disaster recovery** for content and data stores including Cal-PASS Micro-decisions container, Brokers of Expertise, Formative Assessment Container
  - Typically **RAID 0+1 (preferred) or RAID 5 fault tolerance and** Category 1 or 2 storage system backup recovery fulfill most data storage requirements

Technical architecture required to deliver the security functionality



Contents

- Overview of technology recommendations
- Existing architecture
- **Detailed recommendations**
  - Presentation layer
  - Integration layer
  - Data and application layer
  - Security architecture
  - **Network and hardware layer**

Network and hardware layer

NOT EXHAUSTIVE

New additions

Extensions to existing or already planned systems

Key recommendations

- **Enhance network connectivity**
  - **County node level:** continue with planned technology upgrades
  - **Counties to districts:** Increase bandwidth to DS3 for select districts
- **Enhance client computing** (desktops, mobile devices)
  - Roll-out low cost laptops for dedicated educator and administrator use
  - Pilot PDA rollouts across select preK schools
  - Pilot Interactive voice response systems
  - Make available reports available through various interfaces e.g., PDAs, desktops, mobile etc

Choice points: for network and hardware layer

Choice points	Options	Guiding principles	Relevant technologies
Network Basic vs advanced	1. **Basic:** No additional investments beyond the planned upgrades as part of CalREN 2. **Advanced:** – Enhance the network bandwidth from state to counties (existing is typically DS3 networks) – Extend last mile connectivity from counties to all schools especially remote and low-income schools with VPN through local ISPs	• Existing investments will not be sufficient considering current and future demand. Infact, current network is already experiencing traffic congestion and routing failures • However, there is a significant investment required to upgrade the Cal-REN and last mile networks, considering that at least $2M is the existing yearly maintenance cost at county level only	• T1 (DS1) 1.5Mbs network cabling • T3 (DS3) 45Mbs network cabling
Hardware Computers vs Mobile devices	1. **Computers**: Purchase additional computers and mobile devices to reduce state-wide educator to computer ratio 2. **Mobile devices** :Invest in mobile-specific software and websites and roll-out PDAs to educators and administrators	• Low desktop costs considering tight competition between proprietary vendors aswell as availability of open source options e.g., Linux, OpenOffice • While mobile devices are user-friendly, there is an initial change management/ training required. Also, challenging is the cost of ongoing data plan costs	• ASUS Eee PC ($400) laptop e.g. Fresno USD purchased 1000 devices in 2007 • Nokia Symbian and Windows Mobile based PDAs
Software Thick client vs Thin client	1. **Thick client:** Roll-out downloadable software client applications for install on existing computers 2. **Thin client, zero footprint:** Provide web-based applications via browser – Roll-out internet only connected screens placed at specific school and community locations for data access	• Software updates for thick clients are typically complex. However, these typically have better user-experience and faster query performance due to cache based results access • Thin clients can have high remote off-site access and security. However, these have high-network loads	• Rich Internet Applications (RIA) – Ajax, Adobe Flex, etc

Source: Team analysis

Recommendations: The network and hardware layer will be developed in phases

Basic → **Advanced**

Enhance existing capabilities

- **Continue** with planned technology upgrades as a part of the K-12 HSN 3 yr technology refresh cycle. Refresh includes..
  - Upgrading network equipment/ software e.g., CISCO 7507 routers
  - Support for IPv6 routing and services
  - Improve QoS monitoring

- **Develop new capabilities**
- **Support ongoing last mile network upgrade effort for remote and capacity constrained schools and districts**
  - Upgrade ~100 schools to T1or 54kbps wireless connection and ~500-1000 schools to T3 connection
  - This enhancement is in addition to upgrade planned by K12 HSN project

High level cross-agency systems map of key collections

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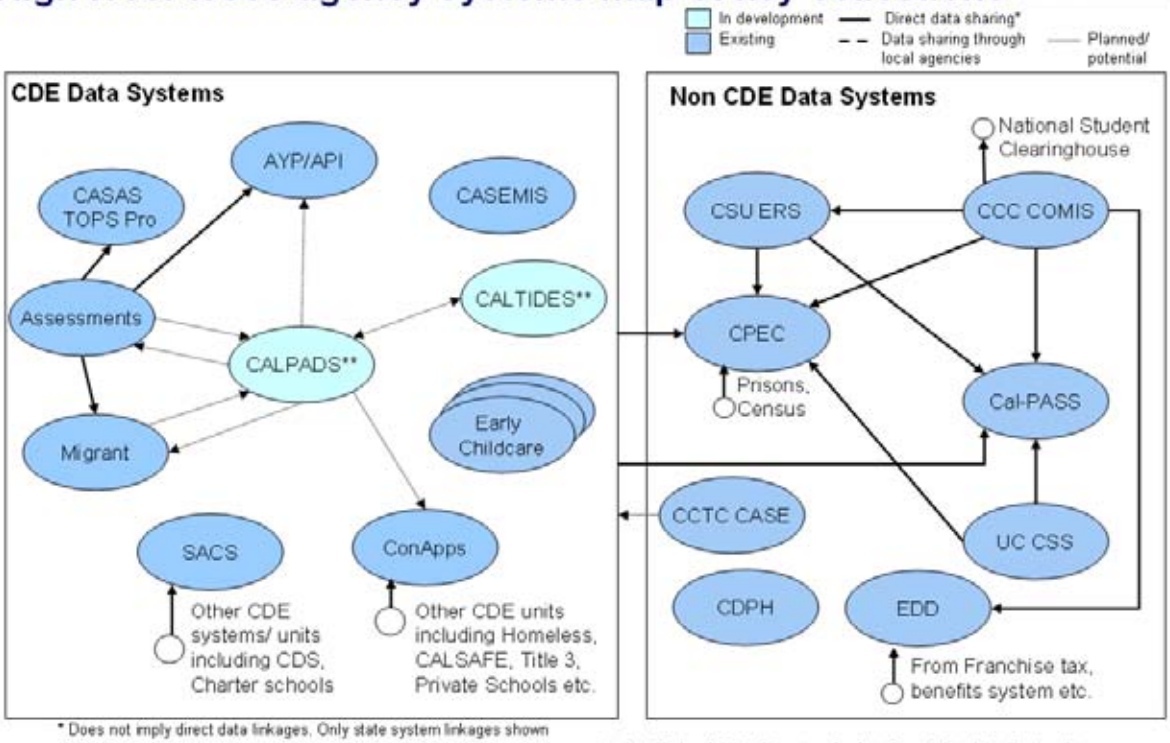


* Does not imply direct data linkages. Only state system linkages shown

** CALPADS is envisioned to replace much of the CBEDS, Language Census, Student National Origin Report and select Consolidated Application data

*** CALTIDES is envisioned to collect data primarily from CALPADS and Commission on Teacher Credentialing's CCTC's Credential Automation System Enterprise CASE system

Source: Interviews with respective agencies, RAND, team analysis

High level system profiles of key CDE collections (1/2)

NOT EXHAUSTIVE

System name	Description	Key identifier	Data categories	Granularity	Data sharing
CALPADS	California Longitudinal Pupil Achievement Data System. System (under development) for tracking K12 students longitudinally, that will replace CBEDS collections	SSID	Student demographic, program participation, grade level, enrollment, course enrollment and completion, discipline, and statewide assessment	Student	Planned include- Assessments, API/AYP, Migrant, ConApps,
CALTIDES	California Longitudinal Teacher Integrated Data Education System. Iintegrated data system for teacher data based on unique SEID	SEID	Teacher credentials, authorizations, teacher participation program, alternative routes, participation in Beginning Teacher Support and intern program, SEID, Salary	Student	Planned include- CALPADS, CCTC CASE
CASEMIS	California Special Education Management Information System. Integrated data system for special education students on students, services and provider programs	SSID	Attendance/Enrollment, Disciplinary, Education Agency, Mobility, Special Education, Staffing Data, Student Demographic, Other (services, age, gender, race/ethnicity)	Student, School district, School, county, region	None at state level
Assessments	California High School Exit Exam CAHSEE, Standardized Testing and Reporting STAR and CELDT	SSID	Attendance/Enrollment, Education Agency, Food and Nutrition, Parent Data, Special Education, Student Demographic	Student, School District, School, County	CASAS, Migrant, AYP/API, CALPADS (planned)
API/ AYP	Accountability related information based on California's Public Schools Accountability Act of 1999 as well as No Child Left Behind Act of 2001	CDS code	AYP/API score by student characteristics	School	Assessments

Source: Respective CDE departments

High level system profiles of key CDE collections (2/2)

NOT EXHAUSTIVE

System name	Description	Key identifier	Data categories	Granularity	Data sharing
Migrant	Student enrollments in migrant education programs. Includes migrant education forms and a directory of offices providing services	Migrant ID, COE number, CDS code	Student demographics, educational programs, counseling, health and support services, emergency health, clothing, food, transportation	Student	Assessments, CALPADS (planned)
SACS	Standardized Account Code Structure. Offers LEAs with a means of reporting financial information	CDS code	For every general ledger accounting transaction- information on funds, resources, project year, goal, function, and object. Includes information on Attendance/Enrollment, Education Agency, Fiscal, Transportation	School, District	CDS, Charter schools
ConAPPS	Consolidated applications. Includes information on categorical programs e.g., Title I, II, V etc.	CDS code	Student demographic, Title I, III, V, Part A, Immigrant, LEP, funding model, charter status, Gradespan, participants	School, District, County	CALPADS (planned)
Early Childcare Systems	CD-801A,B, CDMIS, Special Education Desired Result System SEDRS, and CD 9600	SSID	Child demographics, IEP flag, family identification/case number, household name, type of program, DRDP Desired Result Development Profile, Early Childhood Environment Rating Scale ECERS	Student	None
CASAS TOPSPro	Comprehensive Adult Student Assessment Systems. System for tracking Students in Adult Education Programs	ADA ID, SSID, CASAS no	Student demographics, Agency, instruction level and program, assessment scores, date of entry, reason for exit, class number, attainable goal within program year	Student	Assessments

Source: Respective CDE departments

High level system profiles of non-CDE collections

NOT EXHAUSTIVE

System name	Description	Key identifier	Data categories	Granularity	Data sharing
CPEC	California Post Secondary Education Commission. Data system for Higher Ed- post secondary systems	Student ID based of SSN	Demographic, IEP, grade level, program, Graduation rate, teacher, institution	Student	CDE, CSU, UC,CCC, prison, census
UC CSS	Corporate Student System provides information on student enrollment and performance for University of California campuses	SSN	Student demographic, income, financial aid, education history, assessment	Student	CDE, CCC, Cal-PASS
CCC COMIS	California Community Colleges Management Information System. COMIS data is used to prepare reports for Federal and State reports including Integrated Postsecondary Education Data System (IPEDS) and to track student outcomes	SSN, Student ID	student demographic, income, financial aid, education history, assessment, teacher, institution	Student	Cal-PASS, CPEC, CSU, EDD, National Student Clearinghouse
CSU ERS	Enrollment Recording System is used by Cal State to track student retention and graduation to support regular term reports, IPEDS, and state budget requests	SSN	Student demographic, financial aid, education history, assessment	Student	CPEC, Cal-PASS, CCC
CDPH	California Department of Public Health. System use to track	CDPH ID	Case ID and demographics, clinical and diagnostic data	Case	None
EDD	Employment Development Database	ID based of SSN	Wages, payroll taxes, unemployment tracking, job matching, job training	Employee	Franchise tax, benefits system, CCC

Source: Respective agencies, RAND

Appendix E:
Cost estimates

Contents

Initiatives are grouped into projects for cost estimation (1/2)

For cost estimation, **initiatives are divided into projects based on** whether they:

1. Can be completed as separate projects (e.g. developing inter-system IDs needs to be completed as part of the same project that links data systems, whereas portal development can be completed separately)
2. Potentially require different vendors
3. Have different end-user functionality

No cost estimates made for overall governance projects, which will require setting up a decision-making and leadership organization around some of the new data systems (1.3, 1.5, 2.7, 3.4, 3.5, 3.7, 4.6, 5.3, 5.8, 8.7, 8.10, 8.11, 7.7-7.10, 6.4, 6.5, 6.7-6.9, 9.5, 9.7, 10.6, 10.7, 10.8; 1.6, 2.8, 3.6, 4.5, 5.4, 5.5, 8.9, 6.6, 9.6, 10.5)

Project	Description	Step	Initiative
A	**Data quality**	1	
A1	Provide data quality tools to counties/districts for key systems; improved collection interfaces; create a culture of improved data collection	1	1.1, 1.2, 1.4, 1.7 - 1.10, 7.3
B	**Linkages**		
B1	Connect K12 data systems; develop a data dictionary	1	1.3, 7.1, 9.1, 9.2, 9.4
B2	Connect Pre-K to CALPADS	2/3	9.4, 10.3
B3	Connect CALPADS to employment and higher-ed systems; develop data dictionary for higher-ed systems, linking inter-system IDs		9.1, 9.2, 9.4
	Connect CALPADS to foster care, health, criminal justice, and social services systems ; develop a data dictionary, linking inter-system IDs	2/3	
B4	Link EdJoin to other data systems	2/3	8.6, 9.2, 9.4
B5	Connect CALPASS to CDE systems via SOA layer	1	3.2, 7.1, 9.2, 9.4
C	**Data collection**		
C1	Collect additional data elements in CALPADS	1	4.1, 4.2
C2	Collect professional development fields in CALTIDES	2/3	8.4
C3	Standardize a core set of data elements	2/3	7.4
C4	Collect Pre-K data collection on non-state-funded programs	2/3	10.1

Initiatives are grouped into projects for cost estimation (2/2)

Project	Description	Step	Initiative
D	**Online portal**		
D1	Consolidate existing state education reports into a state wide education portal	1	2.1, 3.1, 9.3
D2	Improve accessibility of School Accountability Report Card (SARC)	1	2.2
D3	Standardize education report 'look & feel' by developing education data report, school website format standards	1	2.4
D4	Translate state reports, websites into languages commonly spoken in CA	1	2.6
D5	Build interfaces from CALTIDES to program information systems	2/3	7.2
D6	Use web-based forms for CADS application to streamline data collection	2/3	7.3
D7	Enhance existing systems (e.g., EdJoin) that match teacher candidates with open positions	2/3	8.6
E	**Infrastructure**		
E1	Enhance last mile network bandwidth	1	2.5
F	**Tools, applications**		
F1	Provide ongoing student classification tools to schools & districts (e.g. EL, speech-impaired)	1	3.3
F2	Provide local agencies with a formative assessment item bank; provide links to standards & curriculum	1	5.1, 5.2
F3	Enhance the ability of schools and districts to assess effectiveness of local initiatives using a model like CalPASS	1	3.2, 7.6
F4	Develop (1) web surveys that track effectiveness in developing a climate of teaching and learning, and (2) web-enabled opt-in survey templates	1	3.4, 8.5
F5	Ensure individual school, district, and state performance by subject and subgroup is transparent	1	2.3
F6	Create a PD system	2/3	8.1, 8.2
F7	Develop easy-to-use standardized state-wide assessments on kindergarten readiness	2/3	10.2
G	**Best practice sharing**		
	Create a best-practice sharing system; launch regional online forums	2/3	7.5, 6.1-6.3, 10.4
H	**PMO & training**		1.9, 2.10,2.11, 4.6, 5.6, 5.7

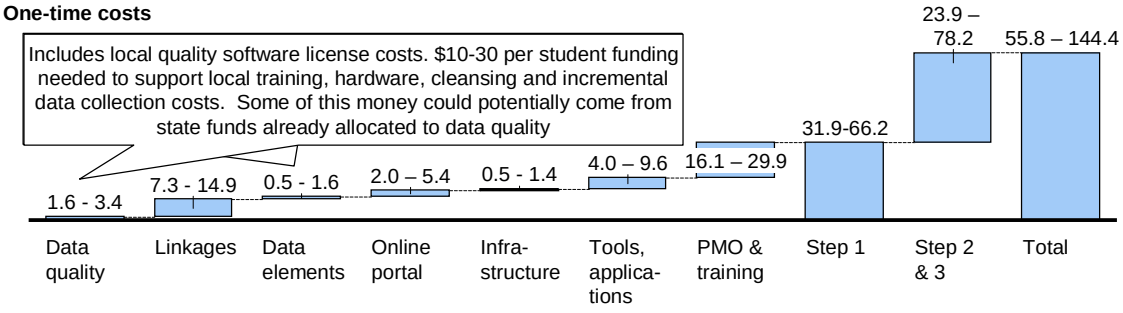
Cost model assumptions

- Cost estimates will be ranges intended to give direction on expected investment, but are not substitutes for vendor responses
- Costs will be fully loaded, including project management and oversight
- For large system development, hardware costs have been estimated, but for smaller costs, hardware needs are assumed to be borne by existing servers
- Funding sources will be important for the overall model, but we will focus on costs and, to some extent, savings
- Cost estimation will focus on 'Stair step 1' recommendations
- Cost estimation will not address funds needed to upgrade legacy systems
- Costs will be estimated only for the state, and not for schools or districts, and the cost of fulfilling mandates will not be estimated

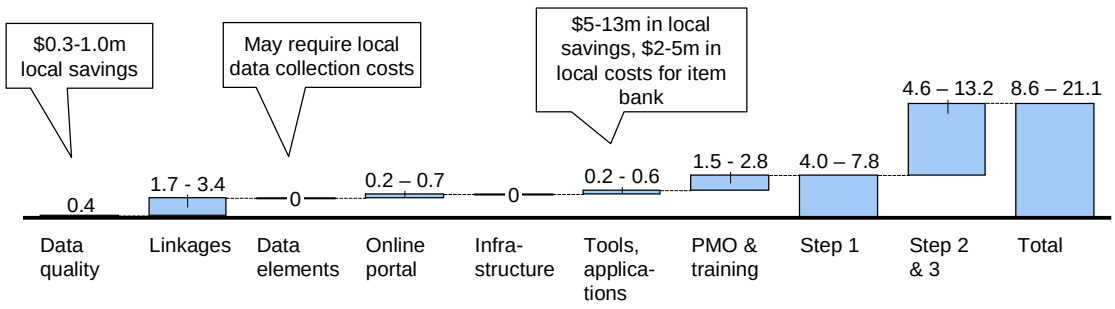
Step 1 recommendations will cost state $32-66m in one-time costs and $4-8m in ongoing costs

Dollars, millions

One-time costs



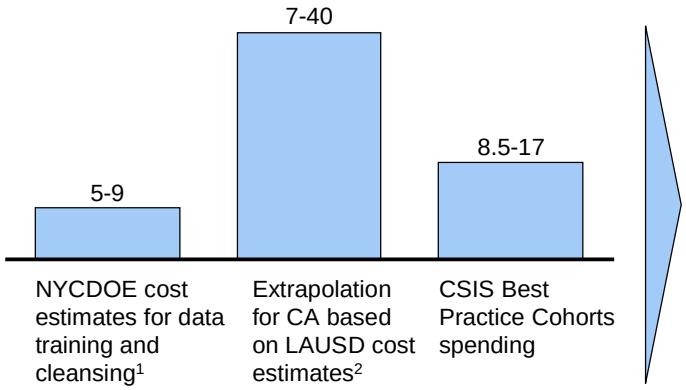
Ongoing costs



Source:McKinsey team analysis

$10-30/student needs to be spent on local data quality improvement and training

Local data quality improvement cost estimates
$, million

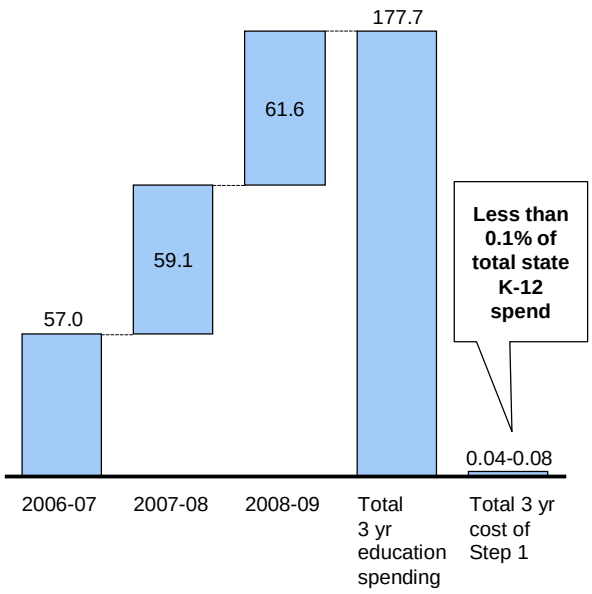


- **~$10-30/student needs to be spent on local data quality improvement**
- **Some of the funding for these needs could potentially come from funds already designated for data quality initiatives at the local level**

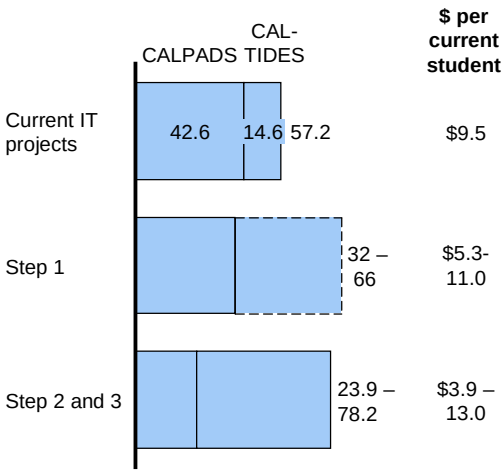
1 Based on unit cost of $50-70/ educators/ administrator. Assuming CA has 400K educators and administrators. Data scrubbing costs are 50-100% of data training costs
2 Based on assumptions that a) 0.8-2.1% of ~250 elements need cleansing, b) 4-8 weeks of cleansing time is needed in large districts (>19 schools) and 2-3 weeks in remaining districts, FTE costs is $150K
Source: McKinsey team analysis, CDE, LAUSD, NYCDOE, NHDOE, TNDOE

Cost of recommendations is reasonable compared to CA education spending and other CDE IT projects

Step 1 recommendations will only account for <<1% of 3 yr CA education spending budget
Education spending, $ billions



Step 1 recommendations will entail similar costs to current IT projects
One-time and ongoing costs through 2010/11, $ millions



Source: McKinsey team analysis, CDE

Many Step 1 activities do not require significant costs

	Project / activity description	Funding required*
Year 1 projects / activities	• **Data quality (A1)**: In year 1, internal FTE time can be allocated towards: – Defining data rules, developing data dictionaries – Planning enhancements to data interfaces – Enhancing field data audits	$200,000 – 400,000
	• **CDE linkages (B1):** In year 1, FTEs can begin project planning in advance of hiring external vendor to develop linkages (excludes project management)	$40,000 – 80,000
	• **Improve the accessibility of the School Accountability Report Card (D2):** Project can be completed in year 1	$250,000 – 500,000
	• **Ensure school performance is transparent by subject area (F5):** Project can be completed in year 1	$90,000 – 160,000
	• **Survey items and templates (F4):** In year 1, FTEs can begin project planning (defining content, structure survey items, templates) in advance of hiring vendor	$45,000 – 90,000
	• **Translate state reports, websites (D4)**: Translation of state reports, websites can begin immediately	$80,000 – 150,000
	• **TOTAL**	**$705,000 – 1,380,000**
Selected year 2-3 projects / activities	• **Student classification tools (F1):** Project can be completed in year 1	$60,000 – 170,000
	• **Enhance CAL-PASS (F3):** Project can be completed in year 1	$790,000 – 1,130,000
	TOTAL	**$850,000 – 1,300,000**

* Costs exclude project management costs

Source: Team analysis

Many estimated costs can be avoided by leveraging existing state resources (1/2)

Dollar, millions

Project	Item	Potential state resource	$ avoided	$ remaining in project
All projects	Server / storage capacity	State will require ~20-40 2 CPU servers for projects, capacity which is likely available within existing state resources	$0.8 – 2.4	n/a
All projects, excluding training	Internal FTEs	While some projects will require hiring additional FTEs, most support of project developments will be done by existing staff	$4.0 – 8.0	n/a
Education portal (D1)	ID management	Centralized state ID management, to be rolled out ~2010	$0.1 – 0.3	$1.0 – 3.2
PMO & training (H)	Teacher training	Various sources may account for ~25-35% of training costs • Leverage existing resources allocated to teacher training (CSIS); 20% of effort • CTAP resources • LEA training capacity	$3.0 – 8.0 (one-time) $0.3 – 0.8 (ongoing)	$12.0 – 20.0 (one-time) $1.2 – 2.0 (ongoing)
Data quality and data collection (A1, C)	Data stewards, trainings, or other necessary local costs	Resources have already been extended ($8.51) to ~1000 LEAs; additional resources are likely required to bring all LEAs up to CALPADS reporting standard, but resources already allocated can be leveraged for data quality, collection initiatives	TBD	TBD
Total			**(cont.)**	

Source: McKinsey team analysis, CDE

Many estimated costs can be avoided by leveraging existing state resources (2/2)

Dollar, millions

Project	Item	Potential state resource	$ avoided	$ remaining in project
Connectivity (E1)	Annual costs to subscribe to T1, T3 lines for under-connected schools / districts	Imperial County already has been allocated resources that should cover this expense	$0.3 – 0.6 (ongoing)	n/a
Formative assessments (F2)	Content for item banks	Leverage already existing formative assessment content at the local levels, that could be uploaded and shared state-wide w/o licensing costs; would forego local spending on item bank licensing	n/a	n/a
Survey items and templates (F4)	Survey items	Textbook publishers already provide ongoing assessment tools to districts, schools	$0.8 – 1.3	$0
Total			**$9.1 – 21.4**	

Source: McKinsey team analysis, CDE

Several recommendations include a potential for state mandate costs

Project	Item
Data collection	Data stewards, trainings, or other necessary local costs
Revise state reporting formats (state report cards)	Revise recommended reporting formats used by the state
Data quality	Data stewards, trainings, or other necessary local costs

Source: CDE; team analysis

Step 1 projects one-time funding needs schedule

USD Millions

APPROXIMATE

IT projects	Total	Jan – Jun 09	FY10	FY11	Remaining one-time costs
A Data quality	1.6 – 3.4	0.3 – 0.6	1.3 – 2.8	-	-
B Linkages & system integration (K-12 only in Step 1)	7.3 – 14.9	0.06 – 0.12	2.4 – 5.0	3.4 – 6.9	0.9.– 2.9
C Data elements	0.5 – 1.6	-	0.5 – 1.6	-	-
D User interface & portal	1.9 – 5.4	0.3 – 0.6	0.9 – 2.8	0.4 – 1.2	0.3 – 1.0
E Infrastructure	0.5 – 1.4	-	-	0.5 – 1.4	-
F Tools and applications	4.0 – 9.6	0.6 – 1.0	2.0 – 5.4	0.2 – 0.6	1.2 – 2.6
H PMO and Training	16.1 – 30.0	0.2 – 0.5	5.4 – 10.0	5.4 – 10.0	5.1 – 9.5
TOTAL	**31.9 – 66.2**	**1.6 – 2.7**	**12.4 – 27.6**	**10.3 – 20.4**	**7.5 – 15.4**

Source: Team analysis

Step 1 projects operating costs

USD Millions

APPROXIMATE

IT projects	Jan – Jun 09	FY10	FY11	Ongoing costs
A Data quality	-	-	0.4	0.4
B Linkages & system integration (K-12 only in Step 1)	-	-	0.5 – 1.1	1.7 – 3.4
C Data elements	-	-	-	-
D User interface & portal	0.1 – 0.2	0.1 – 0.2	0.2 – 0.7	0.2 – 0.7
E Infrastructure	-	-	-	-
F Tools and applications	-	-	0.2 – 0.6	0.2 – 0.6
H PMO and Training	-	-	-	1.5 – 2.8
TOTAL	**0.1 – 0.2**	**0.1 – 0.2**	**1.4 – 2.8**	**4.0 – 7.8**

Source: Team analysis

Contents

Project A1: Data quality (1.1, 1.2, 1.4, 1.7 - 1.10*)

Local costs

Scenario 1
- Purchase of low end, even open-source software solutions to embed in state collections

Scenario 2
- State-hosted advanced data profiling tools that enables local use of these tools for automatic scrubbing of local data inputs for prospective data cleansing
- Improved data input interface (auto-fill, auto-suggest)
- Clean historical (e.g., past 5 years) data

Scenario 3
- Use of high end customized data quality software that is embedded in state collections

	Description	Cost & range
External FTEs	• 3-5 FTEs, 9-12 months for design and development of data input interface as well as custom installation of quality checking tools	• **One-time**: $680,000 - 1,500,000
Internal FTEs	• 8-10 internal data analysts, one for each data system, 20% time commitment to support data/ functionality definition (e.g., a list of drop down values in "auto suggest"); 2-3 FTEs, 50% allocated, to support development • Existing local level support for data scrubbing of historical data	• **One-time**: $410,000 - 750,000 • **Ongoing**: $210,000 - 450,000
	• $10-30 per student funding needed to support local training, hardware, cleansing and incremental data collection costs (includes costs from project C1). Some of this money could potentially come from state funds already allocated to data quality (e.g., CSIS best practice cohort funds of $8.51 per student)	
Software	• Licensing of data quality tools for profiling and reasonability checks; will allow local use, but will accrue as a cost to the state; based on an approximate cost of $180 / year / seat, with 3 seats for larger districts, 2 for medium sized districts, and 1 for the smallest	• **Ongoing**: $240,000 - 300,000
Hardware	• Leverage existing hardware for storage, server requirements	
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $540,000 – 1,130,000 • **Ongoing**: $230,000 – 380,000
Savings	• Reduction in number of man-hours required at the district level to go back and forth on data quality with the state	• **Ongoing**: $380,000 - 750,000
	• Reduced state time monitoring districts (~2-5 FTEs)	• **Ongoing**: $300,000 - 750,000
State total		• **One-time**: $1,630,000 - 3,380,000 • **Ongoing:** $380,000

* Also includes 7.3; the interfaces built in step 1 in conjunction with data quality interfaces, but will be used for additional purposes in a later step

Source: CDE, McKinsey expertise; Departments of Education from NY, TN, SC; selected LEA interviews

Project B1: Integrate CDE systems (1.3*)

Scenario 1
- Purchase of low end or open-source Enterprise Service Bus software solutions to reduce the development effort

Scenario 2
- Create a SOA layer to connect 6 CDE data systems
  - Step 1: CALPADS, CALTIDES, CASEMIS
  - Step 2: CASAS, ConApp, SACS
- Develop data dictionary for each of these systems. Start by including data definitions for at least the core data elements and then expand to all data elements

Scenario 3
- Custom development (ETL, hand-written) would cost 3-5x development cost

	Cost description	Cost & range
External FTEs	• Initial pilot to integrate 2 systems requires ~9 months; later projects can be done simultaneously with ~6-8 systems, integration will take about 3 yrs** • 4-8 external FTEs for 3 years to (1) develop data dictionary and (2) create internal data linkages and implement solution	• **One-time**: $3,600,000 - 7,200,000
Internal FTEs	• 8-10 internal FTEs, one per data system, at 50% capacity, for 6-9 months per data system to support in development of data dictionary, develop sourcing strategy to avoid duplicate collection • Ongoing system maintenance	• **One-time**: $300,000 - 560,000 • **Ongoing**: $900,000 - 1,800,000
Software	• Enterprise Service Bus (ESB) software from enterprise class software vendor, based on the cost for ~10 server license / installation • No local costs; modification by vendors of local data input systems will be part of ongoing maintenance contracts districts have with their individual vendors	• **One-time**: $200,000 – 500,000 • **Ongoing**: $50,000 – 130,000
Hardware	• 4-6 2-CPU servers – for integration server, application/ data server for data layer development, testing, and production (leverage existing hardware capacity); 100 – 200 GB of storage	• **One-time**: $120,000 – 310,000
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $2,110,000 – 4,280,000 • **Ongoing**: $480,000 – 960,000
Savings	• Reduced time and cost effort in analyzing data from multiple agencies • Greater accuracy of analysis	
State total		• **One-time**: $6,130,000 - 12,570,000 • **Ongoing**: $1,430,000 - 2,890,000

* Also includes the portion of 7.1 that references SSID creation, and the portions of 9.1, 9.2, and 9.4 that reference CDE system linkages
** Assumes all systems listed in scenario description are envisioned as remaining in the end state

Source: McKinsey expertise, SW vendor, Forrester

Project B5: CalPASS linkages (3.2)

Scenario 1
- Purchase of low end or open-source Enterprise Service Bus software solutions to reduce the development effort

Scenario 2
- Connect CalPASS to CDE systems via SOA layer
- Develop data dictionary for each of these systems. Start by including data definitions for at least the core data elements and then expand to all data elements

Scenario 3
- Custom development (ETL, hand-written) would cost 3-5x development cost

	Cost description	Cost & range
External FTEs	• 4-5 external FTEs for 6-9 months to (1) develop data dictionary and (2) create internal data linkages and implement solution	• **One-time**: $600,000 - 1,130,000
Internal FTEs	• 1-2 internal FTEs, one per data system, at 10% capacity, for 6-9 months per data system to support in development of data dictionary, develop sourcing strategy to avoid duplicate collection • Ongoing system maintenance	• **One-time**: $10,000 - 20,000 • **Ongoing**: $150,000 - 280,000
Software	• Enterprise Service Bus (ESB) software from enterprise class software vendor, based on the cost for 1-2 servers license and installation	• **One-time**: $20,000 – 50,000 • **Ongoing**: $10,000 – 30,000
Hardware	• 1-2 2-CPU servers – for integration server, application/ data server for data layer development, testing, and production (leverage existing hardware capacity); 100-200 GB of storage	• **One-time**: $30,000 - 110,000
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $330,000 – 680,000 • **Ongoing**: $80,000 – 150,000
Savings	• Reduced time and cost effort in analyzing data from multiple agencies • Greater accuracy of analysis	
State total		• **One-time**: $970,000 - 1,890,000 • **Ongoing**: $230,000 - 430,000

Source: McKinsey expertise, SW vendor, Forrester, CDE

Project C1: Expand existing data systems (4.1, 4.2)

Scenario 1

- Open standards based platform, most of the data already collected at local levels, SIF vertical reporting exists at the local levels, well defined metadata repository that lists data definitions and their relationships

Scenario 2

- Addition of ~20 core data elements in CALPADS, CALTIDES and ConApp
- Time required for data system enhancement could vary based on system complexity (e.g., OS/ data base/ hardware platform), internal resource capability/ capacity, ease of data capture at the local level itself

Scenario 3

- Legacy platform at state level, data not captured at the local district level data systems, no SIF based vertical reporting at local levels, no metadata repository that lists data definitions and their relationships

	Cost description	Cost & range
External FTEs	• For each data systems (CALPADS, CALTIDES and ConApp), – 1 business/data analyst for ~data description/ variances, business rules definition for 1 week; 1 data modeler for 1 week – 2 programmers for 1-3 months	• **One-time**: $290,000 – 1,040,000
Internal FTEs	• 4 data analyst FTEs, 10% allocated for duration of project on data taxonomy • $10-30 per student funding needed to support local training, hardware, cleansing and incremental data collection costs (includes costs from project A1). Some of this money could potentially come from state funds already allocated to data quality (e.g., CSIS best practice cohort funds of $8.51 per student)	• **One-time**: $10,000 - 20,000
Software	• No state-allocated funds estimated, as existing maintenance contracts for local SISs should cover the adjustments; in some cases there may be incremental costs to make changes to data collection / input systems	
Hardware	• No significant incremental hardware costs	
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $150,000 – 530,000
Savings		
State total		• **One-time**: $450,000 – 1,590,000

Source: McKinsey expertise, TN Department of Education

Project D1: Education portal (2.1, 3.1*)

Scenario 1

- Low end/open source portal servers
- Leverage portal servers that are based on per CPU pricing to leverage lower costs compared with per user license
- Leverage state investments in ID management system

Scenario 2

- Integrated statewide portal that has canned reports, parameterized reports, school / students / teachers / administrators profiles
- Basic enterprise portal servers as base case supporting canned/parameterized reporting, ad-hoc reporting, profiles, basic search

Scenario 3

- High end: advanced search, complex workflow capabilities
- Advanced capabilities include advanced statistical analysis, KM and collaboration (both in subsequent phases)

	Cost description	Cost & range
External FTEs	• Custom developed, Java based • 4-6 external FTEs – 6-9 months	• **One-time**: $600,000 - 1,350,000
Internal FTEs	• 3 FTEs (internal) - 50% (3-6 months) for portal user interface design • Focus groups of users (e.g., 2 groups of 10-15 educators, administrators, parents/ community etc) for usability testing	• **One-time**: $60,000 - 120,000
Software	• Application server ($30,000 - $100,000) for 4-8 CPU servers • Database server ($20,000 - $30,000 / CPU) for 4-8 CPU servers	• **One-time**: $200,000 - 1,040,000 • **Ongoing**: $50,000 – 260,000
	• Security (ID management) and license subscription**	• **One-time**: $100,000 - 200,000 • **Ongoing**: $40,000 – 120,000
Hardware	• 4-8 2-CPU servers; 100-200 GB storage capacity	• **One-time**: $120,000 - 410,000
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $540,000 – 1,560,000 • **Ongoing**: $40,000 – 190,000
Savings		
State total		• **One-time**: $1,620,000 – 4,680,000 • **Ongoing**: $130,000 – 570,000

* Also includes the portion of 9.3 that references integrating data systems into the education portal; will likely apply to only the internal CDE systems, which may have completed their data linkage projects

** ADS cost for ID management may be able to be avoided by leveraging state ID management capabilities, to come online ~2010

Source: McKinsey expertise, Gartner, Forester, CDE

Project D2: Improve the accessibility of the School Accountability Report Card (SARC) (2.2)

Scenario 1
- Development of a template for data reporting, including the development of an interactive web capability (forums, etc.) to give feedback (SARC)

	Cost description	Cost & range
External FTEs	• 3-4 FTEs, 3-4 months for... – External development of a new template, design of web features and feedback capability – Revision of user guides	• **One-time**: $150,000 – 300,000
Internal FTEs	• 1FTE, 4-6 weeks for overview of template design	• **One-time**: $11,500 - 17,000
Software		
Hardware		
Project management	• 50% of the cost of the rest of the project, covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $80,000 – 160,000
Savings		
State total		• **One-time**: $250,000 – 500,000

Source: McKinsey expertise, CDE

Project D3: Standardize the "look and feel" of education reports (2.4)

Scenario 1
- External development a template for data reporting, will be a small-scale effort, perhaps one technologist and one familiar with the state's business logic

	Cost description	Cost & range
External FTEs		
Internal FTEs	• 2-4 months, 2 FTEs (one business, one technologist)* • May include costs for LEAs to update their local sites and infrastructure that have not been estimated	• **One-time**: $50,000 - 100,000
Software		
Hardware		
Project management	• 50% of the cost of the rest of the project, covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $30,000 – 50,000
Savings	• Less time spent at the local level independently developing data reporting formats, or copying a complicated state reporting format	
State total		• **One-time**: $80,000 - 150,000

Source: McKinsey expertise, CDE

Project D4: Translate state reports, websites (2.6)

Scenario 1
- Translate state reports, websites into languages commonly spoken in CA
- Approximately 5 languages, and will likely be done by internal staff

	Cost description	Cost & range
External FTEs		
Internal FTEs	• 5 internal state FTEs working for 2-3 months a year on an ongoing basis to translate state reports, websites into the ~5 languages most commonly spoken in CA	• **Ongoing**: $80,000 - 150,000
Software		
Hardware		
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $40,000 – 80,000
Savings		
State total		• **Ongoing**: $120,000 - 230,000

Source: McKinsey expertise, CDE

Project E1: Enhance last mile network bandwidth (2.5)

Scenario 1
- Roll out connectivity upgrades to a small number of districts and schools with low connectivity levels

Scenario 2
- Upgrade ~100 schools to T1 or 54kbps wireless connection and ~500-1000 schools to T2 connection
- This enhancement is in addition to upgrade planned by K12 HSN project

Scenario 3
- State-wide roll-out of connectivity upgrades

	Cost description	Cost & range
External FTEs		
Internal FTEs	• 2-3 internal FTEs, 5%-10% capacity, 1-2 months, to plan roll-out of upgrades	• **One-time**: $20,000 - 50,000
Software		
Hardware	• C12HSN plan has ~$5 million for hardware upgrades for connectivity • Upgrade ~100 schools to T1 networks (~$300 / per) • Upgrade ~500 – 1000 schools to T3 networks in a phased manner (~$600 / per)	• **One-time**: $320,000 – 860,000
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $170,000 – 450,000
Savings	• Improved productivity from better network connectivity • Potential savings from state centralized negotiation of upgrade purchases	
State total		• **One-time**: $510,000 – 1,360,000

Source: McKinsey expertise, CDE, CVUM, vendor research, K12HSN.org

Project F1: Student classification tools (3.3)

Scenario 1
- Basic Excel Macro that is pushed out to local districts or posted on CDE website for local downloads

Scenario 2
- Full web-based implementation of categorization tools; all of the assessment data will be local, and just the business rules/ calculation engine will be developed centrally

Scenario 3
- BI tools that enable "goal seek" capability, with advanced algorithms for forecasting/ predictive modeling

	Cost description	Cost & range
External FTEs	• 1-2 programmer FTEs to develop tool, working for 2-3 months	• **One-time**: $50,000 – 150,000
Internal FTEs	• 1 data analyst FTE working for 2-3 months at 25%, supporting in development of business logic	• **One-time**: $10,000 - 20,000
Software		
Hardware	• No hardware costs, unless systems are based on BI software	
Project management	• 50% of the cost of the rest of the project, covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $30,000 – 80,000
Savings		
State total		• **One-time**: $90,000 – 250,000

Source: McKinsey expertise, CDE, Just for the Kids

Local costs

Project F2: Formative assessment item bank (5.1, 5.2)

Scenario 1
- Open source tools for item collection and retrieval (e.g. Lucene for item retrieval, TBD open source sw for item collection)

Scenario 2
- Provide formative assessment capabilities to districts and schools on an opt-in basis
- Provide links between formative assessment, standards, curriculum, coursework and best practices that are related to the content of the items and assessments

Scenario 3
- Purchase external vendor item bank
  - ~$6-8 million set-up (TN)
- Purchase scoring engine from 3rd party vendor

	Cost description	Cost & range
External FTEs	• 9-12 external FTEs for 6-12 months to: – Development and customization of open-source software to capture, structured (e.g. .doc, .xls files) and unstructured items (e.g. through web-based forms) as well as develop item search capabilities – Develop a flexible store to enable capture and analysis of scores – Integration of open-source solution item bank to other existing state portals • Ongoing costs will vary significantly depending on pricing scheme; costs needed to continue licensing out sharing portal, assessment center	• **One-time**: $1,200,000 – 3,600,000
Internal FTEs	• 2-3 internal FTEs, 50% capacity, for 6-12 months • 1-3 ongoing FTEs at 50% capacity	• **One-time**: $80,000 - 230,000 • **Ongoing**: $80,000 - 230,000
Software	• Low-cost license software for (1) search (e.g. Google Appliances) , and (2) capturing structured, unstructured items • Licensing of item bank will cost $1.00 - $2.00 / student, based on penetration*	• **One-time**: $20,000 - 30,000 • **Ongoing**: $2,000,000 - 5,000,000
Hardware	• 4-6 2-CPU servers – for development, testing, and production (may be able to leverage existing hardware capacity); 100-200 GB storage	• **One-time**: $120,000 – 300,000
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $710,000 – 2,080,000 • **Ongoing**: $40,000 – 110,000
Savings	• State contract could be $1-2 / student, v. $5 - $10/student now; assumes 50% of current users switch to state contract** • Schools / districts will save time in setting up formative assessment databases	• **Ongoing**: 5,000,000 – 13,000,000
State total		• **One-time**: $2,130,000 - 6,240,000 • **Ongoing**: $120,000 – 340,000

* May not accrue as a cost if the state decides to leverage strictly in-house items, developed and uploaded by schools and teachers
** Assuming that 20-35% current use an item bank, and that with a state contract ¼ of those subscribers + 20% switch to state contract
Source: CDE, McKinsey expertise; Departments of Education from NH, TN, SC; selected LEA interviews

Project F3: Enhance CalPASS (3.2b, 3.2c*)

Scenario 1
- Enhance CAL Pass to provide schools, districts with initiative effectiveness assessments, incl financial & HR data for ~25-30 additional data elements
- Enhance a Cal-PASS-like portal to provide end users access to advanced analytic capabilities on their own data

	Cost description	Cost & range
External FTEs		
Internal FTEs	Program CALPASS to collect additional elements • 1 business/data analyst for ~data description/ variances, business rules definition for 1 week; 1-2 data modeler for 3-6 months • 4 programmer/analysts for 9 months – 1 year to customize tools • Local resources to collect data, but as they will be optional, no costs are estimated; core elements for CALPASS will be populated from CALPADS	• **One-time**: $530,000 – 750,000
Software	• None – additional data fields can be collected via existing software support systems • Leverage open source ETL/OLAP tools	
Hardware	• No significant incremental hardware costs	
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $260,000 – 380,000
Savings		
State total		• **One-time**: $790,000 - 1,130,000

* Also includes 7.6

Source: McKinsey expertise, CDE

Project F4: Survey items and templates (3.4*)

Scenario 1
- Use low-cost platforms for survey items
- State to recommend content for survey, provide standard items

Scenario 2
- Develop additional web survey items and opt-in survey templates
- Internal support of external development effort

	Cost description	Cost & range
External FTEs	• External FTEs to design and develop survey platforms (4-6 people, 4-6 months)	• **One-time**: $400,000 – 900,000
Internal FTEs	• Internal FTEs will define the survey frameworks (5-6 FTEs, 50% allocated, 6 months time); includes defining the survey framework as well as supporting data analysis • Groups to conduct usability tests (5-6 FTEs, 25% allocated, 1-2 months), supported by stakeholder focus group meetings • 1-2 FTEs, 50% allocated on ongoing basis to support district use	• **One-time**: $140,000 – 260,000 • **Ongoing**: $80,000 – 150,000
Software	• No additional costs – will be locally hosted	
Hardware	• No additional costs – will be locally hosted	
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $270,000 – 580,000 • **Ongoing**: $40,000 – 80,000
Savings		
State total		• **One-time**: $810,000 – 1,740,000 • **Ongoing**: $120,000 – 230,000

* Also includes 8.5

Source: McKinsey expertise, CDE

Project F5: Ensure school performance is transparent by subject area (2.3)

Scenario 1
- Revise API to include subject matter reporting by subgroup
  - Math, Science, Social Science, English, etc.; API currently only reports aggregate school results, and results by student type

	Cost description	Cost & range
External FTEs		
Internal FTEs	• 2-4 months, 3 FTEs (two programmers, one programmer to re-do website interface) • 1 FTE, 4 weeks, to re-write user guides to the API • It may take ~1 year+ to get revisions through approval process	• **One-time**: $80,000 - 150,000 • **One-time**: $10,000 - 20,000
Software		
Hardware		
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $40,000 – 80,000
Savings		
State total		• **One-time**: $130,000 - 250,000

Source: McKinsey expertise, CDE

Project H: PMO and trainings (1.9, 2.10, 2.11, 5.6, 5.7, all)

Scenario 1
- Establish PMO for data architecture project management
- Training allocation for 'how to use' training; adopt a 'train-the-trainer' model of asking teachers to distribute state trainings to their schools

	Cost description	Cost & range
External FTEs		
Internal FTEs	• 1-2 full FTEs to manage overall project, fully allocated for three years • 8-12 FTEs involved in leadership capacity at 10% allocation for three years	• **One-time**: $450,000 - 900,000 • **One-time**: $360,000 - 540,000
	• One-time training cost of ~$50-$70 / user (e.g., teacher, administrator), allocated over three years; ongoing cost of 10% of one-time cost annually to refresh original trainings • Will cost $2.25-4.50 / student	• **One-time:** $15,000,000 - 28,000,000 • **Ongoing:** $1,500,000 - 2,800,000
Software		
Hardware		
Project management		
Savings		
State total		• One-time: $15,810,000 - 29,440,000 • Ongoing: $1,500,000 - 2,800,000

Source: CDE, McKinsey expertise; Departments of Education from NY, TN, SC; selected LEA interviews

Funding requirement details (1/3)

USD Thousands

IT projects	Year	Activities / description
(A) Data quality	Jan – Aug 09	• Internal FTEs to begin working on defining data rules, developing data dictionaries, planning enhancements to data interfaces, enhancing field data audits
	FY10	• Hire external vendors to begin developing, implementing business rules, designing interface • Implement data scrubbing
	FY11	• Ongoing cost requirements, though none are estimated to accrue to the state – Local data stewards – State-level employees to assist in implementation; however, data quality tools should actually result in freeing up time for state FTEs on an ongoing basis
(B) Linkages & system integration	Jan – Aug 09	• Internal FTEs can allocate time to planning data system integration efforts in advance of hiring integration vendor
	FY10	• Kick-off CDE data system linkages efforts, hire vendor • Complete integration of a few systems • Purchase software licenses, hardware
	FY11	• Continue full effort (Y3) for CDE system linkages • Begin system maintenance ongoing costs for any completed system linkages • Kick-off CALPASS data system linkages project

Source: Team analysis

Funding requirement details (2/3)

USD Thousands

IT projects	Year	Activities / description
(C) Data elements	Jan – Aug 09	• None
	FY10	• Programming of CDE systems to accept additional data allocation • Roll out of any needed systems to LEAs to begin data collection
	FY11	• First year of local data collection, which may include significant data collection costs • State internal support of LEA collection efforts
(D) User interface & portal	Jan – Aug 09	• SARC revisions • Standardization of state reporting formats • Translation of state reports and websites (ongoing)
	FY10	• Develop education data portal
	FY11	• Ongoing costs, including support costs for rolled out education portal

Source: Team analysis

Funding requirement details (3/3)

USD Thousands

IT projects	Year	Activities / description
(E) Infrastructure	Jan – Aug 09	• None
	FY10	• None
	FY11	• Roll-out "last-mile" network connectivity upgrades state-wide
(F) Tools and applications	Jan – Aug 09	• CAL-PASS enhancements • Internal FTE time to plan survey item content, structure • Include subject-level transparency in the API
	FY10	• Formative assessment item bank (6 month effort) • Create, roll-out student classification tools • Develop, roll-out survey items
	FY11	• Ongoing costs to support survey items, formative assessment item bank, student classification tools
(H) PMO and training	Jan – Aug 09	• Project management will need to begin oin year 1
	FY10	• One-year of project management costs • Training efforts should kick off in year 2, and are planned to last for 3 years, so 33% will accrue in year 2
	FY11	• One-year project management costs • Continued training efforts (33% of one-time allocation)

Source: Team analysis

Contents

Step 2, 3 projects (1/6)

Project	Description	Estimate rationale	Estimate
B2	**Develop Pre-K data system linkages** **9.2 - Develop 'translatable' identifiers in all state systems to enable them to link in the data service layer** • Ensure that each participating system has a record identifier that is based on common fields that enable its translation to other systems. It is not necessary to capture SSN in all participating systems • Ensure SSIDs are captured for all students at the PreK level itself **9.4 - Include a common data dictionary for relevant data elements starting with the core elements of the P-20 systems, as described in recommendation #1.3.** Develop this dictionary in a phased manner as linkages are developed for non-state education systems **10.3 - Develop linkages from PreK to CALPADS for core elements** mentioned above	20-30% of cost of B11 • Connects 1 system instead of 8 • However, linkage to external system is ~2x cost	• **One-time**: $1.3 – 3.9 mil • **Ongoing**: $0.3 – 0.9 mil
B4	**Develop EdJoin data system linkages** **8.6 - Enhance EdJoin functionality** and make it more user-friendly • Develop linkages with CCTC (for auto upload of teacher credentials), CALTIDES (transfer of transcripts), and higher education (candidate transcripts) **9.2 - Develop 'translatable' identifiers in all state systems to enable them to link in the data service layer** • Ensure that each participating system has a record identifier that is based on common fields that enable its translation to other systems. It is not necessary to capture SSN in all participating systems • Ensure SSIDs are captured for all students at the PreK level itself **9.4 - Include a common data dictionary for relevant data elements starting with the core elements of the P-20 systems, as described in recommendation #1.3.** Develop this dictionary in a phased manner as linkages are developed for non-state education systems	50-60% of cost of B11 • Involves 4, not 8 systems • Linkage involving external systems is more complex, but CCTC – CALTIDES – Higher-ED linkages are not needed; effects approximately cancel	• **One-time**: $3.2 – 7.7 mil • **Ongoing**: $0.7 – 1.7 mil

Source: CDE, McKinsey expertise; Departments of Education from NH, TN, SC; selected LEA interviews

Step 2, 3 projects (2/6)

Project	Description	Estimate rationale	Estimate
B3	**Develop employment, higher-education, foster care, health, criminal justice, and social services systemsdata system linkages** **9.1 - Link K-12 databases to databases in other agencies in phases: 1) links to higher ed and employment EDD and 2) links to foster care, health, criminal justice, and social services systems.** Links between various CDE data systems have been described in other recommendations**.** Ensure that the integration layer is based on open standards (i.e., Service Oriented Architecture), having: • Global 'translation table' for different identifiers • Identity management "black box" to ensure user role based data privacy and access • Common data dictionary across systems to ensure data can be shared and combined easily • Capabilities for service definition, discovery and message transmission • Hold off from development of a data warehouse unless there are sever performance issues with this approach **9.2 - Develop 'translatable' identifiers in all state systems to enable them to link in the data service layer** • Ensure that each participating system has a record identifier that is based on common fields that enable its translation to other systems. It is not necessary to capture SSN in all participating systems • Ensure SSIDs are captured for all students at the PreK level itself **9.4 - Include a common data dictionary for relevant data elements starting with the core elements of the P-20 systems, as described in recommendation #1.3.** Develop this dictionary in a phased manner as linkages are developed for non-state education systems	200-300% of cost of B11 • Involves ~10, not 8 systems – CALPADS, CALTIDES – CPEC, UC, CSU, CU – EDD – Foster care, health, criminal justice, and social services • Linkages involving external systems is ~2x cost	• **One-time**: $12.7 – 38.6 mil • **Ongoing**: $2.9 – 8.7 mil

Source: CDE, McKinsey expertise; Departments of Education from NH, TN, SC; selected LEA interviews

Step 2, 3 projects (3/6)

Project	Description	Estimate rationale	Estimate
C2	**8.4** - **Enhance scope of CALTIDES** to include candidate characteristics, teacher and administrator performance, professional development, mentorship, and attrition	50% - 100% of cost of C1 • Includes only 1 source of data collection (instructors) vs. two (Pre-K, all students) • ~10% as many teachers as students • Data elements are 3-5x as complicated to collect	• **One-time**: $0.2 – 1.6 mil
C3	**7.4** - **Standardize a core set of data elements** collected across all programs and collect additional data elements identified in 'Data Gaps' section (e.g., curriculum framework name, funds source and funds received)	100% - 200% of cost of C1 • Includes ~2 – 4 types of data collection (instructors) vs. two (Pre-K, all students)	• **One-time**: $0.5 – 3.2 mil
C4	**10.1** - **Enhance existing PreK collections for state and non-state funded programs** • Make SSIDs mandatory. Use the same SSID from K-12 e.g., MN and TX • Enhance existing PreK collections (CDMIS that includes CD-801A, CD-801B and CD-9600) to include data elements such as student ID, race, ethnicity, Gender, protective services, child health, ECERS score, state-wide cognitive assessment e.g., DRDP	100% - 300% of cost of C1 • 2 sources of data (Pre-K funded, un-funded) vs. two (Pre-K, all students) • ~10% of students in Pre-K • Data elements are 3-5x as complicated to collect, as elements are outside state funding • ~4-5x the number of data elements (20-40 elements, v. 20 elements)	• **One-time**: $0.5 – 4.8 mil

Overall, scope of additional data element collection in C2 – C4 is 2.5 – 6x project C1, and **may require additional local funding for data collection** capabilities

Source: CDE, McKinsey expertise; Departments of Education from NH, TN, SC; selected LEA interviews

Step 2, 3 projects (4/6)

Project	Description	Estimate rationale	Estimate
D5	**7.2** - **Build interfaces from CALTIDES to program information systems** (e.g., ConApp, Cal-PASS) to track educator level program data by collecting EIDs for state (Con-App), federal (opt-in) and local programs (in CAL-Pass)	25% - 50% of cost of C1 • Includes only 1 source of data collection (instructors) vs. two (Pre-K, all students) • ~10% as many teachers as students • Data elements are 3-5x as complicated to collect	• **One-time**: $0.1 – 0.8 mil
D6	**7.3** - **Use web-based forms** for Consolidated Application Data System (CADS) application to streamline data collection for state, federal and local programs	20% of project A	• **One-time**: $0.3 – 0.7 mil • **Ongoing**: $0.1 – 0.2 mil
D7	**8.6 - Enhance existing systems (e.g., EdJoin) that match teacher candidates with open positions** • Enhance quality of administrator portfolios, enable upload of candidate transcripts and job profile spreadsheets, enable search function on school profiles • Develop linkages with CCTC (for auto upload of teacher credentials), CALTIDES (transfer of transcripts), and higher education (candidate transcripts)	~6-9 month project for 4-5 external FTEs	• **One-time**: $0.9 – 1.7 mil

Source: CDE, McKinsey expertise; Departments of Education from NH, TN, SC; selected LEA interviews

Step 2, 3 projects (5/6)

Project	Description	Estimate rationale	Estimate
F6	**8.1 - Create a web based self-directed professional development (PD) system** • Provide "search" capability that links to off-line and on-line course offerings • Include "auto suggestion" capability based on existing standards (CSTP), PD history and available programs **8.2 - Provide analysis tools (opt-in) to districts and schools to target educator and administrator PD based on curriculum, teaching objectives and teacher performance,** e.g., WV and TN Value Added Modeling, DE Correlates of Achievement, CT Results Based District Accountability Systems • Connect CALPADS (course ID, CST information) and CALTIDES (SEID, attendance) to the new PD system • **8.8 - Establish a state level support mechanism** for the new PD system as well as **district level support for analytic tools**	50-100% of formative assessment item bank development cost (F2) • Does not require (1) item development, or (2) formative assessment scoring system, just the (3) formative assessment backbone	• **One-time**: $1.1 – 6.2 mil • **Ongoing**: $0.1 – 0.3 mil
F7	**10.2 - Develop easy-to-use standardized state-wide assessments on kindergarten readiness for children coming from various PreK programs** (state, federal or local private)**.** Currently 'Desired Results' DRDP information is administered to all students but collected at state level for children with IEPs.	$0.50 – 1.00 for each student to develop the system backbone; $1.00 – 4.00 for the licensed content for the summative assessments; assume 500K K-school students (plus 50% project management)	• **One-time**: $0.4 – 0.8 mil • **Ongoing**: $0.8 – 3.0 mil
G	**Best practice sharing system**	See deep-dive	• **One-time**: $1.7 – 3.7 mil • **Ongoing**: $0.4 – 1.0 mil
STATE TOTAL		**One-time:** **Ongoing:**	$24 mil – 77 mil $5 – 15 mil

Source: CDE, McKinsey expertise; Departments of Education from NH, TN, SC; selected LEA interviews

Step 2, 3 projects (6/6): Best-practice sharing system (G; 7.5, 6.1-6.3, 10.4)

Scenario 1
- Low-end system designed based on open-sourced software

Scenario 2
- Enterprise class for best-practice sharing and collaboration
- Provides search capability across all content areas and media types using parameters such as subject area, target student population, standards, and sources

Scenario 3
- High-end, custom designed system development

	Cost description	Cost & range
External FTEs	• 10-15 external FTEs for 6-9 months to: – Customize open-source sw to capture structured (e.g. .doc, .xls files), unstructured content (video, audio, etc.), collaboration sw, search capability • Integration of open-source solution to the state education portal	• **One-time**: $1,500,000 - $3,340,000
Internal FTEs	• 4-6 internal FTEs, 50% capacity, for 6-9 months	• **One-time**: $150,000 - $340,000
Licensing	• $25000 - $35000 – Use low-cost license software (e.g. Google Appliances, TBD for document management) for (1) search, and (2) capturing items • 30% maintenance ongoing • Application server ($30,000 - $100,000) for 4-8 CPU servers	• **One-time**: $160,000 - $830,000 • **Ongoing**: $40,000 - $210,000
Hardware	• 4-8 2-CPU servers for development, testing, and production (leverage existing hardware capacity) • 50-100 GB file storage	• **One-time**: $60,000 - $120,000
Project management	• 50% of the cost of the rest of the project; covers time allocation to achieve consensus on project definition and oversight during the project	• **One-time**: $960,000 – 2,470,000 • **Ongoing**: $210,000 – 530,000
Savings		
State total		• **One-time**: $2,660,000 - $6,170,000 • **Ongoing**: $640,000 - $1,490,000

Source: McKinsey expertise, CDE

Contents

- Summary of cost model
- Cost estimate details for step 1 initiatives
- High level estimates for step 2, 3 activities
- **Backup: Approach to cost model**

Financial model will estimate one-time, ongoing costs, and any savings

Main focus
Secondary focus

Cost model principles

- Cost estimates will be ranges intended to give direction on expected investment, but are not substitutes for vendor responses
- Costs will be fully loaded, including project management and oversight
- For large system development, hardware costs have been estimated, but for smaller costs, hardware needs are assumed to be borne by existing servers
- Funding sources will be important for the overall model, but we will focus on costs and, to some extent, savings
- Cost estimation will focus on 'Stair step 1' recommendations
- Cost estimation will not address funds needed to upgrade legacy systems
- Costs will be estimated only for the state, and not for schools or districts, and the cost of fulfilling mandates will not be estimated

Categories	Line items
1 One-time	FTEs: Outsourced new development, installation
	FTEs: In-house configuration, customization
	FTEs: Internal business, data analysts
	Software licenses
	Hardware (e.g. servers)
2 Ongoing	FTEs: HW support, maintenance
	FTEs: SW support, maintenance, upgrades
	FTEs: Business, data analysts
	Ongoing software costs
	Hardware updates
3 Savings	Any relevant one-time, ongoing line items

Categorization of types of costs

Dollar, thousands

	One Time	Ongoing
External FTEs	• Software development, installation costs • Existing system customization	• External support for data systems
Internal FTEs	• Business/data FTEs to support data system development • PMO / leadership time allocation • Allocation of time for training • Development / modification of tools, data systems by internal technical staff	• Ongoing support & maintenance of data systems • Training
Software	• Initial software license purchases • License purchases for vendor generated content (e.g. item bank)	• Ongoing subscription cost for licenses
Hardware	• Hardware upgrades • Laying cables for connectivity • Central servers	• Ongoing connectivity costs for internet links
Savings	• n/a	• Saving of FTE time based on improving data system efficiency • Savings from local use of lower-cost state-negotiated licenses (e.g. for assessment banks)

Source: McKinsey team analysis, CDE

Selection of key data points used in costing model

PARTIAL LIST

Project	Element	Source	Value
Multiple	Full loaded FTE costs – internal maintenance & support	CDE input	$150,000 / year
Multiple	Full loaded FTE costs – internal business, data analysts	CDE input	$150,000 / year
Multiple	Full loaded FTE costs – LEA staff	CDE input	$150,000 / year
Multiple	Full loaded FTE costs – external developers	CDE input	$300,000 / year
Multiple	Project management	CIO input	50% of project costs
Multiple	Number of districts, schools, students, and distribution by size	NCES	1,100; 9,970, 6,300,000
Multiple	2-CPU servers	CDE; based on DTS costs	$30,000 – 50,000
Multiple	Storage costs (1 TB)	McKinsey experience, CDE	$20,000 – 25,000
Multiple	Enterprise Service Bus software license	Forrester	$50,000
Multiple	Application server license	Forrester	$100,000
Multiple	Database server for distributed cache license	Forrester	$30,000
Training	Training cost for new IT system roll-out	NYCDOE, LAU	$50 - $70 / person $2 – 4 / student

Appendix F:
Description and cost estimates for CALPADS and CALTIDE (Currently planned)

Background and history of CALPADS (from CDE website)

The cornerstone for compliance with federal law, as delineated in the No Child Left Behind (NCLB) Act of 2001, is increased accountability for student achievement. Schools must be able to show adequate yearly progress (AYP) in academic achievement and increases in graduation rates. California has adopted rigorous academic standards and developed assessments to track whether students are achieving the standards set for them. To fully comply with federal accountability requirements, however, California must be able to track individual student enrollment history and achievement data over time.

To enable California to meet the federal requirements, Senate Bill 1453 (SB 1453) was enacted in September 2002 to require: (1) the assignment of a Statewide Student Identifier (SSID) as an individual, yet non-personally identifiable number to each K-12 student enrolled in a California public school; and (2) the establishment of the California Longitudinal Pupil Achievement Data System (CALPADS) that includes statewide assessment data, enrollment data, teacher assignment data, and other elements required to meet federal NCLB reporting requirements. In 2006, Senate Bill 1614 was also enacted establishing the California Longitudinal Teacher Integrated Data Education System (CALTIDES) to facilitate teacher assignment monitoring through automation and enable monitoring of Highly Qualified Teacher requirements under NCLB.

CALPADS-CALTIDES will be the foundation of California's K-12 education data system, enabling the migration from the current numerous aggregate data collections to a flexible system based on quality student- and teacher-level data. CALPADS will include student demographic, program participation, grade level, enrollment, course enrollment and completion, discipline, and statewide assessment data. CALPADS will also include teacher assignment data, and will be linked to teacher credential and authorization data in CALTIDES that is sourced from the Commission on Teacher Credentialing. The student-level, longitudinal data in CALPADS will facilitate program evaluation, assessment of student achievement over time, the calculation of more accurate dropout and graduation rates, the efficient creation of reports to meet state and federal reporting requirements, and the ability to create ad hoc reports and respond to questions. CALPADS provides local educational agencies (LEAs) access to longitudinal data and reports on their own students, and immediate access to information on new students enabling them to place students appropriately and to determine whether any assessments are necessary.

Background and history of CALTIDES (from CDE website)

Currently teacher data resides in different ways in multiple databases in different agencies at the state and local levels with no mechanism for integration. This results in redundant data data to support state and local decision-making, monitoring and compliance activities.

To address these issues, the 2005 Budget Act included funds for the California Department of Education (CDE) to assess the feasibility of implementing an integrated teacher data system. In March 2006, the CDE submitted to the Department of Finance (DOF) a Feasibility Study Report (FSR) for such a system, and in May 2006 it was approved. In September 2006, SB 1614 was enacted (Chapter 840, Statutes of 2006), permanently authorizing the project in statute, and renaming it the California Longitudinal Teacher Integrated Data Education System (CALTIDES). Senate Bill 1614 also authorizes the Commission on Teacher Credentialing (CTC) to assign Statewide Educator Identifiers (SEIDs) to all educators working in the K-12 public school system in a position that requires a credential or authorization granted by the CTC.

CALTIDES will be a new comprehensive system environment that primarily entails integrating existing databases to enable the retention of longitudinal educator data to meet federal No Child Left Behind (NCLB) and other state

reporting requirements, to facilitate assignment monitoring, and to conduct high quality program evaluations. CALTIDES will be jointly developed by the CTC and the CDE.

Cost estimates for CALPADS and CALTIDES

(As approved in the FSR/SPR)

All large state information technology (IT) projects must be approved by the Department of Finance (DOF), through approval a Feasibility Study Report (FSR), or a Special Project Report (SPR). An FSR analyzes whether a particular business problem can be addressed with an IT solution, and includes a projection of projects costs based on high level estimates. A SPR is required when there is a 10% or more change to the projected costs in an approved FSR. SPRs are often written after a vendor is selected and their cost bid is larger than projected in the FSR.

The tables below summarize the project costs as estimated by the CALPADS SPR and the CATIDES FSR. Each year the California Department of Education (CDE) submits a Budget Change Proposal (BCP), requesting funds required for the project in the budget year consistent with the approved FSR or SPR.

Table 1 displays the one-time costs to develop and implement CALPADS as approved in the SPR. The costs include all contracted services: Request for Proposal (RFP) development, project management, independent oversight and verification and validation, systems integration services.

Table 1 – CALPADS

One-time Costs

2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	TOTAL
560,198	674,657	4,837,203	9,096,344	8,991,850	50,000	24,210,252

Table 2 displays: (1) the new one-time costs to CSIS to assist in the development and implementation of CALPADS; (2) the new ongoing costs to CSIS to assist in the development and implementation of CALPADS; and (3) CSIS' current existing costs associated with CURRENT data collection and Statewide Student Identifiers (SSIDs) maintenance activities. These existing costs end in 2010, which is the year following CALPADS implementation, when CSIS' ongoing CALPADS costs increase, since CSIS will maintain CALPADS and provide ongoing technical assistance and training to LEAs. The one-time and ongoing costs in 2008-09 total $1.1 million, which is the amount requested for CSIS in the budget year for CALPADS implementation. This amount was included in the May Revise.

Table 2 - CALPADS

CSIS One-time, Ongoing, Existing Costs

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
One-time			600,000	445,114*	460,748	50,000
Ongoing				668,818*	696,850	4,667,121
Existing	3,640,000	3,640,000	3,640,000	3,640,000	3,640,000	0

Table 3 displays the one-time and ongoing costs for the Department of Technology Services (DTS) to house CALPADS at the State Data Center.

Table 3 - CALPADS

DTS One-time, Ongoing Costs

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
One-time			211,851	1,996,920	2,036,622	
Ongoing					412,218	2,448,842

*Note the one-time costs in Table 2 and 3 are included in Table 1; therefore the tables should be considered separately and their numbers not summed.

Table 4 displays the one-time costs to develop and implement CALTIDES as approved in the FSR. Due to delays in the approval of the Request for Proposal (RFP) by the Department of General Services, the projected costs for 2008-09 and 2009-10 will move to 2009-10 and 2010-11 respectively. It should also be noted that these projected CALTIDES costs will likely change after vendors propose their solutions and cost bids for the project.

Table 4 - CALTIDES
One-time Costs

2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	TOTAL
1,098,480	1,148,769	6,849,162	2,707,591			11,804,002

Table 5 displays the ongoing costs associated with CALTIDES. These costs primarily reflect DTS services to house the system, and contract services to maintain the system.

Table 5 - CALTIDES
Ongoing Costs

2009-10	2010-11	2011-12
1,027,958	1,783,149	1,715,156

Appendix G:
Approach for california to meet the requirements of the data quality campaign

Background

The Data Quality Campaign (DQC), created in 2005, is a national, collaborative effort to encourage and support state policymakers to improve the collection, availability and use of high-quality education data and to implement state longitudinal data systems to improve student achievement. It is managed by the National Center for Educational Achievement and supported by The Bill & Melinda Gates Foundation.

Apart from conducting research and developing tools on various aspects of education policy, each year the DQC conducts a survey to determine whether states meet the 10 essential elements that are critical to a longitudinal data system.

The elements

The specific essential elements are:

1. A unique state-wide student identifier that connects student data across key databases across years
2. Student-level enrollment, demographic and program participation information
3. The ability to match individual students' test records from year to year to measure academic growth
4. Information on untested students and the reasons they were not tested
5. A teacher identifier system with the ability to match teachers to students
6. Student-level transcript information, including information on courses completed and grades earned
7. Student-level college readiness test scores
8. Student-level graduation and dropout data
9. The ability to match student records between the P–12 and higher education systems
10. Student-level K-12 records can be matched with the records of the same students in all of the state's public colleges and universities

California's status

California currently meets 7 of the 10 essential elements; elements #5, 6, 9 and parts of 10 are not met. As reference, Florida, Utah, and Arkansas meet all the elements.

Planned data systems like CALTIDES as well as CSIS Transcript Center will help meet the requirements of elements #5 and 6 respectively. However, to meet and fully comply with elements 9 and 10, California needs to develop new capabilities as mentioned in recommendations #9 on data linkages, as well as #1 on improving quality and timeliness of existing data collections.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