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Understanding and Assessing the Impact of Data Visualization On Stakeholder Access to Data, Sensemaking and Decision Making in the context of the Local Control Funding Formula

By

Jason Robert Murphy

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Education

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Bernard R. Gifford
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Summer 2018

UNDERSTANDING AND ASSESSING THE IMPACT OF DATA VISUALIZTION ON ACCESS TO DATA, SENSEMAKING AND DECISION MAKING IN THE CONTEXT OF THE LOCAL CONTROL FUNDING FORMULA

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By

Jason Robert Murphy

ABSTRACT

Understanding and Assessing the Impact of Data Visualization On Stakeholder Access to Data, Sensemaking and Decision Making in the context of the Local Control Funding Formula

by

Jason Robert Murphy

Doctor of Education

University of California, Berkeley

Professor Bernard Gifford, Chair

Implemented in 2013, the Local Control Funding Formula (LCFF) requires Local Education Agencies (LEA's) to engage in a continuous improvement process that identifies actions that extend and improve services for targeted student groups. The vision of the LCFF is that all stakeholder groups including Staff (certificated, classified, management and community members) are consulted and have the opportunity to provide feedback on the LCAP. However, stakeholders have varying degrees of access, levels of technical knowledge and understanding of the fiscal, adult behavioral data and student achievement and outcome data. These differences set the stage for some stakeholders to unwittingly included or exclude different information based on personal biases and local accountability demands.

This design study is intended to provide stakeholders with a tool that supports their access and use of data as they engage LCFF continuous improvement process. A focused group was convened to review the data dashboards. Early feedback from stakeholders characterized the dashboards as a good starting point. They also provided feedback about integrating additional data elements into the dashboards which would make them more useful in their work of reviewing programs in the LCAP. Also, stakeholders requested that more systems be built to support access to data as well as increase opportunities for collaborative data driven decision making.

DEDICATION

On October 25, 2010 my life changed forever. That is the day you were born, Abigayle Savannah Murphy. You are our miracle baby. We were told by several doctors that it was impossible for us to have you. In fact, one doctor told us that you had less than a 10% chance of ever being conceived. My daughter, remember that statistics are predictions, not facts. Your mother went before the Lord and asked Him for you. And here you are. I am blessed to be your father and that I may walk with you as you grow into your own womanhood. I dedicate this dissertation to you because, like you, it is a miracle. Someday, I will join mommy. I hope you keep this dissertation, along with your mom's thesis, as a symbol that you are strong enough to succeed in anything to which you dedicate yourself. Do not compromise yourself for anyone or anything. Own your own meaning for all that you do. Know your 'why'. And make sure you make every day "your day".

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CHAPTER 1: PROBLEM OF PRACTICE AND KNOWLEDGE BASE

Introduction

The objective of this design development study is to develop a tool that can support school district stakeholders as they make sense out of large amounts of information and make decisions about how to allocate resources to actions and services outlined in their Local Control Accountability Plan. (LCAP) The tool, a data dashboard is a scaffold designed to leverage data visualization techniques based in Gestalt Theory to help LEA stakeholders, including district staff, students, parents and community-based organizations have ready access to understandable representations of individual, subgroup, organizational and local context data necessary to engage in the continuous improvement process outlined by the Local Control Funding Formula regulations. (LCFF) (Kirst & Hough, 2016).

Implemented in 2013, the Local Control Funding Formula (LCFF) requires Local Education Agencies (LEAs)[1] to engage in a continuous improvement process that identifies actions that extend and improve services for students in state identified targeted subgroups (English Learners, Foster Youth, Socioeconomically Disadvantaged Students), review spending patterns for actions supported by resources base grant, supplemental grant, concentration grant and other local and federal resources and analyze Expected Measurable Outcome (EMO's) associated with the goals in the LEA's LCAP. The EMO's are broken out into 22 state metrics, organized by conditions for learning, engagement and pupil outcomes. (Taylor, 2013). The LCFF regulation also eliminated several state categorical funded programs identified in Table 2. Understanding that the needs of LEA's varied and complex the LCFF also eliminated many of the state's restricted categorical programs systems allowing LEA's to apply the Base, Supplemental and Concentration grants in ways tailored to their needs.

Table 1. Eliminated Programs: LCFF

Advanced Placement Fee Waiver	Community-Based Tutoring	High School Class Size Reduction
Alternative Credentialing	Community Day School	Instructional Material Block grant International Baccalaureate Diploma Program
Ca High School Exit Exam Tutoring	Deferred maintenance	Oral Health Assessments
CA School Age Families	Economic Impact Aid	Physical Education Block Grant
Cat Programs for new schools	Educational Technology	Principal Training & Teacher Dismissal
Certificated Staff Mentoring	Gifted and Talented Education	Professional Development for Math and English

[1] Local Education Educations include school districts and county offices of education.

Charter School Black Grant	Grade 7-12 Counseling	School and Library Improvement Block Grant School safety
School Safety	Summer School Programs	Student Councils
Source: CDE (http://www.cde.ca.gov/fg/aa/lc/)		

The requirements of the LCFF continuous improvement model presents LEA's with an implementation challenge. This challenge emerges from the requirement that actions and services are to be determined in consultation with local stakeholders. Students, parents, school staff and community members approach the analysis and decision-making process, understandably from their own perspective. However, stakeholders have varying degrees of access, levels of technical knowledge and understanding of the fiscal, adult behavioral data and student achievement and outcome data. These differences set the stage for stakeholders to include or exclude information based on personal biases and local accountability demands. Also, while requiring stakeholder engagement, the state has not provided clear procedures for managing these differences that lead to competing interests as stakeholders make decisions about how to prioritize resources to support actions. (Coburn & Turner, 2011; Shipps, 2012; Kundson, 2014).

Decision Making Responses in Complexity

The presence of the large volume of disconnected data generated by 24 metrics, 8 priorities, 3 focus areas, 3 targeted groups along with stakeholders of varying degrees of understanding and the absence of clear direction for prioritizing and managing competing priorities in the face of scarce resources has set the context for an incomplete implementation of the LCFF legislation. This is illustrated by the fact that LEA stakeholders engaged in status quo decision making (Taylor, 2015). A document analysis of 50 LCAPs from first year implementation of the LCFF revealed several status quo behaviors determined the actions placed and funded in the first year LCAP Plans. One of the most notably status quo behaviors was using fiscal flexibility and additional funds to maintain and extend existing services and build up district reserves (Taylor, 2015).

The status quo response pattern observed in 2014-2015 LCAP plans is consistent with how districts have responded to earlier experiments with fiscal flexibility. For example, during the 2008 budget crisis the California state legislature decided to relax categorical fund restrictions to allow districts flexibility since the legislature also suspended the minimum 39% guarantee from Proposition 98 funding. Forty of the state's categorical funds were lumped into a category called the flex item, which districts could use in any way they saw fit as long as they held a public hearing. Fuller, Marsh, Stecher and Timer (2011) studied a sample of 10 characteristic districts. They reviewed budgets and interviewed officials and found that fiscal flexibility did not generate substantial difference in practice. Specifically, 90% simply sweep the flex grant into the district general fund budget. Fifty percent explicitly used funds to support the minimum fund balance of their districts and minimize layoffs. Fuller et al (2011) reported that many of the qualitative responses of district leaders centered on the fact that fiscal flexibility did

not absolve their districts from the constraints of already established collective bargaining agreements or student needs that were met through existing categorical programs and obligations to address budget short falls generated by suspension of Proposition 98. Like Fuller et al (2011), Taylor (2010) also used the fiscal flexibility of the 2008 proposition 98 guarantee as an observational study to exemplify how districts responded to fiscal flexibility. Taylor (2010) response rate was 22% but his findings mirrored Fuller's et al (2011) findings.

The decision-making challenges presented by information complexity are increased by institutional features including an organizational orientation toward maintenance (Shipps, 2012) and a loosely coupled organizational structure (Wieck, 1977). Both of these contribute to a dynamic where different divisions of the organization are focused on different data points that determine dimensions of organizational effectiveness. For example, Karl Weick (1977) is first the first researcher characterize the public education as a loosely coupled system. Weick states that loosely coupled systems like education tend to lack coordination, have an absence of regulations and have highly connected networks with very slow feedback times. Although 30 years old, Weick's conceptualization of organizations offers a useful framework to understand the factors that barriers to full implementation of the LCFF. Also, it provides a basis for identifying potential remedies to those barriers. Weick's framework describes California's challenge in implementing the LCFF because CDE has provided little guidance for districts about how to develop strategic priorities to address all 8 state priorities operationalized by 24 different metrics. (Taylor, 2015). In the absence of clear direction a natural response pattern is to default back to a status quo behavior pattern.

Local Context

This design development study will be carried out in WXYZ Unified School District (WXYZ). WXYZ is a K-12 unified school district in ABCDEF WXYZ County. In July 2014, coalition of community groups ABCDEF WXYZ Interfaith Supporting Community Organization (CCISCO), Greatness Rediscovered In Our Time (GRIOT) and the National Association For the Advancement of Colored People (NAACP) and legal advocacy firm Public Advocates sent a letter of concern to the WXYZ Superintendent and ABCDEF WXYZ County Office of Education (ABCDE) Superintendent. The letter alleged that WXYZ simply applied its 20 million dollars in new supplemental and concentration grant revenue to existing services already paired for the base grant. The district was accused of providing no proof of a needs assessment or a rationale for how these exiting services improve and extend services for targeted students. Put another way coalition challenged WXYZ on how these expenditures address the minimum proportional requirement of the LCFF. Although eventually approved WXYZ was challenged in two subsequent years by the same coalition continuing to not adequately accounting for additional S&C allocations met minimum proportionality requirements. The reproduction of existing budget allocation behavior patterns observed in WXYZ is consistent with findings on early LCFF implementation studies and for mentioned theoretical rationale for reproducing existing behavior patterns. As a result WXYZ emerges as a good pilot space to test the degree that a geospatial data dashboard will support divergent thinking and subsequent novel decision making.

Problem of Practice

In the context of public policy numbers are understood to be political entities that have metaphorical and normative power (Stone, 2012). For example, numbers are used as metaphors to assign group membership. A student's family income level, their score on the Cultural English Language Development Test (CELDT), Woodcock- Johnson Cognitive Test, Naglieri Nonverbal Abilities Test (NNAT) have the power to assign students to categories such socioeconomically disadvantaged, limited English proficient English learner, special education, and Gifted and Talented (GATE) respectively. Numbers also have a normative dimension because the group associations they assign have normative implications. A NNAT score at the minimum threshold assigns a student to GATE. Another element to the normative dimension of numbers is their implicit call to action (Stone, 2012). For instances, a LEA with too many English Learners students with low CELDT scores is not meeting the needs of its English Learner population. A LEA with a high percentage of students identified as eligible for special education services has a problem with over identification. Implicit in these values is a call to action either individual student level of the LEA level.

However, measuring students and LEA's on certain dimensions, assigning membership and action steps based on those measurements doesn't explicitly translate into action steps for LEA's. This is because LEA's are not monolithic units of organizational structured. LEA's are better understood as nested associations of actors organized by roles, functions and process that are often accountable to different measures (Coburn & Turner, 2011; & Mintrop & Sunderman, 2009). For example, in a LEA the business division is organized and accountable to measures like revenues, expenditures, cash flow, minimum fund balance and reserves for economic uncertainty. Consequently, they organize their routines and tasks in processes like first and second interim reporting as well as LEA budget and LCAP development. In contrast, the educational service division of most LEAs organizes their tasks, routines and process around measures of student achievement and attainment. These measures include achievement indicators like grades and test score and attainment measures such as dropout, graduation and A-G eligibility[2]. Each department must balance responsiveness to its local accountability demands defined by their local measurements.

Divisions that make up the LEA also challenged to engage in coherent or systemic action steps in regards to measurement because LEA's tend to lack formal structures, regulations and fast feedback networks (Weick, 1977). Weick (1977) employed the description loosely coupled system to describe this collection of organizational dynamics. Because of this dynamic data data get processed by different divisions of the LEA through their unique lens filtered by division specific routines, norms and power relations. Consequently, member's different division's notice, interprets, and prioritizes next steps differently. The collective norms, interpretations and priorities that result from these processes is called the habitus (Mintrop, 2016). The habitus or prevailing organizational culture promotes a bounded rationality where actors in a division notice, interpret, and construct implications based on data in a manner consistent with their prevailing beliefs (Coburn & Turner, 2011). Also, because of these arrangements stakeholders do not attend to information that does is not consistent with their pre-existent belief structure

[2] A-G eligibility refers to the completion of the A-G requirements which define the minimum eligibility requirements for admission to the California State University and University of California systems.

(Coburn & Turner, 2011). In the context of the LCFF, neither the CDE nor the legislature has provided LEA'S with specific guidance for how to prioritize amongst the 24 metrics, 8 priorities and 3 focus areas identified by the LCFF (Knudson, 2014; Taylor, 2015). Unfortunately, this dynamic has contributed to some LEA's responding to reforms like the LCFF with status quo behavior patterns (Fuller, et al, 2011; Taylor, 2010; Taylor, 2015).

Design Challenge

The LCFF has established a decision-making landscape characterized by subsidiarity, transparency, accountability all student's conditions of learning, engagement and outcomes. Subsidiarity refers to the idea that decisions are most effective when handled at the least centralized level. The LCFF operationalizes the value of subsidiarity with the design principal of fiscal flexibility (Wolf & Sands, 2016). Transparency refers to the idea that an LEA's expenditure plan is accessible to stakeholders and clearly establishes how funds are being used to improve or extend services to students that generate funds. Accountability, in the context of the LCFF refers to both internal and external accountability (Elmore, 2005). Student needs are operationalized by the conditions of learning, 8 state priorities and 24 metrics.

The 24 metrics and the absence of guidance or decision rules from the CDE and legislature leaves LEA decision makers to contend with an overwhelming complex information landscape. Newman and Simon (1972) offer a mental model that explains how information overload can lead to status quo problem solving. Humans first understand a problem by integrating stimuli, in the form of data in a mental space called the task domain. The task domain is the set of all mental representations around an environment. Humans generate the problem space and the solution space from the task domain. The problem space is the set of all mental representations of tasks, needs, goals related to the problem. The solution space is the specific set of the fore mentioned items that closes the space between the current state and ideal state of the problem. In the context of the LCFF, the 3 focus areas, 8 state priorities and 22 associated metrics that measure the district, the schools and targeted subgroups constitutes the task domain. However, task domain presents too much complexity for LEA stakeholders. Faced with this complexity LEA stakeholders assimilate and exclude information consistent with their individual and group mental models. Consequently, the problem and solution space for LEA stakeholders becomes shaped by preexisting world views which leads to status quo behavior patterns.

This design and development study aims to mitigate the complexity that LEA decision makers face and allow them to make decisions informed but not overwhelmed by all the associated with student outcomes. This is the basis of my design challenge. **Design Challenge: Develop a data dashboard that reduces the task domain faced by district stakeholders and satisfies the following conditions: 1) reduce complexity but maintain essential information integrity; 2) is efficient both by being highly portable and cost neutral; 3) universally assessable to all LEA stakeholder groups including district employees and community stakeholders.**

Table 2. Theory of Action

Problem of Practice	LEA stakeholders are faced with overwhelming complexity in the form of an unbounded task domain generated the LCFF state priorities and metrics. Faced with complexity decision makers reduce their problem and solution space to pre-established patterns.
Defining the Problematic Behavior	LEA stakeholders are likely unaware that they are engaging in cognitive tunneling. 1) LEA stakeholders are unware of how division specific routines, beliefs and knowledge bases cause them to filter what information they include in their decision making process. 2) LEA stakeholder are might appreciate how natural problem solving processes leads to filtering out information that is not consistent with existing world views. 3) LEA stakeholders may not full appreciate how division specific norms and practices moderate decisions and transform action steps into forms more salient with the implementers local accountability demands and norms of practice.
Defining the Desired Outcome	The data dashboard will have three intendent outcomes. 1) Leverage Geshalt theory and data visualization principles to reduce complexity in the task domain while maintaining conceptual integrity for LEA decision makers. 2) Generate savings both in time saved, ease of access, portability and deployment and maintenance costs. 3) Mitigate cognitive tunneling and micro political skirmishes by making all relevant LEA metric information universally available at all scales to all stakeholders.

The Problematic Behavior

The LCFF outlines a continuous improvement process comprised of a collection of data driven activities. These activities include review of LEA data organized by the eight state priorities, working with stakeholders including both LEA staff and community members to notice patterns in the data, interpreting their meanings and construct implications or actions steps in response to the data (Coburn & Taylor, 2011). The designers of the LCFF intended to design a data driven continuous improvement process that ensures subsidiarity, transparency, internal and external accountability (Taylor, 2013).

Table 3. Local Control Accountability State Requirements

LCAP Requirements			
Eight State Priorities	Consultation	Review & Comment	LCAP Template

• Conditions for Learning (1,2,7) • Pupil Outcomes (4,8) • Engagement (3,5,6)	• Teachers • Administrators • Parents • Pupils • Staff • Bargaining Units	• Parent Advisory Committee • English Learner Advisory Committee • Superintendent respond to comments in writing	Use the state approved templated with included sections.
Source : School Services Of California, LCAP Workshop September 2015.			

Unfortunately, the design features of the LCFF continuous improvement process do not directly address certain features of human information processing that sway data processing and decision making toward status quote patterns. For instance, without intervention there is natural tendency for decision makers to process information by assimilating new information in the context of existing mental models (Coburn et al., 2009). Also, while processing information humans have a natural tendency to allow information into their task domain that is salient to their existing belief patterns. They simultaneously and sometimes unconsciously filter or fail to notice information that is not salient with existing mental models. This process is known as confirmation bias (Coburn, et al, 2009). Finally, humans in particular, in the presence of sanction driven accountability systems tend to avoid processing information that raises questions about performance of capability. This is known as self-affirmation bias (Spillane, Reiser & Reimer, 2002). All of these features of human processing impact data processing activities such as noticing, interpreting, and implication construction (Coburn & Turner, 2011).

Additionally, data processes are impacted by social structure because data processing tends to be a social enterprise (Means et al., 2009) In the education setting the act of noticing, interpretation and implication construction tend to play out through structured interactions that are social in nature (Coburn & Turner, 2011). In this social setting routines, time, access to data, norms of interaction leadership and power relations interact with and shape the fore mentioned data processing activities. For example, in the organization setting routines determine when, what and how data is looked at (Horn & Little, 2010). Likewise, the availability of time to way multiple interpretations of data impacts what decisions construct LEA stakeholder's problem and solution space. Coburn et al. (2009) suggests that there is a direct relationship between time and decision making quality. Also, the availability of data shapes what data is available for decision makers to notice (Marsh et al, 2009). In education norms of interaction such as the norm of teacher privacy around performance data shape what information is made available to use to make decisions about how to improve student achievement (Ikemoto & Marsh, 2007). Leadership and authority also shape data process because leaders and authority figures can both control access to data as well as assign meaning and interpretations to data for decision makers and implementers (Coburn & Taylor, 2011).

The Desired Outcome & Behavior

This design study has the following distill and proximate outcomes: the long term goal is to ensure that LCAP's are developed in consideration of all of the 8 state priorities and associated metrics, that the needs or targeted student groups are address and the interpretations of

all stakeholders regardless of status or technical knowledge are consulted. In the short term this design study aims to support the data processing of district stakeholders in the needs assessment, goal development and program evaluation phases of the LCAP continuous improvement cycle.

Figure 1. Desired Outcome Data Driven Program Planning Process

Also, the intended outcome of providing a tool in the needs assessment and goal development phases of the continuous improvement process is to support individuals and stakeholder groups avoid some of the fore mentioned pitfalls of data processing. If successfully the continuous improvement process will take on the outcome features of a program planning budget model as opposed to a roll-over budget model that characterize many LCAP's and district budgets (Taylor, 2015).

This design study also has the following desired behavioral outcomes. The use of Gestalt theory and data visualization principles in a data dashboard will to reduce complexity in the task domain while maintaining information integrity for LEA stakeholders. This will allow individual decision makers and groups of decision makers to integrate more into their task domains. It will also mitigate the impact of information asymmetries created because information is not universally available to stakeholders (Coburn & Turner, 2011). Finally, an intended outcome of

the data dashboards is the ease of access which increase the time horizon and lower the organizational energy loss due to acquiring data (Coburn et al., 2009).

Consulting the Professional Knowledge Base on Intervention Design

Design development studies are motivated by an intuition. Leaders have an inclination about how to bridge a gap between a current state and an ideal state of practice in an organization. However, consulting the professional knowledge base is a necessary step in developing a rigorous theory of action and change capable of actually impacting the organizational environment (Mintrop, 2016). To inform the develop of my design, I consult the knowledge base on data driven process in schools and the use of data dashboard use in performance management and decision support. The knowledge on data process in schools points to three major means of supporting data process in school settings. These processes include the use of tools, comprehensive data initiatives and employment of accountability systems (Coburn & Turner, 2011). The current design development study focuses on the use of a tool. Consequently, As a result my review of the literature on data support focuses on tools. Since the tool under investigation in this design study is a data dashboard, I also review the literature on the use of data dashboards to support data process in an organizational setting (Yigitbasioglu & Velcu, 2011).

Literature Review

The review of the literature of highlights three primary mechanisms by tools can support data process in educational settings. First, the literature suggests that tools can facilitate access to data (Means et al., 2009). This is illustrated by the proliferation of student information and assessment warehouse and reporting systems. Coburn et al, (2009) suggests that increased access to data influences the school stakeholder decision making because increase access to a variety of different kinds of data increases the space of information that school actors may notice. In addition to increased volume there are themes in the literature which suggest that tools can impact what school actors notice interpret through data presentation. For example, some investigations into data report format showed that format lead decision makers to focus on cut point scores as oppose to students' scores throughout the entire score range (Supovitz, 2006; Zapata-Rivera & Katz, 2014). Data presentation at the height of the NCLB accountability regimes as also associated with causing decision makers to focus in on certain kinds of testable data points which resulted in narrowed curriculum and teachers centered instruction strategies in schools (Au, 2016 & Booher-Jennings, 2006). Overall, the literature on tools does suggest that tools can impact data process that LEA stakeholders engage in.

In my consultation of the professional knowledge based I also reviewed the use of data dashboards to improve data driven decision making. To facilitate my consultation, I explored the knowledge base on performance management and business intelligence in the for profit sector. In the business intelligence tradition data dashboard are defined as data driven decision support systems that provide information in a particular format to decision makers (Yigitbasioglu & Velcu, 2011). Data dashboards provide decision support to decision makers by consolidating large volumes of information about the organization into summary visual representation, maintain information integrity and leverage human visual processing systems (Few, 2006). Although limited there is evidence form the business intelligence knowledge base which suggest

that data dashboards directly contributes improved decision making outcomes in organizations. For example, a case study a processes at Unisys marketing found that data dashboards improved budget allocation process, accountability systems and performance management systems (Miller & Cioffi, 2004). Also, another case study of data dashboards Edwards Hospital found that the presence of data dashboards was associated with increased efficiency in decision about budget allocation and cash flow management (Schulte, 2006). Overall, findings from the professional knowledge base business intelligence tools in the for profit sector suggest that tools are plausible option for intervention into education decision process. The findings from the business intelligence and performance management knowledge base also suggests that data dashboards are plausible intervention tool to that can support district stakeholder decision making process in the LCFF continuous improvement cycle.

Results from engines of innovation like the CORE district collaborative suggest that using data dashboards can be an effective scaffold to address implementation challenges resulting from differential impacts of external (Mintrop & Trujillo, 2007) and internal (Elmore, 2005) accountability demands created by the requirements of the Local Control Funding Formula as well as the educational context in general. Deborah Stone (2012) argues that systems actors respond to measurement. Consequently, one strategy to encourage across division collaboration would be to implement data dashboards that integrate multiple measures of accountability for all divisions and the district as a whole. (Kirst & Hough, 2016)

Data dashboards provide an opportunity for system actors across multiple divisions to enjoy the successes of their organization and their contribution to progress on specific metrics. Data dashboards also allow actors from multiple divisions mobilize, with a sense of urgency (Kottier, 2008) without fear of sanction or mischaracterization around a critical area for follow-up. Edgar Schein (2010) describes that successful organizational change can be planned and carried out in a collection of deliberate stages. Schein describes three stages as 1) unfreezing culture, 2) changing culture and 3) Refreezing culture. Schein states that the unfreezing stage is characterized by engaging in actions that create a motivation to change. Next he describes the changing phase which is characterized by deliberate teaching new concepts, meanings and standards to new system. He lastly describes the refreezing stage in terms of the deliberate work of incorporating new concepts, meanings and standards into self-concepts, group identity and relationship structures.

Data dashboards can be used scaffold the unfreeze stage of culture by facilitating a common place for school, district and community stakeholders to reflect holistically progress on the 8 state priorities. Seeing pattern and trends on all state priorities in one place in one place allows for critical dialogues that interrupt assumptions about the efficacy of practices. Data dashboards can also be used to scaffold the culture change phase because annual update process of the LCAP requires districts to reflect with stakeholders how actions and services are doing with respect to the 8 state priorities. Stakeholders can hold each other accountable to multiple measures that are available to all the same time. This can help mitigate the micro political processes where actors either inadvertently or intentionally focus in on one indicator to the detriment of the process as a whole (Coburn, Toure, & Yamashita, 2009) Finally, data dashboards can be used to help refreeze new cultural norms because system actors can agree meet and review data dashboard together. This can lead to developing norms and interaction

spaces that are data driven and constructive with regards to how the district, the school and programs in operation in and around the schools are doing.

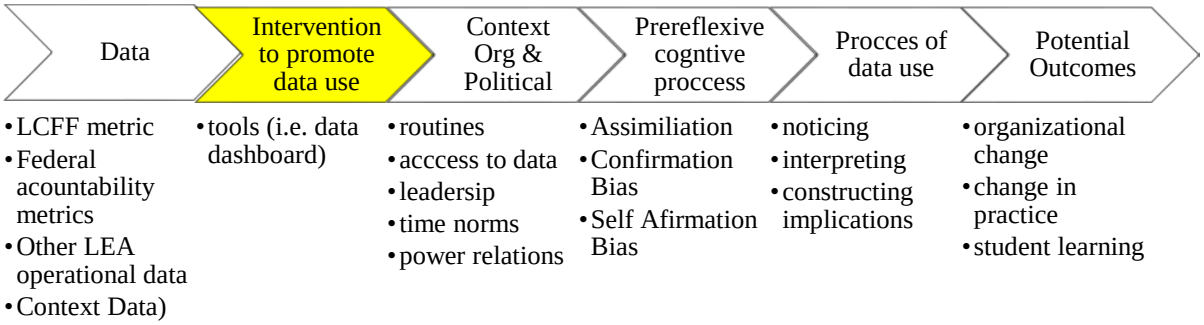
The findings from the business intelligence and performance management knowledge base also suggests that a data dashboard may be plausible intervention tool to that can support the district stakeholder decision making process in the LCFF continuous improvement cycle. Consequently, a theory of action, change and intervention design will be developed in accordance with the professional knowledge base.

CHAPTER 2: THEORY OF ACTION & INTERVENTION DESIGN

Theory of Action

My review of the professional knowledge base on tools for data processes and data dashboards has led me to employ the following theory of action to guide the develop of my design study. The following flow chart illustrates the relationship between tools, mitigating context factors, decision making process and outcomes. This theory of action which integrates

Figure 2. Change Model



concepts from Coburn & Turner, (2011) conceptual framework for data use, Spillane et al., (2012) findings on cognitive biases and concepts from Yigitbasioglu & Velcu, (2011) conceptualization of data dashboards. In this conceptual model data is collected form a variety of disparate sources, arranged in summarized in visualizations that mitigate the impact of information overload. Organizations are then able to engage in routines and data practices associated with the LCFF continuous process of inquiry, notice, interpret construct implications and subsequently take action steps. The difference is that more decision makers are able to access more data, consequently expanding their task domain and subsequent problem and solution space.

Needs Assessment

Needs assessment is essential an essential step of the design study process (Mintrop, 2016). It allows design researchers to determine if the prospective intervention generated through intuition, formalized by ideation in consultation of the professional knowledge base is a fit with the local context were the study is to be carried out. Here, findings from initials implementation of the LCFF offers criteria to explore fit. For, instance Taylor (2015) findings about response patterns of LEA's during the first year of LCFF suggest LEA's are prone to falling victim to data processing inefficiencies suggested in the theory of action. Consequently, assessing fit for application of the design intervention with Taylor's (2015) findings is a plausible course of action to determine fit. Specifically, review of local media reports and document analysis of prior LCAPs for status quo decision and spending patterns will reveal opportunity for trial of the data process too.

Next, a local needs assessment was also conducted to assess the fit between the proposed intervention tool and the local context to which the tool is to be applied. Recently the LEA participated in the LCFF Differentiated Assistance program because two student subgroups failed to make group targets on the Fall 2017 release of the California Schools Dashboard. The LCFF Differentiated Assistance process is a series of coaching interactions between the LEA and the LEA's county office of education that is intended to assist the LEA in reflecting on system practices and the impact of those system practices on student outcomes. The assessment consists of 6 components. (Clear & Collaborative Relationships, Shared belief, Vision, Mission, Teaching Learning & Assessment, Leadership & Governance, Professional Development For All and Infrastructure Alignment)

Figure 3. LEA Self-Assessment: Component 5 Infrastructure Alignment

COMPONENT 5: Infrastructure Alignment

5.1 LEA USE OF DATA FOR RESOURCE ALLOCATION TO IMPROVE STUDENT LEARNING refers to a LEA documented system for targeting resources, including money, staff, professional learning, materials, and additional support to schools based on the analysis of a variety of data that is disaggregated by student groups to determine LEA and school needs.

INDICATORS OF LEA SUPPORT

Implementing (Transformation and systemic efforts are underway)	**Continuous Improvement and Sustainability** (Systems are in place that are regularly monitored and revised)
X Our LEA **has a continuous improvement process** involving **multiple stakeholders** who use a variety of data that are disaggregated by student groups to allocate resources in order to improve LEA operations and meet critical learning needs of students. X The **system is evaluated and refined** to improve resource allocation to meet the needs of the schools and our LEA.	Our LEA **has a documented systematic continuous improvement process** involving **multiple stakeholders** who use a variety of data that are proactively disaggregated by student groups to allocate resources in order to improve LEA operations and meet critical learning needs of students. The **system is continuously evaluated and refined** to improve resource allocation to meet the needs of the schools and our LEA.
Laying the Foundation (Not yet started or minimal implementation)	**Installing** (Working towards implementation)
□ Our LEA **does not have a process** to consistently use disaggregated student data to make decisions related to resource allocations/ adjustments to improve LEA operations and meet critical learning needs of students. □ There is **no provision for refining the process.**	□ Our LEA **has a process** to use data. Our LEA uses data that is disaggregated by student groups to make some adjustments based on performance and operational needs. □ The **system may be periodically refined** to improve resource allocation.

Component 5.1, LEA Use of Data for Resource Allocation to Improve Student Learning provided a useful contextualized tool to assess the fit between the intervention tool and the local

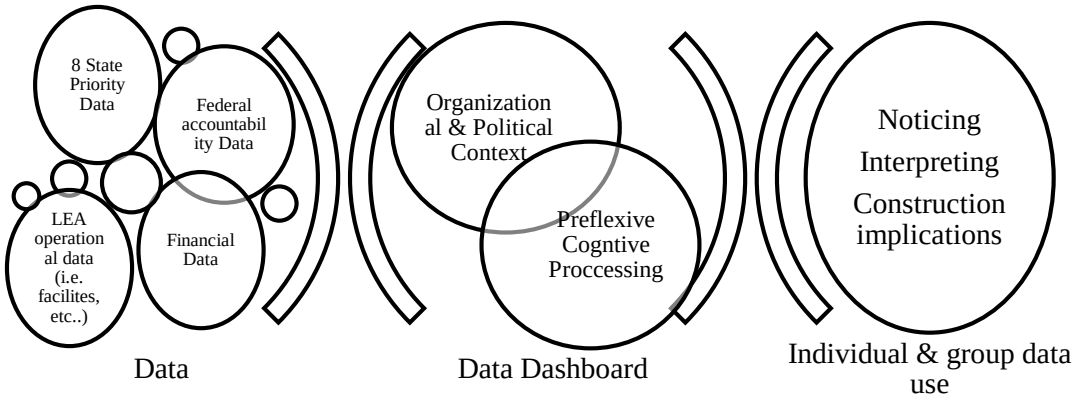
context of the LEA. Results from the LEA's reflection imply that the LEA stakeholders belie that they are at an installing state in their use of data to drive instruction and by extension student outcomes. For instance, nearly 60% of respondents rated their LEA had a system that periodically refined and actions and resource allocation to improve student outcomes.

Also, LEA stakeholders where asked about their perception of processes that exist for involving stakeholders, making sense of information and analyzing and making use of data to improve LEA operations and student learning? The sentiment expressed by respondents as that data or information was not disseminated at all or periodically shared with stakeholders. The results of the needs assessment suggest there is an opportunity for employment of an intervention to increase access and collective reflection on data to support decision making about actions and services in the LCAP. Next a theory of change is outlined how the intervention tool may address the identified gaps and problematic behaviors surfaced in the LEA self-reflection.

Theory of Change

The intervention in this design study is a tool to assist in managing complexity for LEA stakeholders engaged in the data process. In the absence of this tool LEA's are challenged to leverage complex resources necessary to engage in continuous improvement process (Grubb, 2009) Some of these complex resources include the availability of data, the human capital and the arrangement of stakeholder's time with routines and process necessary to notice patterns, consider possible interpretations, finalize an interpret the data and make decisions. Overall, in the absence of intervention LEA decision makers are overloaded by the volume of information required to be processed by the LCFF continuous improvement process. Faced with overwhelming complexity, decision makers engage in a collection of mental operations including assimilation of data, cognitive tunneling, confirmation bias and self-affirmation bias to decrease the cognitive load on their individual or collective task domain (Coburn & Turner, 2011).

Figure 3. Data, Dashboards and Usage



Employing a data dashboard as intervention tool supports group and individual dynamics of data processes in the following ways. It addresses organizational pressures on LEA's make data available to all stakeholders because the data dashboard is available for free on the internet. It also mitigates demands on organizational time and energy to process data from multiple sources because the data will be in one in location. At the individual level it address the cognitive load on LEA decision makers and stakeholders because the data dashboard leverages principles of human visual processing to summarizes all salient information from data while maintaining information richness (Few, 2006; Tuft, 2001) This supports LEA stakeholders with optimizing information process in the task domain which subsequently becomes the patterns stakeholders notice, interpret and construct implications around.

Intervention Design

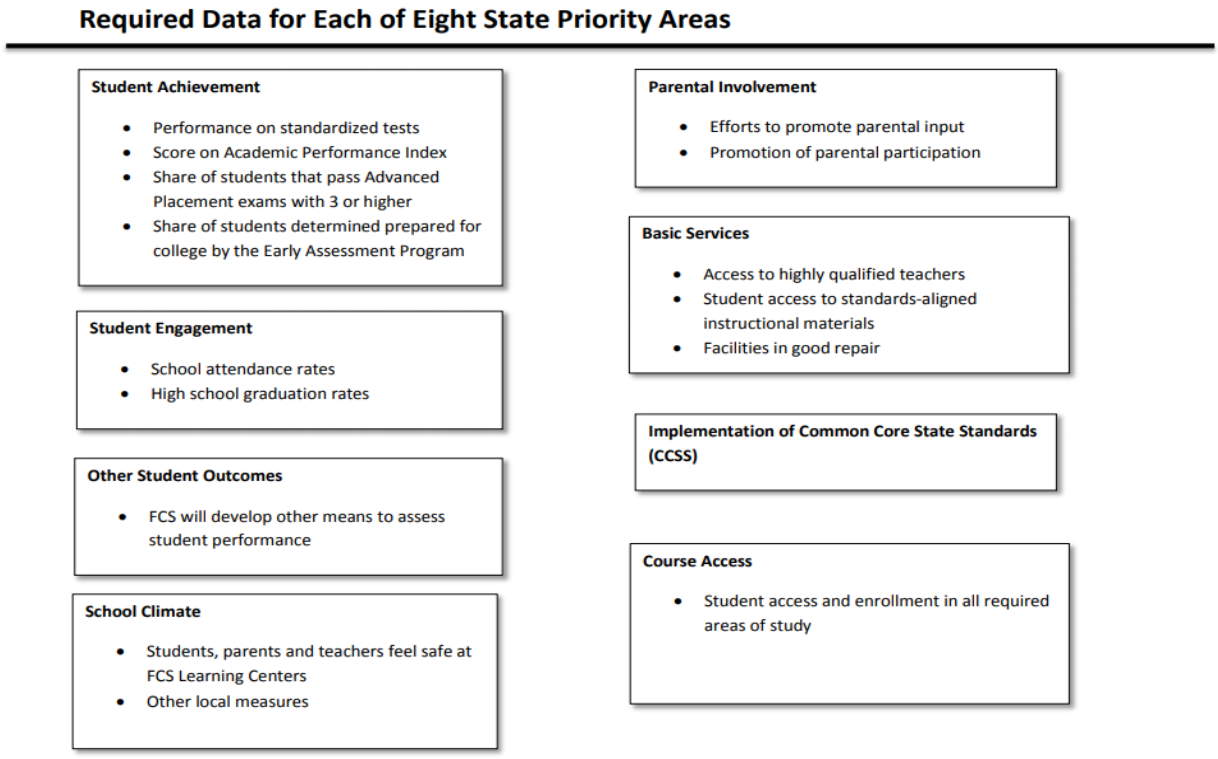
The intervention will focus on developing a tool that acts as a scaffold that mitigates the effects of information overload on individual and collective information processing in the context of the LCFF continuous improvement process.

School District Student Data - The LCFF requires that LEA's address each of the 8 state priorities through the LEA LCAP goals and associated actions and services. LEA's are expected to identify Expected Measurable Outcomes that are established data elements. Figure 4 identifies all of the data elements associated with a state priority. State identified Expected Measurable Outcome data for all school districts was collected from the California Department of Education, Dataquest website. Data sets for each data element was downloaded and stored as a Comma Spaced Valued (CSV) data file that was subsequently queried by the dashboard tool.

Also, Local Indicator data including, School Climate indicators, Basic Services indicators, Course Access indicators and Parental Involvement indicators. The LEA used internal systems such as the California Healthy Kids Survey results, Williams Visit Report results. Also, Local Indicator data including, School Climate indicators, Basic Services indicators, Course Access indicators and Parental Involvement indicators. The LEA used internal systems such as the California Healthy Kids Survey results, Williams Visit Report results, Facility Inspection Tool (FIT) data was collected internally and stored CSV file format.

School District Financial Data – The LCFF requires LEA's to identify and track how programs and services increase or improve services for students (i.e. Foster youth, English Learners and socioeconomically disadvantaged students). This is called the minimum proportionally requirement (MPP). Financial transaction data regarding programs and services in the LCAP was stored in resources that were associated with individual programs. Currently, the CDE allocates LCFF general fund dollars, including the Base Grant, Supplemental Grant and Concentration Grant to LEA's in one resource (i.e. 0000). Because of this, it is impossible to use data from state Standardized Account Code Structure (SACS) downloads to compare Supplemental Grant and Concentration Grant between districts. Transactions organized by LCAP program and goal was downloaded and stored as in CSV file format to be uploaded to the intervention tool.

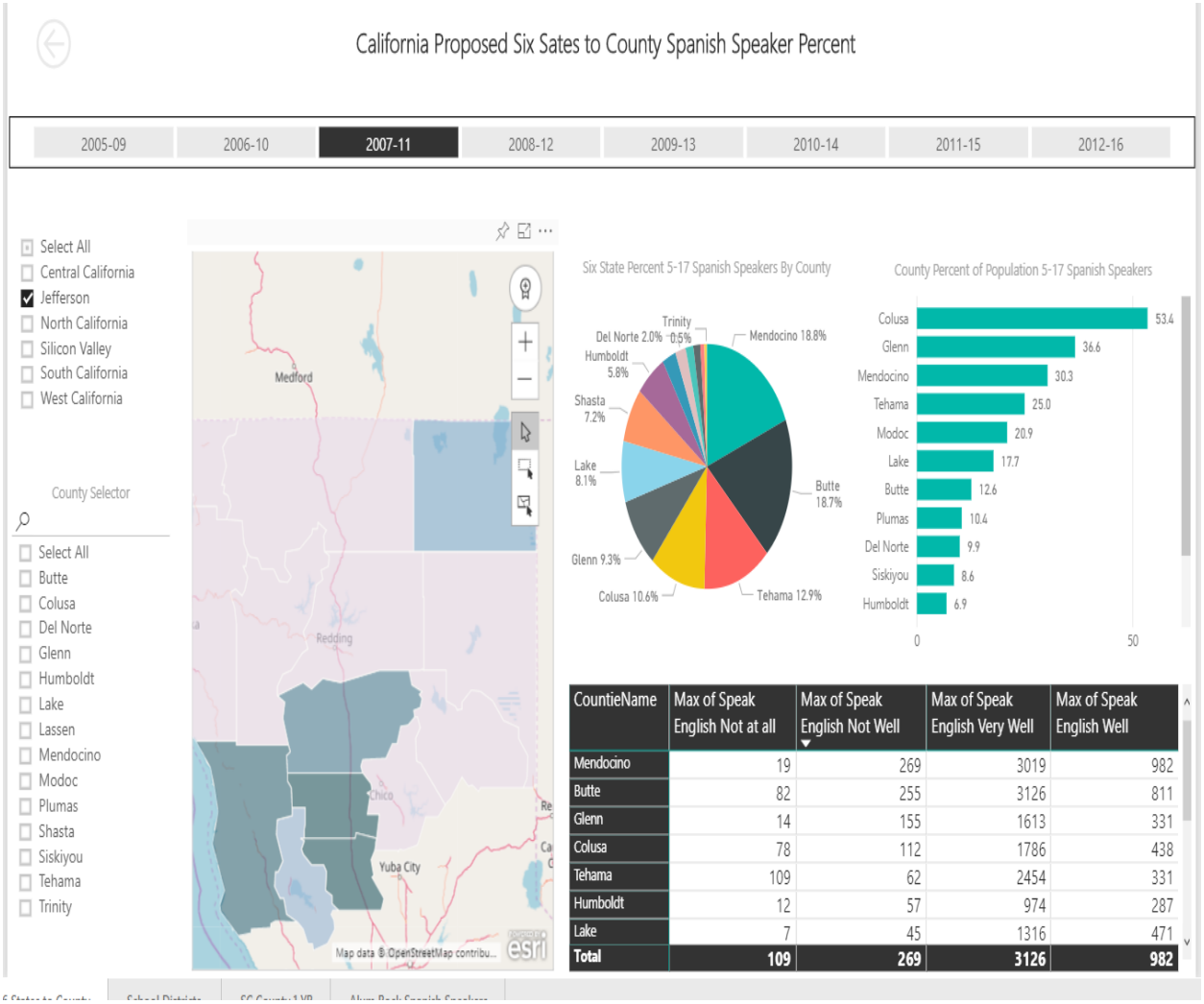
Figure 4. Required Data for Each of Eight State Priority Areas.



Community Context Data – Collecting community context data is not required by the LCFF. However, findings from suggests that environmental and contextual factors not physically located with the school are associated many of the for metric data elements. (Santone, et al., 2013). Because of this I will also be providing geospatial maps of each district with data procured from the American Community Survey (ACS) facilitate an understanding of the school and the districts ecological context which interacts with the school system. The ACS is produced by Census Bureau. Every year the Bureau produces 3 and 5 year population estimates for a variety of demographic variables over a number of different geographies (Jacobsen & Mather, 2008). Some of the geographies include States, Counties, Cities, Zip Codes, Locales and School Districts.

The American Community survey is a power source of community context data because 3 and 5 year sameling strategy allows for users to make more reasonable inferences about relatively small geographies with low sampling response rates. The ACS 3 and 5-year sampling strategy allows for relatively reliable inferences around geographies and timeframes. However, users of the ACS data source are cautioned not to attempt make longitudinal references from overlapping 3 or 5 year timespans (Jacobsen & Mather, 2008). This is because overlapping time intervals are going will lead to making inferences that are based on cases in both time spans. For example, the 2009-2014 and the 2010-2015 ACS data sets overlap for cases sampled in the yeas of 2010-2014. Despite this limitation the ACS represents a powerful data source that will be used to explore the relationship between school, LEA and community dynamics.

Figure 5. American Community Survey Data with Nativity and Language Fluency Estimates.



Data Visualization Principals – The data will be organized in accordance with the 8 state priorities. accordance with data visualization principals I will develop visualizations of each state metrics. Specifically, I will employ the principals of Gestalt Theory which emphasize the use of proximity, similarity, connectedness, continuity and common fate (Nadia & Peebles, 2013). Also color is an important tool for encoding meaning into each graphic display in the intervention tool

Table 4. Gestalt Principals of Information Representation

TABLE 1: Five Gestalt Principles

Gestalt	Principle Description	Application to Graph Comprehension
Proximity	Objects near to each other tend to be grouped together	The proximity of bars to the *x*-axis values allows rapid association to *x*-axis values compared with lines that are plotted at the center of the display and are distant and separated from *x*-axis values.
Similarity	Objects that are similar tend to be grouped together	Color matching allows graph readers to match the color of the lines or bars to legend values.
Connectedness	Objects that are connected by other elements are grouped together	Data points connected by lines form common patterns that can be identified and interpreted rapidly by experts. Novices, however, cannot interpret the pattern but attend to the lines, sometimes to the detriment of the data points.
Continuity	Objects that form continuous curves are more likely to be grouped together	Interpreting multiple intersecting lines plotted in a line graph is enabled (at least in part) by the perception of continuity at the lines' intersection.
Common fate	Objects moving or aligned in the same direction are grouped together	Parallel lines or plotted points are readily identified and grouped together. Their visual similarity may then be interpreted as reflecting some conceptual or numerical similarity between variables.

Data Visualization Tool - I will create three data dashboard in the Microsoft Power BI (Power BI) data visualization suite. I have elected to employ Power BI to address the human, time and cost factors associated with implementing a data board system in an organization. Time, resources and zone of proximal development is always should always be a consideration when implementing an intervention (Mintrop, 2016; Coburn & Turner, 2011). Power BI accomplishes time, cost and resources savings because it is deployed as a cloud based service as service platform. Additionally, it supports persistent data connection to virtually any data source. It also supports universal access by allowing none system actors to actors to access content through it public publishing feature (Coburn & Turner, 2011).

Data Dashboard 1: Program Expenditure Dashboard – The LCFF requires that LEA's monitor and evaluate the degree to which programs and services identified by goals in the LCAP increase or improve services for targeted student groups. Clearly aligning program expenditures to programs and goals is a challenge because the LCFF allocation, including the Base Grant, Supplemental Grant and Concentration are apportioned to LEA'S in a lump sum in accordance with the state's apportionment schedule. Specifically, the state apportions the general

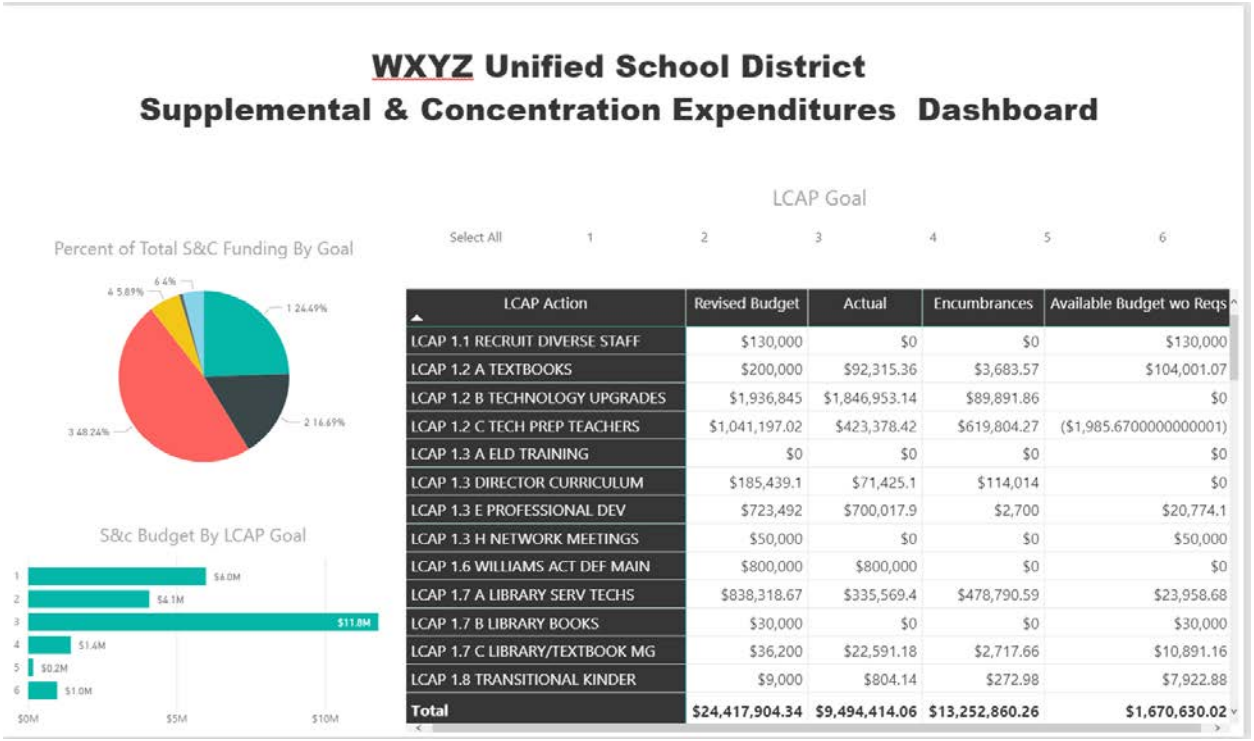
Table 5. Standard Account Code Structure

Standardized Account Code Structure							
XX	XXXX	XXXX	XXXX	XXX	X	XXX	XXXX
Fund	Resource	Goal	Function	Site	Year	DOU	Object

the General Fund Apportionment to the LEA's in Fund 01, Resource 0000. Prior to specific program resources the LEA separated LCFF general fund revenue into resource 0000 for Base Grant and resource 0787 for Supplemental and Concentration Grant expenditures.

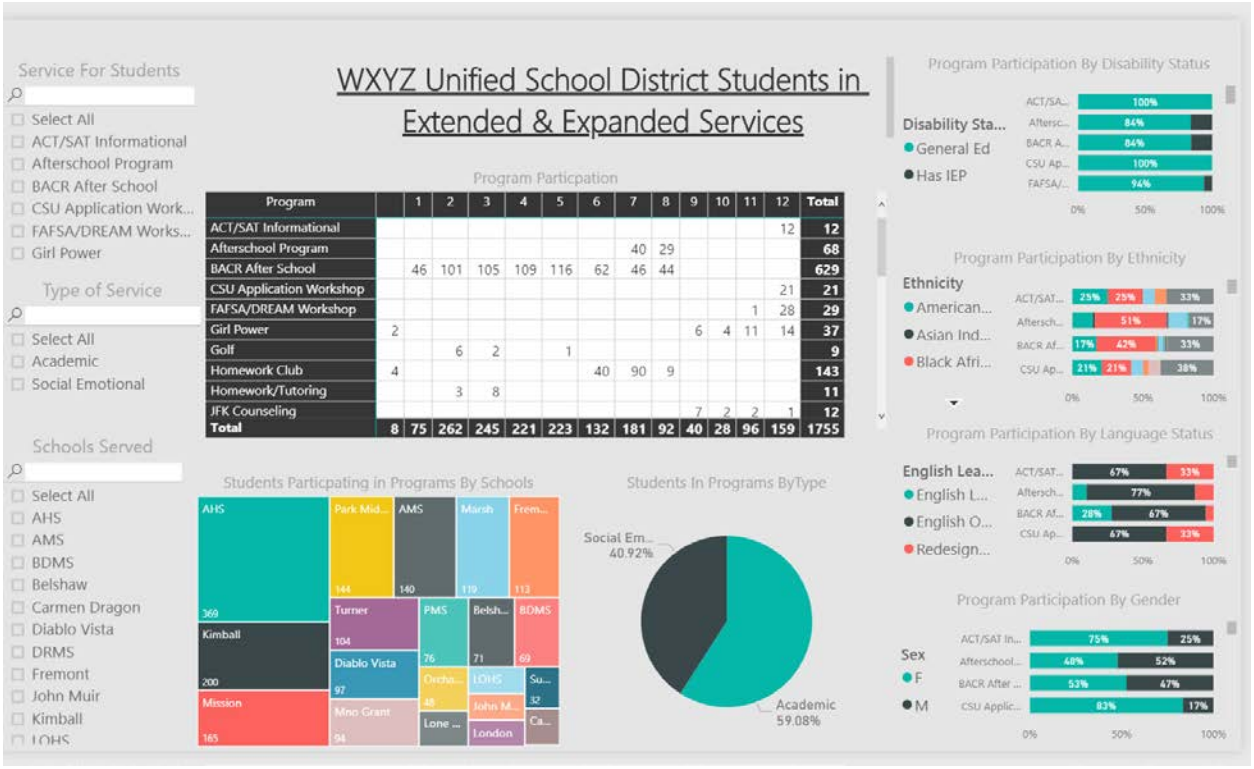
To support stakeholders having access to specific program expenditures, I worked with the Business Services Office to create a unique resource for each action in the LEA's LCAP. A qualitative descriptor, representative of the program or service was associated with the resource code in the district financial system. The LEA recently obtained access to CUBE's, automatic SQL internet connections that allowed for automatic updating for the status of each program associated with a resource. Also, a tag for each goal was associated for each program which allowed for expenditures to be monitored at the goal as well as action level in the LEA's LCAP. Figure 6 represents the Supplemental & Concentration Expenditures dashboard.

Figure 6. Supplemental and Concentration Expenditure Dashboard



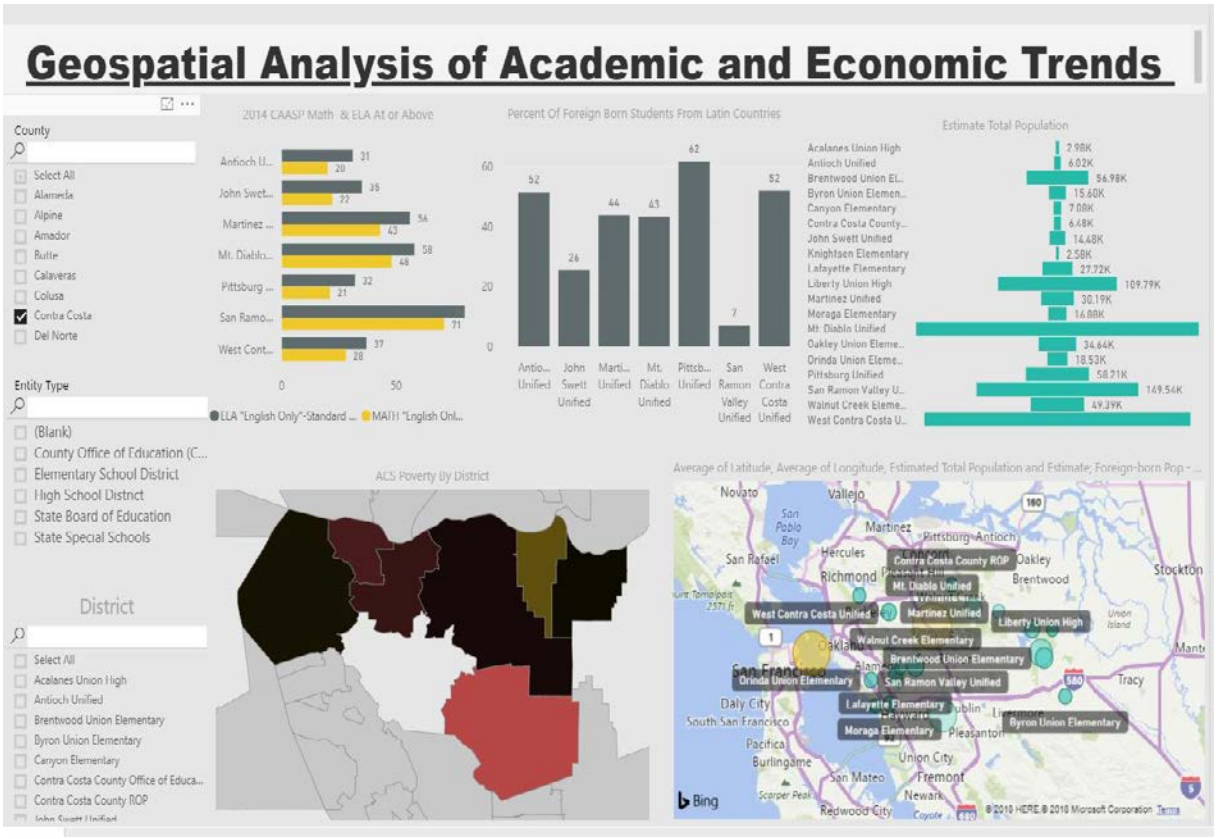
Data Dashboard 2: Intervention Services Dashboard – The LCFF also requires LEA's to monitor the implementation, effectiveness and financial impact of programs and services outlined in the LEA's LCAP. The impact of Actions and Services outlined in a goal area are evaluated by the Expected Measurable Outcomes (EMO). To support stakeholders in understanding implemented programs and services data was collected about students, what programs they participated in, what targeted subgroups they are a member of, what schools they programs are located at and if the program is classified as social emotional or academic in nature.

Figure 7. Program Intervention Dashboard



Data Dashboard 3: Geospatial Analysis of Academic and Economic Trends – As stated before the LCFF requires that programs and services are evaluated respect to LCAP's EMO's and ultimately the 8 State Priorities. However, there is a significant body of literature in the research knowledge base that suggests variance in student outcomes may be associated with context variables (Grubb, 2009). For example, some literature that there is significant correlation between parent variables such as parent education, school location, and community climate. (Grubb, 2009). Student, school level and community context data was integrated into one dashboard to support stakeholders as the reflect and make sense of data and make decisions about programs and services outlined in the LCAP.

Figure 8. Geospatial Data Dashboard



Once the data dashboards are complete they will made available to the all system stakeholders by posting the dashboard to the internet. Once deployed the members of the districts Local Control Accountability Stakeholder Advisory Committee will be trained on how to use the Power BI system and provide feedback. Throughout the course of the stakeholder advisory process members will be formally interviewed, focus groups will be held; surveys and exit tickets will be used to assess implementation and impact of the data dashboard.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

Introduction

This investigation is a design study. Specifically, the goal of this study is to increase the depth and quality of LEA stakeholder evolvement in the LCAP process. The vision of the LCFF is that certificated staff, classified staff, management staff and community members all are entitled to be consulted and have the opportunity to provide feedback on the LCAP. Both the LAO (Taylor, 2015) and the LEA's technical support self-assessment results suggest that there is gap in access and use of data necessary to evaluate and make decisions about programs. My consultation of the knowledge base suggests that the application of a tool, in this case a data dashboard may be able to narrow or even close data access gap (Coburn & Turner, 2011).

Research Questions

1. Does a data dashboard will increase access to data related to LEA function and operation, student outcomes and local context?
2. Does access to a data dashboard populated with the fore mentioned data elements will increase stakeholder sense of their own understanding of programs and services occurring in the LEA?
3. Does access to a data dashboard populated with the fore mentioned data elements will support stakeholders in integrating context factors related to neighborhood that interact with variables within the school that are associated with program and student outcomes?

To investigate these questions, I leveraged my role as a central office administrator. In my current capacity as Director, Educational Services I am charged with coordinating the input from the Human Resources division, Business Services division, Educational Services division, school sites and community stakeholders on the various components of the LCAP. My current role as Director also allowed me to leverage the LEA's Differentiated Assistance process to engage in a needs assessment to establish the organization's baseline orientation toward access to data, use, and decision making. The findings from the LEA Self-Assessment allowed me to conceptualize the gap between the status quo and ideal state of the LEA with respect to data use. Based on this finding I concluded that there is identifiable problem of practice. I further infer that the data dashboards would be an appropriate data intervention tool to prototype in this context. To investigate the claims implied by my research questions I engage in a follow up with community stakeholders who have been consistently involved in both the LEA's LCAP development and Differentiated Assistance process.

Research Design

I will detail the various components of my design. I will identify action research stance, my research participants, my unit of analysis and research strategy. Following this I will describe my how I am collecting data to assess implementation and impact of the tool. I will then discuss my analytical strategies for determining impact. Following this I will address how I plan to control for bias and attend to rigor, reliability, validity and transferability.

Action Research Stance

The purpose of this design study is to develop, implement and assess the impact of a tool intended to address a gap between the ideal and actual access and usage of data by stakeholders in the LEA. Action research is about collaboratively developing applicable solutions to real problem (Coghlan & Brannick, 2007). At it's core it is goal oriented and focused on developing practical knowledge and understanding which becomes the basis of informed practitioner wisdom. In my capacity as Director, leading the LCAP development process I had the unique opportunity to advance the implementation of the tool.

I am deeply engaged in the work of the LCAP because I am the supervisor of the LCAP development process. Consequently, I will classify my role in this study as a participant and observer. In this study I am both the developer of the LCAP plan, the LCAP budget and the data dashboard tools supporting stakeholders reflect on massive amount of information and make decisions that reflect they values of the community as well as be transparent.

Research Participants

Design development studies are meant to address emergent challenges to ideal operation facing local communities (Mintrop, 2016). The LCFF continuous improvement process call for district and community stakeholders to engage in data process, notice trends in the data, make interpretations and construct implications in the form of new and expanded services to meet the need of targeted students (Taylor, 2013). These data processes are engaged in at the LCAP stakeholder advisory committee and on the LCAP Differentiated Assistance Team. Because of this the members of the stakeholder advisory committee and differentiated assistance team are identified as the research participants for this design study. Although a convenience population, the LCAP advisory committee consists of around 40 stable members including teachers, counselors, administrators, classified staff, students' parents and community stakeholders. Of the original group of 40, 6 stakeholders elected to participate in a follow up interaction where I further explored perception of their access to data and what actions can be taken to address this gap. To assess the stakeholders on access to data I employed a online reflection form. This grouping of participants provides a novel opportunity to explore how data dashboards support data process and decision making for various stakeholders in the context of the LCFF continuous improvement process.

Unit of Analysis

This design study attempts to address impact of information overload on LEA stakeholders engaged in the LCFF continuous improvement process. However, the design study also seeks to address the impact of information overload with an aim of ensuring that LCAP's operate truly in the frame of a continuous improvement cycle that better reflect the needs of targeted students identified in the data. Consequently, in this design study there will be unit of study and one unit of analysis (Mintrop, 2016). The unit of study for this design investigation is the local educational agency. The unit of analysis is the 44 stakeholders who participated in differentiated assistance and 6 stakeholders who participated in the follow up assessment.

Data Collection

To collect data on the impact of the tool I will employ a follow up survey to members who participated in the Differentiated Assistance process. Individual responses will be used to see how stakeholders who hold certain specific positions respond to access to the tool. The individual responses will be aggregated to see what the findings suggest about the use of the tool with respect to access and usage of data in the LCAP stakeholder context. Due to scheduling and time constraints the survey was administered on line using the Google Docs online form application.

Data Analysis

Design studies seek to address organizational dynamics that either interferes with ideal organizational function. The success of the design intervention is assessed in the degree that it has impacted the dynamic that is problematic. However, impact cannot be determined without also assessing implementation of the intervention (Mintrop, 2016). This coincides with findings from the business intelligence professional literature which suggests that data dashboards should

be evaluated in term of the way users employ them and how they support users with making decisions (Yigitbasiolgu & Velcu, 2014).

To address this I will use the Harvard Strategic Data Project Rubric to facilitate the assessment of LEA stakeholder's perception and access of data. I use this rubric to place individuals, groups and the LCAP as well as monitor how their ranking changes over time. The Harvard Strategic Data Project rubric is employed because it outlines a clear, research informed schema for understanding and placing and organization on a scale with respect to its use of data. This avoids the need to develop internally generated rubric which my suffer from validity and reliability issues.

Reliability, Validity, Transferability, Rigor, Generalizability

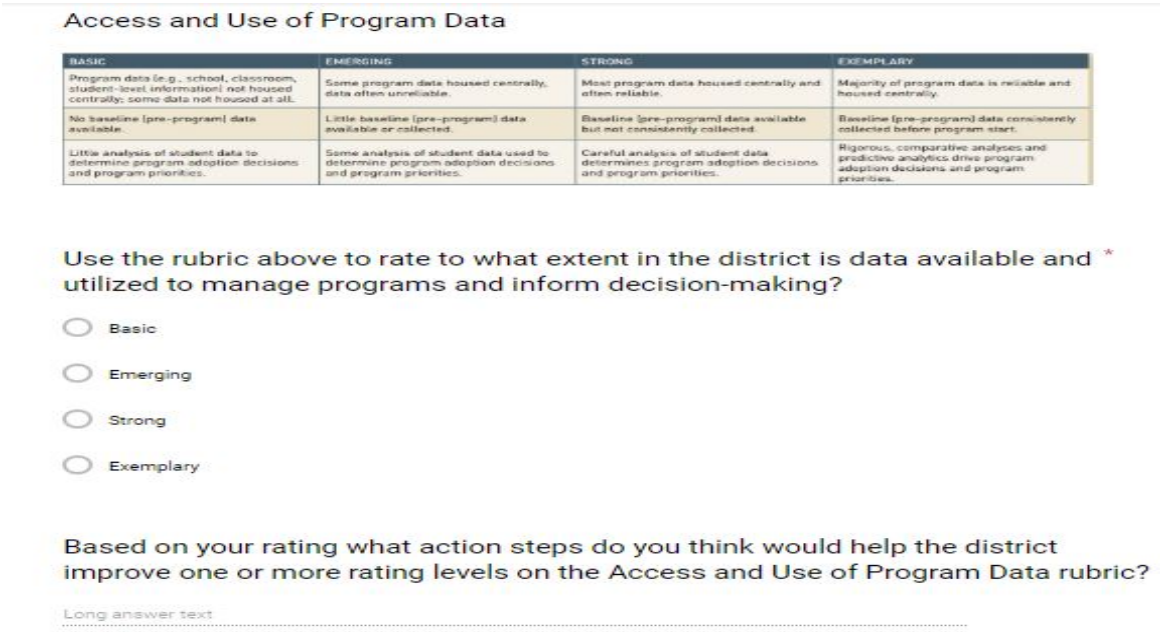
Like all studies reliability, validity, rigor and transferability must be attended to for findings to have use beyond the current study (Mintrop, 2016).

Reliability - Studies are reliability if study design can be replicated with similar findings. (Creswell, 2009) To support the implementation of a design study with reliable findings I will use clear and low inference protocol that all participants will have access to. This will minimize variation in results due to instrument variability. I will increase reliability of the findings by auditing my biases through journaling and confirming my findings with the research participants.

Validity - In addition to reliability it is essential that study findings have validity (Creswell, 2009). Validity refers to the degree that a studies measures what it intends to measures. In this design study I will addresses face, content and construct and. I address face validity by limiting my data collection activities to those that are actually related to data use. For example, I will not generate item were more than one construct of access at the same time. I will also attend to content validity by ensuring that all my tools measure that core components of the data process. Face validity operates like a buffer preventing erroneous content from leaking into my tools. Content validity operates like a floor demanding I include enough conceptual material

to ensure that my tools measure all he core features of data processes. I will address construct validity by employing the strategic data projects data use rubric and research based surveys.

Figure 9. Strategic Data Project – Access and Use of Program Data Rubric



Access and Use of Program Data

BASIC	EMERGING	STRONG	EXEMPLARY
Program data (e.g., school, classroom, student-level information) not housed centrally; some data not housed at all.	Some program data housed centrally, data often unreliable.	Most program data housed centrally and often reliable.	Majority of program data is reliable and housed centrally.
No baseline (pre-program) data available.	Little baseline (pre-program) data available or collected.	Baseline (pre-program) data available but not consistently collected.	Baseline (pre-program) data consistently collected before program start.
Little analysis of student data to determine program adoption decisions and program priorities.	Some analysis of student data used to determine program adoption decisions and program priorities.	Careful analysis of student data determines program adoption decisions and program priorities.	Rigorous, comparative analyses and predictive analytics drive program adoption decisions and program priorities.

Use the rubric above to rate to what extent in the district is data available and utilized to manage programs and inform decision-making? *

- Basic
- Emerging
- Strong
- Exemplary

Based on your rating what action steps do you think would help the district improve one or more rating levels on the Access and Use of Program Data rubric?

Long answer text

Transferability - Next findings form this design study must be transferrable if they are to be useful. For example, if my intervention, a data dashboard, can be transferred to a non-education context then my design study findings are transferrable (Van Den Akker, 1999). In my case there is some evidence that the answer to this question is already yes. For example, my review of the business intelligence and performance management literature highlighted data dashboards increased the efficiency of delusion making processes in the business and health care sector. This design study aims to test the hypothesis that data dashboards can provide similar decision-making support in the context of education.

Rigor - Finally, rigor must be addressed to ensure that findings from this design study have application beyond the immediate inquiry. One challenge to rigor that must be addressed arises from the fact that I am both the designer and the evaluators of the instruments impact (Van Den Akker, 1999) To address this challenge to rigor I will employ several externally valid measures of impact. These include the LCFF evaluation rubrics, the county office of education LCAP approval rubric and the Harvard, Strategic Data Project, Data Use Rubric. I am also using the strategy of triangulation to ensure that my findings are verifiably across several measures (Creswell, 2009). I will also audit my preliminary findings with stakeholders to minimize the chance for me project my own meanings on their reflection of their experience with the data process. Finally, I will also use journaling to engage in a cycle of reflection to audit my biases and account for them in my interpretation of findings (Coghlan & Brannick, 2005).

Generalizability – The goal of this design study is to see if a data dashboard is a tool that can bridge the gap in access and use of data for different stakeholder groups in the LEA. Design

studies are also iterative enterprises characterized by prototyping a solution for an audience before scaling up implementation of an intervention. This study represents an early phase in a prototyping process where a tool is made available to a small consumer group to establish proof of concept and obtain feedback for integration into the next design cycle. Given this the responses of individuals who are members of a certain stakeholder group are not to be interpreted as representative of that class. For example, the response patterns of the teacher in the focus group are not meant to be generalized to teachers at large. Also, the responses of the focus group as whole are not meant to be generalized to the LEA. Instead their responses patterns of individuals and the group are meant to guide our general understanding of the tool with respect to goal of the study and guide next steps in the design process.

CHAPTER FOUR: FINDINGS

Introduction

This design study is intended to address the gap in access to and use of a variety of data sources for multiple LEA stakeholder groups who are all entitled to give feedback on the actions and services outlined in the goals of the LEA's LCAP. The intervention, comprised of a collection of data dashboards, is a tool that leverages information design principles, such as Gestalt Theory, to make a high volume of data accessible to a wide variety of stakeholders who have varying degrees of familiarity with the specific data represented in the dashboard as well as being familiarity with data-driven decision making in general.

A small focus of group of engaged stakeholders was established to engaged in an in-depth analysis of the feasibility of applying the data dashboard as a tool for all LEA stakeholders. The focus group provided their input on the current status of access to data within the LEA, what actions steps can be taken to address any perceived gap between status quo and ideal state, and their opinion of the data dashboards as a tool to address the gaps they identified. The findings of my design study are detailed below. I first describe the composition of the focus group, followed by an exploration of their individual responses to the question of data access through the data dashboards. I will profile their responses as a group on the topics of data access and the use of the data dashboards.

Study Participants

The focus group consisted of eight participants. Each participant has been involved in the LCAP process for at least two years. Focus group participants were selected because they are members of a stakeholder group that the LEA should be consulting as the programs and services outlined in the LEA's LCAP are being reviewed. Each participant in the focus group also participated in the LEA's Differentiated Assistance process. Their input in the LEA Self-Assessment, along with others, established the fit of the LEA as an appropriate context to prototype the intervention.

Table 7. Focus Group Participants

Individual	Position in relation to LEA	Data Proficiency	Data Familiarity
Parent	Parent of student enrolled in LEA	High	The parent works as school teacher in a different organization.
Community Member	Faith Based Leader	High	The community member has experiences using data in both the education and non-profit context.
Elementary Teacher	Certificated Staff, working at elementary school; also, serves as a teacher on special	High	The teacher regularly uses data in both classroom and in management of intervention program.

	assignment overseeing a summer intervention program		
Research Analyst	Consultant, working in Education Services Division	High	The analyst is proficient in the use of both qualitative and quantitative research methods in the education context.
School Site Administrator	Certificated Staff, working at a comprehensive high school in the LEA	High	The administrator uses a variety of forms of data in the management of the school site.
Human Resources (HR) Director	Certificated Staff working in the LEA's Human Resources Division	High	Experienced district administrator uses data to assess HR practices. Formerly worked as the LEA's Director of Assessment
District Coordinator	Certificated Staff, Working in the LEA's Education Services Division	High	The administrator uses a variety of forms of data in the management of intervention programs.
Administrative Assistant	Classified Staff, Working in the LEA's Education Services Division	High	The administrative assistant uses data from a variety of sources to support analysis of LEA functions.
Business Manager	Classified Management, working in the LEA's Business Services Division	High	The business manager uses financial data to support district operations, including programs outlined in the LEA's LCAP.

Except for students, a member of each stakeholder group required by the LCFF participated in the focus group. LEA students were deeply involved in both LEA's LCAP development and Differentiated Assistance process. At the time of the data collection, no students were available to participate in the focus group. This will be discussed further in the limitations of the study during the discussion.

All stakeholders who participated in the focus group were classified as high with respect to their own understanding of data and its use. This finding about the focus group turned out to be advantageous because it informally controlled the dimension of individual proficiency with data. Stakeholders were generally aware of the eight state priorities and associated metrics. Because stakeholders' background knowledge of data was controlled for, I was able to focus on their perception of their access to data, knowing that they were aware of the full range of data points that could be considered.

Baseline Data

Baseline data was collected from the focus group through the first item in the online survey. The baseline results about data availability collected from the focus groups are consistent with the findings from the LEA Self-Assessment, which the LEA administered during the Differentiated Assistance process. Both assessments suggest that the stakeholders engaged in reviewing programs and services in the LCAP feel that the availability of data to manage programs and make decisions is in the early stages of implementation. For example, seven of the nine, or approximately 79% of the respondents, ranked the LEA as either Basic or Emerging with respect to the availability and utilization of data for decision making. It was also observed that two of the nine focused group members responded that availability of data within the LEA was strong.

Table 8. Baseline Data - Use the rubric above to rate to what extent in the district is data available and utilized to manage programs and inform decision-making?

Rating Label	Rating Description	Frequency	Percent
Basic	• Program data (e.g., school, classroom, student-level information) not housed centrally; some data not housed at all. • No baseline (pre-program) data available. • Little analysis of student data to determine program adoption decisions and program priorities	2	22.2%
Emerging	• Some program data housed centrally, data often unreliable. • Little baseline (pre-program) data available or collected. • Some analysis of student data used to determine program adoption decisions and program priorities.	5	56.6%
Strong	• Most program data housed centrally and often reliable. • Baseline (pre-program) data available but not consistently collected. • Careful analysis of student data determines program adoption decisions and program priorities.	2	22%
Exemplary	• Majority of program data is reliable and housed centrally. • Baseline (pre-program) data consistently collected before program start. • Rigorous, comparative analyses and predictive analytics drive program adoption decisions and program priorities.	0	0

The two respondents who rated the availability of data high were both site-based personnel. There is not enough data to make an inference about this finding, but I will reflect on how it can be explored further in the discussion section.

Table 9. Baseline Data – Individual Responses to the Question – To what extent in the district is data available and utilized to manage programs and inform decision-making?

Administrative Assistant	District Coordinator	Business Manager	Community Member	Research Analyst	Parent	School Site Administrator	HR Director	Elementary Teacher
Emerging	Basic	Emerging	Emerging	Emerging	Basic	Strong	Emerging	Strong

Resources Needed to Access and Use Data for Decision Making

After collecting baseline data, the focus group members were asked to reflect on what action steps the LEA would need to take to improve at least one rubric level with respect to access to and utilization of data to manage programs and to inform decision making. I reviewed each focus group member's response and noted themes that I described with in situ codes (Huberman & Miles, 2002). The codes I identified are people, data, systems, and training. The code 'people' applied to statements in which the focus group member directly suggested that the LEA's next action step should include hiring more staff. The Administrative Assistant and the Elementary Teacher were the only respondents that explicitly stated that the LEA needed to hire more staff as its next action step. The code 'data' was applied to statements that explicitly called for or implied that the LEA's next steps should include acquiring more data. For clarity, I included statements that suggested the need for acquiring data management infrastructure as well as acquiring more data itself. The District Coordinator and the Research Analyst both directly spoke to need for more data in their comments on next steps to be taken by the district. The code 'training' was applied to statements in which respondents explicitly stated or implied tha=t the LEA's next steps should include training or professional development for existing staff. The Community Member was the only respondent that spoke directly to the need for training. The last code, 'systems', was the most observed code among the nine respondents. 'Systems' in this context refers to the creation of patterns of behavior and interaction that are goal-oriented toward acquiring or analyzing data as well as making decisions about programs and services based on data. All respondents except the Administrative Assistant spoke directly to the need for the LEA to include developing systems as the next action step required to move up one rubric level.

Table 10. Baseline Data - Based on your rating, what action steps do you think would help the district improve one or more rating levels on the Access and Use of Program Data rubric?

Role	Focus Group Member Response	in situ code	Simple Resources	Compound Resources	Complex Resources	Abstract Resources
Administrative Assistant	Hire Data/Research Analyst in Educational Services Department	• People	Increase human capital.			
District Coordinator	Collect data more intentionally, i.e., based on data-based needs statements. Organize	• Data • Systems	Increase data		Invest in human systems that	

	and store data across sites/programs/etc. centrally, then make it available upon request to drive data-based decision-making and action steps.				organize people, time, and what people do with their time to consume and use data for decision making.	
Business Manager	Invest in data collection and analysis infrastructure, using resources devoted to initiatives which are not based on or contributing to data baseline, collection, and analysis	• Systems			Invest in human systems that organize people, time and what people do with their time to consume and use data for decision making.	
Community Member	Those overseeing implementation of 5 goals at district need to use data that is collected and have eval in place- LCAP team is providing data to people which is great but we will need more district and site admin doing training and eval for it to be as effective as intended	• Training • Systems		Build capacity in existing staff	Invest in human systems that organize people, time and what people do with their time to consume and use data for decision making.	

Research Analyst	The two biggest areas for growth that I see for the district would be, first, the centralization of data. Currently, data is housed in multiple places and is not easily or centrally accessible to all users. Second, the development of baseline data. Currently, not all program administrators use baseline data for their programs, so any data collected on the efficacy of a programs has no baseline to compare it to.	• Data • Systems	Increase Data		Invest in human systems that organize people, time and what people do with their time to consume and use data for decision making.	
Parent	Careful analysis of student data will determine program priorities and adaptation. Give students different options/opportunities to get involvement in different groups, clubs, and activities and taper this in such a way that parents will also get involved. All parents want to see their child excel and succeed.	• Systems			Invest in human systems that organize people, time and what people do with their time to consume and use data for decision making.	
School Site Administrator	Targeted, more meaningful; follow up to review if programs are successful social and emotionally	• Systems			Invest in human systems that organize people, time and what people do with their time to consume and use data for	

					decision making.	
HR Director	There's a need for ongoing review of data points with multiple stakeholders. The review of data needs to be also more in depth.	• Systems			Invest in human systems that organize people, time and what people do with their time to consume and use data for decision making.	
Elementary Teacher	Clarifying baseline measures to be used to determine program effectiveness. Identifying staff responsible for data collections and the avenue for data transmission; Assuring adequate training on those measures;	• People • Systems	Human Capital		Invest in Invest in human systems that organize people, time and what people do with their time to consume and use data for decision making.	

After reviewing the codes in situ and developing themes, I classified the responses of focus group members into requests for additional resources. I applied the concepts Simple, Compound, Complex, and Abstract Resources to further classify and organize the responses (Grubb, 2009). Simple Resources refers to resources that are can be purchased. Hiring a teacher is an example of a Simple Resource. Compound Resources refers to resources that are created by combining two simple resources. An example of a compound would be hiring a teacher, equivalent to obtaining a simple resource, and providing that teacher with training and time, also considered to be a simple resource, to create an experienced teacher, who then represents a compound resource. A Complex Resource refers patterns of behavior that are the product of combining simple resources. Grubb, (2009) states that a teacher's instructional pedagogy is an example of a complex resource because it is a pattern of behavior that emerges from the combination of a teacher, time, training, and opportunity to practice. In the context of this design study, systems are classified as a complex resource because the term refers to the data practices

of stakeholders that emerge from the combination of simple resources such as people, data and time to meet, reflect, understand, and make decisions about programs and services informed by data. Abstract Resources refers to culture, atmosphere or climate. It is the context in which simple, compound, and complex resources reside. In the context of this study, abstract resources refers to a culture and climate that supports data-driven decision making.

Mapping Grubb's resource concepts onto the in situ codes of the statements associated with them reveals a theme. All but one member of the focus group explicitly articulated a need for the LEA's next steps to include building complex resources to ensure that the systems are in place to support stakeholders in having access to data, time, and opportunities to collaborate and make decisions about programs and services in the LEA's LCAP. None of the respondents spoke explicitly to the need for the creation of a culture of data-driven decision making. However, I believe it is implicit in the respondents' statements. I will discuss the implicit idea of a data-driven culture in the discussion chapter.

Impact of Data Dashboard on Stakeholders' Sense of Availability of Data

Focus group respondents were given the opportunity explore three data dashboard prototypes. They were asked if having access to these data dashboards addressed the concerns they articulated at the time of their baseline assessments. The respondents were specifically asked, "To what degree does this report address any of the action steps you identified in your response**?"** Their feedback is included in Table 11.

WXYZ Supplemental & Concentration Expenditure Dashboard – Feedback on the Expenditure Dashboard ranged from "not related" to "great start". The District Coordinator's statement "good start" seems to capture the spirit of the comments from all of the focus group responders. The Research Analyst provided the most direct feedback to the question about the tool and the degree to which it makes data more accessible for decision making by stating that it is "emerging data." The Analyst further elaborated that it is a collection of centralized information, but due to the lack of baseline data, it falls short of what would be characterized as true information to support decision making. The Community Member remarked that the level of transparency was positive, but was concerned that there wasn't a line item for a parent engagement budget. The Business Manager's remark were also informative; he stated that the display could also be used to display initiatives that are not data-driven. Altogether, the focus group members' comments suggest that the Expenditure Dashboard is a good, but incomplete, step towards addressing the gaps identified in question 1.

Intervention Program Dashboard - The responses of the focus group members with respect to the Intervention Program Dashboard also suggest that the dashboard is a good, but incomplete start. The Administrative Assistant, the Business Manager, The Human Resources Director, and the Research Analyst all stated that the data display seemed incomplete. The Administrative Assistant captured the sentiment of the group with the statement, "This captures a piece of the puzzle but not the whole picture." The District Coordinator, Business Manager, and the Research Analyst clarified what they felt when they made the statement that the display was incomplete. Their sentiments are captured by the Business Manager who states, "This only appears to show participation without baseline participation or metrics against which to evaluate." Overall, I inferred from the focus group that the display needed baseline and metric

data to be useful for making decisions about programs and services.

Geospatial Analysis of Academic and Economic Trends Dashboard - The focus group expressed a sense that the data represented in the Geospatial Analysis appeared disconnected from their work of using data to reflect on programs and services in the LCAP. The Administrative Assistant, Human Resources Director, Elementary Teacher, and the Educational Services Director all stated that they felt the data in this dashboard was not helpful or connected to the task at hand. The District Coordinator captures the spirit of their sentiments best with the quote "The data available in this particular dashboard is not helpful in guiding decision-making processes and dialogues."

Table 11. Stakeholder Analysis of Three Dashboards

Role	Expenditure Dashboard	Intervention Program Dashboard	Geospatial Analysis of Academic and Economic Trends Dashboard
Administrative Assistant	Not related	This shows a piece of the puzzle, but not the whole picture.	not related
District Coordinator	Knowing what funding is available and how it is being spent in real time is a good start. It leads to the question of whether or not the funds are spent appropriately and effectively, which should move the discussion towards the impact the funded programs/activities have on students.	OK, so now we can look at who is being served in what programs/actions funded as per the first dashboard. Given the LCFF and LCAP reporting requirements for unduplicated (targeted) students, this is a good next step. I did notice that the numbers are incorrect for some of the programs of which I have direct knowledge. If data dashboards are used to drive decision-making, the data needs to be accurate and reliable. There are not yet any expected, measurable outcomes or data on how students are progressing towards those outcomes as a consequence of participating in or benefiting from the funded programs.	The dashboard as presented provides very limited trend data. As presented, the data available in this particular dashboard is not helpful in guiding decision-making processes and dialogues.
Business Manager	This report can be used to identify initiatives which are not data-driven	This appears to show only current participation in a single program, without baseline participation or metrics against which to evaluate program effectiveness.	Trend is not evident, appears to be a snapshot. We need the present and the past to determine the future.
Community Member	It is great to have transparent access to the data (major improvement from years past). I	It's great in terms of data re dosage of programming, but again where is the directors of	This is amazing comparative data. It allows one to look at other similar or dissimilar

	still do not see which directors are over which goals and what evaluation they are using to determine effectiveness of their programs' implementation	particular goals eval stating effectiveness of dosage? I loved the ability to navigate by ethnicity and schools esp. for HS and Elem	counties and compare. A great tool- I wonder how directors are using this data to evaluate programming in supplemental & conc as well as in the classroom
Research Analyst	This data does not address the action steps I outlined in the pervious question. This data is what I constitute as the "emerging" data. It gives a lot of information, and attempts to centralize information. However, there is no baseline data included on this dashboard, and where this data is coming from (i.e. the centralization of the data) is not entirely clear.	This dashboard gets closer to the action steps I outlined because this dashboard can be used as baseline data. However, I think the month and year need to be included to make this an effective baseline data dashboard.	This does not address the action steps I outlined, however, I think this dashboard does get the districts data to a more "exemplary" utilization of data because it actually analyzes the data, rather than just warehousing it. So this dashboard would improve what "rating level" I would give the districts data usage by at least one level.
Parent	No budget was made for parent involvement. How are we going to get that extra push for that child without making a budget for these things?	Finding diverse options according to the child needs would give greater numbers of attendance to this different focus group as well as having child accountable to parent for attendance and participation.	Approximately 30 percent of the WXYZ that is international and bilingual students, so our resources should be tailored accordingly.
School Site Administrator	Very True	Very True	Very True
HR Director	Good to be able to see all of the expenditures.	Good start, dashboard doesn't have baseline or metrics. Also data is incomplete	Don't see the connection.
Elementary Teacher	The dashboard is very clear, helpful and transparent	Again- it's transparent on communicating the who's and the why's	n/a

Focus group members seemed to express an overall agreement that the data dashboards were a "good start." However, their consistent sentiment across all three data dashboards was that the displays were incomplete and lacking connection to either baseline data, program data, or outcome data. The majority of the focus groups members articulated that the data dashboards, in their current iteration, were not capable of supporting decision making about programs and services. This is captured by the sentiments of the Research Analyst who stated that the data dashboards constitute "emerging data."

Impact of Data Dashboard on Rubric Ranking

Table 12. Impact of Access to Data Dashboards on Stakeholder Rankings

Role	Baseline Data Utilization Ranking	Post Tool Exposure Data Utilization Ranking	Change Based on Dashboard
Administrative Assistant	Emerging	Emerging	No
District Coordinator	Basic	Beginning	Yes
Business Manager	Emerging	Emerging	No
Community Member	Emerging	Strong	Yes
Research Analyst	Emerging	Strong	Yes
Parent	Basic	Basic	No
School Site Administrator	Strong	Exemplary	Yes
HR Director	Emerging	Emerging	NO
Elementary Teacher	Strong	Strong	No

Overall, five out of nine focus groups members stated that the data dashboards displayed were not sufficient to address the next action steps they outlined in the in the initial needs assessment. The Elementary Teacher, HR Director, Parent, Business Manager, and Administrative Assistant all stated that their ranking of the LEA wouldn't be changed by the presence of these data dashboards. Surprisingly, the Research Analysis and the District Coordinator both articulated that their ranking of the district would improve with the presence of these data dashboards. Next I will explore the rationale of the focus group members before moving on to a discussion of the of the significance and overall implications of the findings.

Table 13. Rationale for Change in Ranking

Role	If yes, why did it change your opinion?
Administrative Assistant	Not Applicable
District Coordinator	As stated throughout my short answers, having access to timely and accurate date is fundamental to the continuous improvement/inquiry cycle. Availability and use of these dashboards does facilitate a basic phase of the process. Understanding and using basic data

	about where funding is spent, who is being served, and what effect the services have on the targeted student populations may help stakeholders make decisions that improve the quality and effectiveness of the actions/programs funded by LCFF and defined in each LEA's LCAP
Business Manager	Not Applicable
Community Member	if it is used to inform eval and monitoring effectiveness then yes- again the data is amazing but are all directors of levels using it in conjunction w eval as amazing as this tool is it will still need to be used by and with those that need access to people and systems that can help their children succeed. It is the transparent info the parents and community have been asking for so kudos to the creator of such a tool, but now how will it be used by directors and how will WXYZ staff connect w those that don't have access to tech in order to use it to its fullest potential? Who is willing to do the home visits and help train parents to navigate this great data tool
Research Analyst	The dashboards featured in the first questions of this survey were basic. As the questions progressed, the dashboards featured also progressed. Each dashboard featured went into more detail, and actually began analyzing the data, rather than just warehousing it and presenting it in a single variable manner. I think if the district used these data dashboard in a widespread manner, for all programs, and with as much detail and analysis as the Geospatial or Intervention dashboards do, I would change my ranking of the districts use of data to be very strong. Without these dashboards, the District's use of data is very basic, and almost non-existent from a community Stakeholder's perspective. These dashboards actually house the data, analyze the data, compare the data, and have predictive qualities and abilities. All in all, the use if these dashboards would change my overall rating of the districts use of data.
Parent	Not Applicable
School Site Administrator	Very data rich that is user friendly
HR Director	Yes
Elementary Teacher	Not Applicable

Four focus group members responded that they would change their rankings based on the availability of the data dashboards. Of the four, the District Coordinator and the Research Analyst provided detailed feedback as to why they would change their rankings. Ironically, both the District Coordinator and the Research Analyst both offered the most detailed and behavioral feedback on their reflections of the three dashboards. They both articulated a sentiment in their individual analysis that all three data dashboards constitute the beginning of providing data. However, they both articulated the theme that the data did not yet rise to the level of being truly usable information because it was either incomplete or not associated with other data points.

Despite this, both the District Coordinator and the Research Analyst stated that they would change their ranking based on the general theme that the data dashboards, although

incomplete, do provide some forms of usable data that can assist stakeholders in reviewing programs and services in the LEA's LCAP. For example, the District Coordinator states that the data dashboards facilitate "a basic phase of the process. I infer that the Coordinator used the term 'process' to refer to the overall continuous improvement cycle outlined in the LCFF. The Research Analyst echoed a similar sentiment with the statement that "These dashboards actually house the data." Both the District Coordinator and the Research Analyst speak to a theme that the provision of data in any format is just the beginning of a data-driven decision making process.

Conclusion

This design study is motivated by the need to close a gap in how data should be provided to stakeholders and how it actually is provided to stakeholders to support their decision making about programs in the LEA's LCAP. Based on the needs assessment, I developed a tool, a data dashboard, to attempt to close the gap between the current and the ideal state of operation of the LEA with respect to access to and use of data. The efficacy of the tool was evaluated by prototyping the tools with community stakeholders and then soliciting their feedback. In summary, the following understanding emerged from the feedback provided by the stakeholders.

1. Stakeholders expressed that there is a gap in access to data to make decisions about the programs and services outlined by the LEA's LCAP.

2. Stakeholders overwhelming framed the gap in access to data in terms of the absence of systems to facilitate consumption of ad reflection on data, collaboration, deliberation, and ultimately, data-informed decision making about programs and services in the LEA's LCAP.

3. Stakeholders articulated that the data dashboards presented only present a "piece of the puzzle" of data driven decision making.

4. Stakeholders perceived the data dashboard with geospatial data as largely disconnected to their immediate work of decisions about programs and services outlined in the LEA's LCAP.

5. Stakeholders articulated that data dashboards are perhaps a good place to start, but that there need to be systems of providing and consuming data to support data-driven decision making.

In the next chapter I will discuss the implications of the findings, the limitations of the study, and implication for practice and further study.

CHAPTER 5: DISCUSSION

Introduction

The vision of the LCFF is that certificated, classified, and management staff as well as community members are all given the opportunity to provide feedback on actions and services listed in the LCAP. Both the needs assessment done during the Differentiated Assistance process and the needs assessment done during the design study highlighted a gap in the access to and the use of data intended to help stakeholders make decisions about such programs and services. To address this problem of practice, a tool was developed to attempt to bridge this gap. The findings also highlighted the need to reflect on other factors that impact accessibility to and use of data that interact with we organizational context of the LEA.

Summary of Findings

The findings in the design study suggest that several factors impact access to data, use of data, and data-driven decision making. The needs assessment first established that there is a problem of practice or gap in access to data for stakeholders. Data about programs identified in the LEA's LCAP are not readily available in ways that allow stakeholders to fully understand the programs, understand their impact, provide input, and finally make decisions about resource allocation for programs. For instance, stakeholders consistently articulated that they needed more opportunities and guidance to collaboratively analyze and reflect upon data to make valid decisions about programs. In my review of the research knowledge base, I found examples of how data visualization could be leveraged to make data readily available to a large number of stakeholders. Data dashboards were constructed, integrating financial, program, and community context data.

Stakeholders in the focus group stated that the data provided in the dashboards was a good start, but they also articulated that it provided only an incomplete picture. They suggested that the dashboards would be more effective if they included baseline as well as formative and summative program data. They also articulated that the data dashboards would be more effective if the visualization were to connect program data and metrics to the financial data. Stakeholders also stated that it was difficult to use the dashboard because some of the data was incomplete, and they voiced concerns that this would lead to wrong conclusions about programs. They expressed that did not see a connection between the community context data from the American Community Survey and their local programs. Five out of nine focus group members stated that data dashboards as presented would not cause them to change their ratings of the LEA with respect to access to and use of data.

Study Limitations

This design study did provide insights into some of the factors that may impact the use of data for stakeholders who are charged with reviewing an LEA's LCAP and making recommendations and decisions about the programs and services therein. However, as with any investigation, there are limitations to the conclusions that the study implies.

The first limitation is the generalizability of the findings outlined in this study. Specifically, the population of study is an LEA, and the population of analysis are the

stakeholders who are engaged in the process of using data to make recommendations about the LEA's LCAP. During this study, I was able to connect with nine stakeholders who were involved in the development process of the LCAP. With the exception of students, all other stakeholder groups - teachers, parents, administrators, district staff, community leaders and classified staff - were represented in the focus group. The focus group consequently constituted a representative sample of the constituencies the LCFF requires to be represented in the LCAP development process. The number of participants in the stakeholder group, however, falls well short of the number necessary to make generalizations about the populations represented by the individual focus group participants.

It also should be noted that many members of the focus group as well as other members that were engaged in the LCAP committee actually occupy more than one identity in the stakeholder feedback process. Many who are staff are also parents of students who attend schools in the LEA. It is consequently difficult to distinguish from which perspective an individual is speaking as he or she offers their perceptions and feedback on the effectiveness of a tool such as the data dashboard and, more generally, on the programs and services that are outlined in the LEA's LCAP. The same limitation becomes apparent when considering the group of stakeholders as a whole. Those who participated in the focus group may represent an atypical composition of individuals whose perceptions on access to data, district practices, and data dashboards may differ from a different collection of stakeholders who are asked the same question the same way.

Additionally, the findings are limited because it is impossible to truly control for all the variables that interact with the study variables relevant to this investigation. For example, access to technical information may very well impact one's perception of the availability of information in general. One instance where this may have been illustrated is the variation in stakeholders' responses in regards to the efficacy of the data available in the data dashboards. Only one stakeholder surveyed, the research analyst, observed that the dashboards provided in the survey were cumulative in nature. Another stakeholder, a parent, focused on the fact that they did not see a line item in the budget for parent involvement.

There are clear limitations to the generalizations that can be made in the findings of this design study. However, there are definite implications for leadership, practice, research, and even future iterations studies.

Implications for Practice & Leadership

The overall findings of this design study are not generalizable to the population of study nor to the population of analysis. An analysis of the LEA's ranking and the recommendations for next steps provided by stakeholders suggests that they are interested in having opportunities to engage in discussions, supported by having the appropriate data available, that will allow them to better understand programs and make decisions about them. Grubb, (2009) referred to this as the creation of complex resources. Leaders in the organization are in a unique position because they control the allocation of resources as they are deployed in the organizational landscape. This suggests that leaders can create opportunities for meaningful feedback from stakeholders by bringing data experts who know how to make sense out of data into collaborative meetings with stakeholders who work inside of the school system as well as stakeholders who not work in the

school system. The addition of a data expert to such meetings would enable participants to reflect on the data provided in a more thoughtful way and perhaps make more effective decisions about programs and services based on meaningful data conversations.

The findings also present an opportunity for leadership to support stakeholders at all levels in developing and implementing expected measurable outcomes (EMOs) for programs as well as goals of the LCAP. The LCFF currently requires that LEAs develop EMOs to assess the impact of actions and services outlined in the LCAP. Not all programs and services defined in support of the goals of this LEA's LCAP include EMOs that facilitate an assessment of their efficacy by stakeholders charged with making recommendations about eliminating, maintaining, or adding programs and services.

Further Research and Iterations

The findings of this design study suggest that the data dashboards created for the study are early prototypes that may eventually fill the need of making a variety of data readily available and accessible to a number of different stakeholder groups as they engage in their reflections on the programs and services described in an LEA's LCAP. Participants in the stakeholder focus group commented repeatedly that the data dashboards were a 'good start', and two respondents clearly stated that access to data dashboards could serve as first step in the larger and more complex process of creating a system of interactions that supports data being provided and used to support data driven decision making.

In future iterations of this design development study, I recommend that data dashboards be created that integrate program data as well as EMO data and financial data in the same visual display. Representing resource, program, and outcome data in one dashboard would help stakeholders to understand the cost and the benefit of a program as they prepare to make decisions about the program. Any future iteration of this study should also spend a significant amount of time framing the need and the value of having contextual data readily available for stakeholders to reflect on as they make decisions about the programs and services eliminated from, maintained, or added to their LEA's LCAP.

Conclusion

California's accountability system calls for meaningful engagement by a variety of stakeholder groups. It requires that LEAs implement programs based on the identified needs of the students in their communities. It also calls on LEAs to establish clear and measurable outcomes that will enable stakeholders to understand how and why funds are invested in programs delineated in the LCAP. Data is essential to this process. This design study explored the idea of using data dashboard to facilitate data-driven dialogue and decision making by an LEA's stakeholders. The results of the design steady suggest that the data dashboard prototypes

created for the study presented an opportunity for community stakeholders to access and understand the data necessary for them to make recommendations about programs and services. However, the results of this design study also suggest that data dashboards of any level of detail by themselves will not be a sufficient tool bridge the gap between access, collaboration, and data-driven decision making. The findings do suggest that a robust data dashboard can serve as a

tool or a scaffold to support stakeholders as they engage in this process. A data dashboard may, at best, function as a mechanism to facilitate the generation of the complex resource that is the interaction with the data. Overall, findings suggest that the creation, implementation and maintenance of systems, i.e. complex resources, through intentional leadership may be the condition necessary to ensure that ready access to comprehensible data and opportunities to engage in data-driven decision making are maintained.

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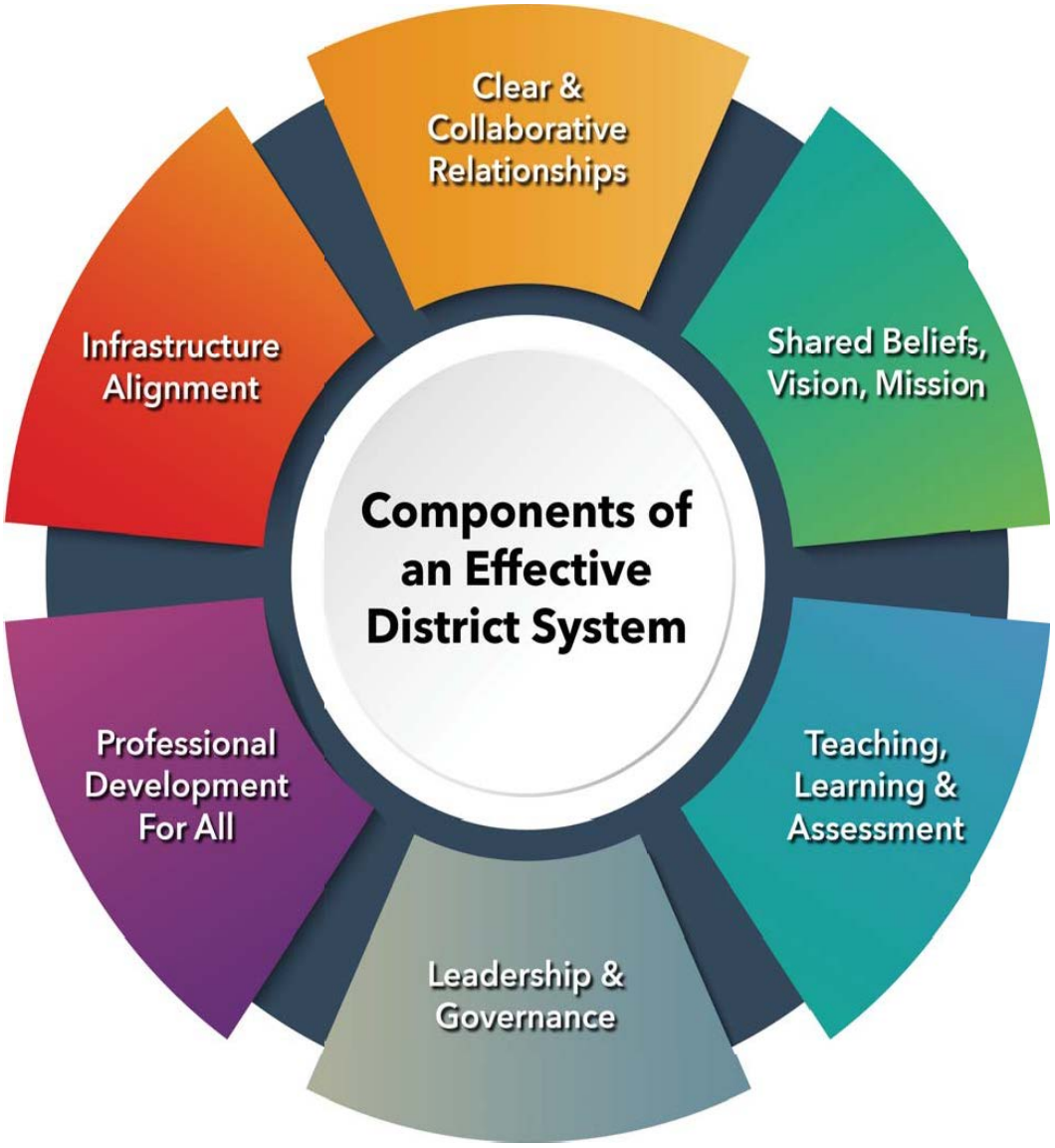
APPENDIX A: CCSEA LEA SELF ASSESSMENT COMPONENT 5.1 LEA USE FOR DATA RESOURCE ALLOCATION TO IMPOVE STUDENT LEARNING

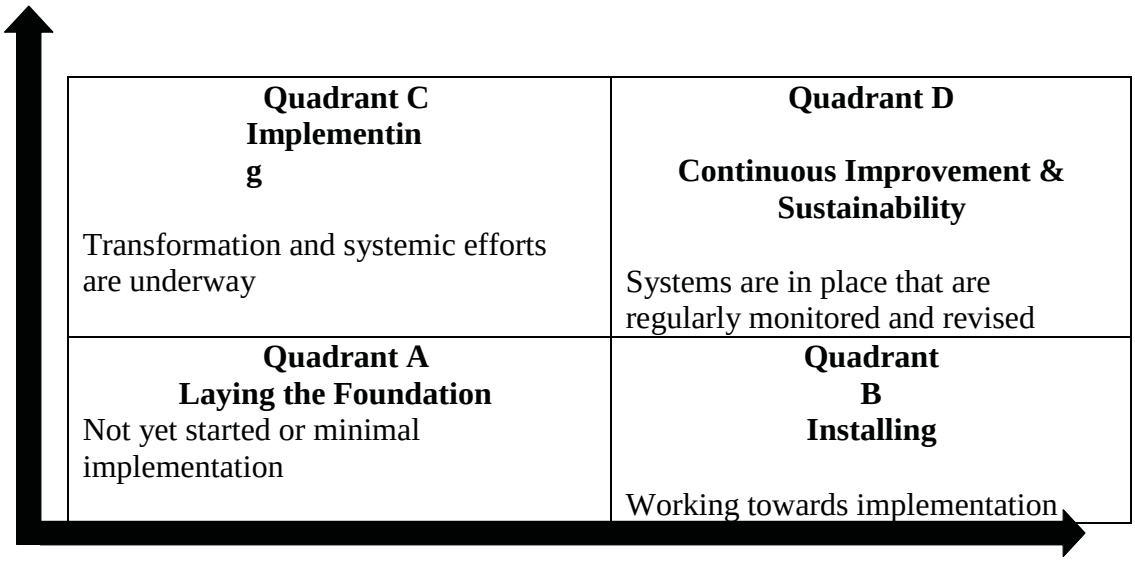
The LEA Self-Assessment is a tool for District Leadership Teams to examine the current status of systemic practices that have been consistently demonstrated through research to be the components of effective district systems.



Instructions

LEAs use this tool to self-assess their level of implementation of the six components of an effective district system. Under each Indicator of LEA Support are descriptive statements that differentiate levels of implementation. Check the box that most accurately describes the LEA's current implementation level. The quadrant that has

the most boxes checked is the LEA's current level of implementation. If there are an even amount of check boxes marked in each quadrant, as a team, decide which quadrant best describes current implementation. Work towards improving in areas marked in the lower quadrants and reflect on the policies, practices, and systems in place that moved the LEA into the higher quadrants.



LEA Self-Assessment was developed from:

- SWIFT Education Center: Fidelity Integrity Assessment (FIA)
- District Capacity Assessment (NIRN)
- LEA Self-Assessment Companion Resource (CCSESA)
- Michael Fullan's Coherence Framework

COMPONENT 5: Infrastructure Alignment

5.1 LEA USE OF DATA FOR RESOURCE ALLOCATION TO IMPROVE STUDENT LEARNING refers to a LEA documented system for targeting resources, including money, staff, professional learning, materials, and additional support to schools based on the analysis of a variety of data that is disaggregated by student groups to determine LEA and school needs.

INDICATORS OF LEA SUPPORT

Implementing (Transformation and systemic efforts are underway)	**Continuous Improvement and Sustainability (Systems are in place that are regularly monitored and revised)**

X Our LEA **has a continuous improvement process** involving **multiple stakeholders** who use a variety of data that are disaggregated by student groups to allocate resources in order to improve LEA operations and meet critical learning needs of students. X The **system is evaluated and refined** to improve resource allocation to meet the needs of the schools and our LEA.	Our LEA **has a documented systematic continuous improvement process** involving **multiple stakeholders** who use a variety of data that are proactively disaggregated by student groups to allocate resources in order to improve LEA operations and meet critical learning needs of students. The **system is continuously evaluated and refined** to improve resource allocation to meet the needs of the schools and our LEA.
Laying the Foundation (Not yet started or minimal implementation)	**Installing (Working towards implementation)**
I Our LEA **does not have a process** to consistently use disaggregated student data to make decisions related to resource allocations/ adjustments to improve LEA operations and meet critical learning needs of students. I There is **no provision for refining the process.**	I Our LEA **has a process** to use data. Our LEA uses data that is disaggregated by student groups to make some adjustments based on performance and operational needs. I The **system may be periodically refined** to improve resource allocation.

LBUSD LCAP Goal 1: Increase student academic achievement and social/emotional strength through collaboration, critical thinking, creativity, and communication.

LBUSD LCAP Goal 4: Safe, attractive, clean, well equipped learning environments for all students that promote critical thinking, collaboration, creativity, and communication.

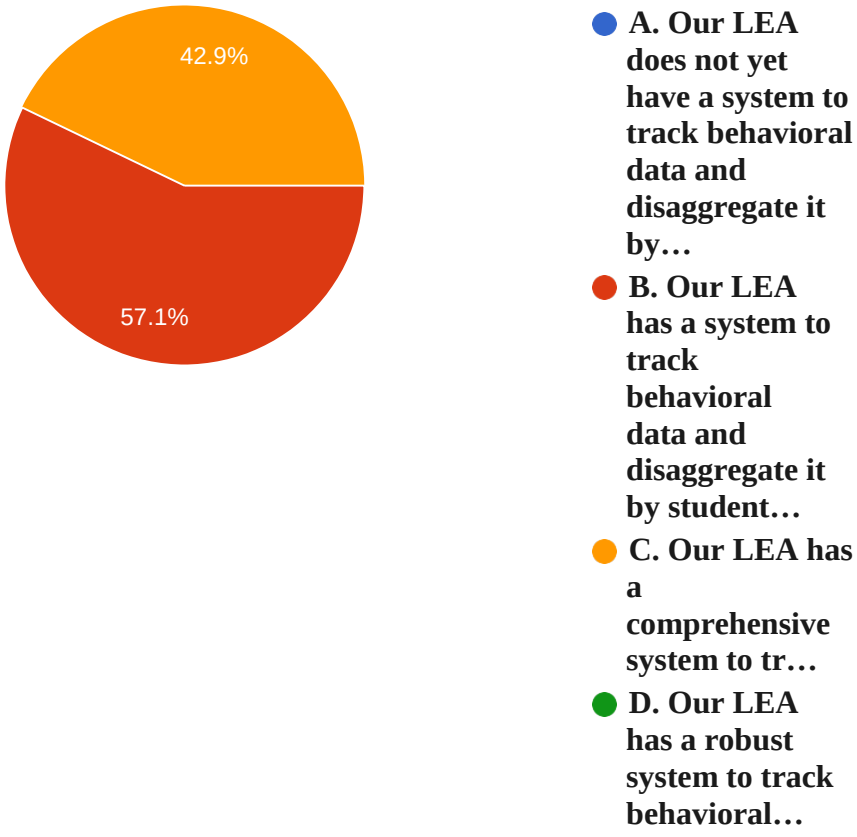
APPENDIX B: 5.1 LEA USE OF DATA FOR RESOURCE ALLOCATION TO IMPROVE STUDENT

COMPONENT 5: Infrastructure Alignment

5.1 LEA DEVELOPMENT OF A DATA SYSTEM FOR SCHOOL IMPROVEMENT

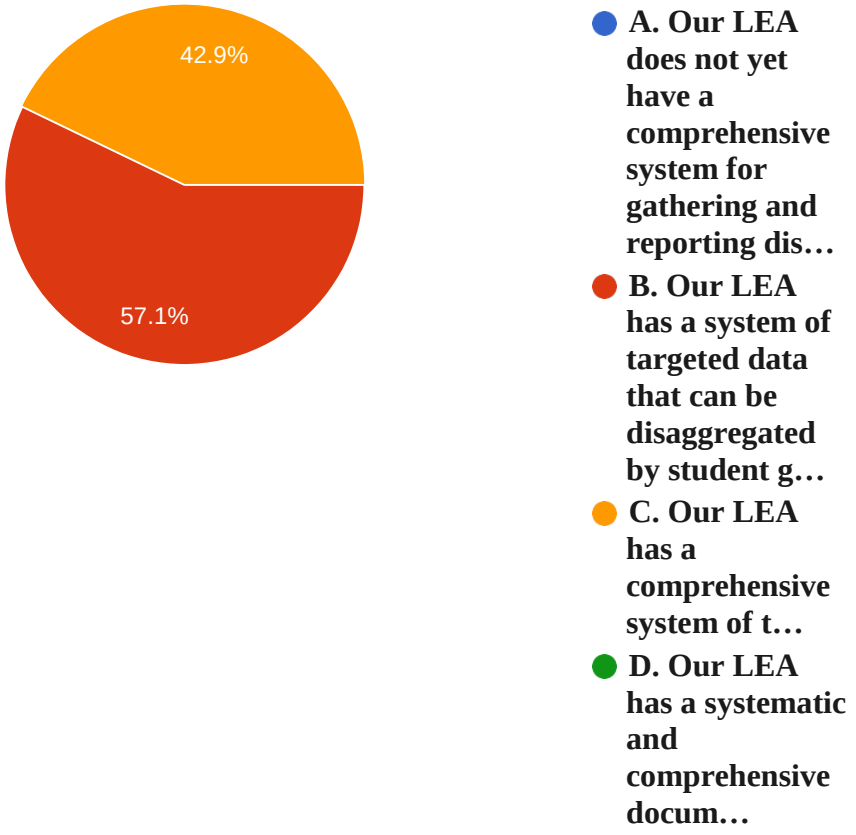
5.11 Which statement best describes the district?

7 responses



5.11 Which statement best describes the district?

7 responses



Reflective Questions: What tools, processes and structures are in place to facilitate the use of data for continuous improvement? In what ways are staff and other key stakeholders involved in making sense of student and school performance data?

2 responses

We have a lot of data on students - their achievements, behaviors, etc. However, District-wide data is not easily accessible as it is siloed in multiple systems with varying software. Access to some systems is restricted.
Querying data from the Aries system is not a user-friendly process.

We have not been trained nor given comprehensive dis-aggregated data.

APPENDIX C: STRATEGIC USE OF DATA SURVEY

Strategic Use of Data Rubric

Thank you for participating in this survey. The objective of this survey gain better a better understanding as to how to make information about programs and services in the Local Control Accountability Plan accessible and understandable to a variety of stakeholders. All personal information will be destroyed. Thank you for your time.

* Required

1. **First Name** *

2. **Last Name** *

3. **Last Name** *

Mark only one oval.

- ◯ Student
- ◯ Parent/Guardian
- ◯ Classified Staff
- ◯ Teacher/Counselor
- ◯ Administrator/Management
- ◯ Community Based Organization Member

Access and Use of Program Data

BASIC	EMERGING	STRONG	EXEMPLARY
Program data (e.g., school, classroom, student-level information) not housed centrally; some data not housed at all.	Some program data housed centrally, data often unreliable.	Most program data housed centrally and often reliable.	Majority of program data is reliable and housed centrally.
No baseline (pre-program) data available.	Little baseline (pre-program) data available or collected.	Baseline (pre-program) data available but not consistently collected.	Baseline (pre-program) data consistently collected before program start.
Little analysis of student data to determine program adoption decisions and program priorities.	Some analysis of student data used to determine program adoption decisions and program priorities.	Careful analysis of student data determines program adoption decisions and program priorities.	Rigorous, comparative analyses and predictive analytics drive program adoption decisions and program priorities.

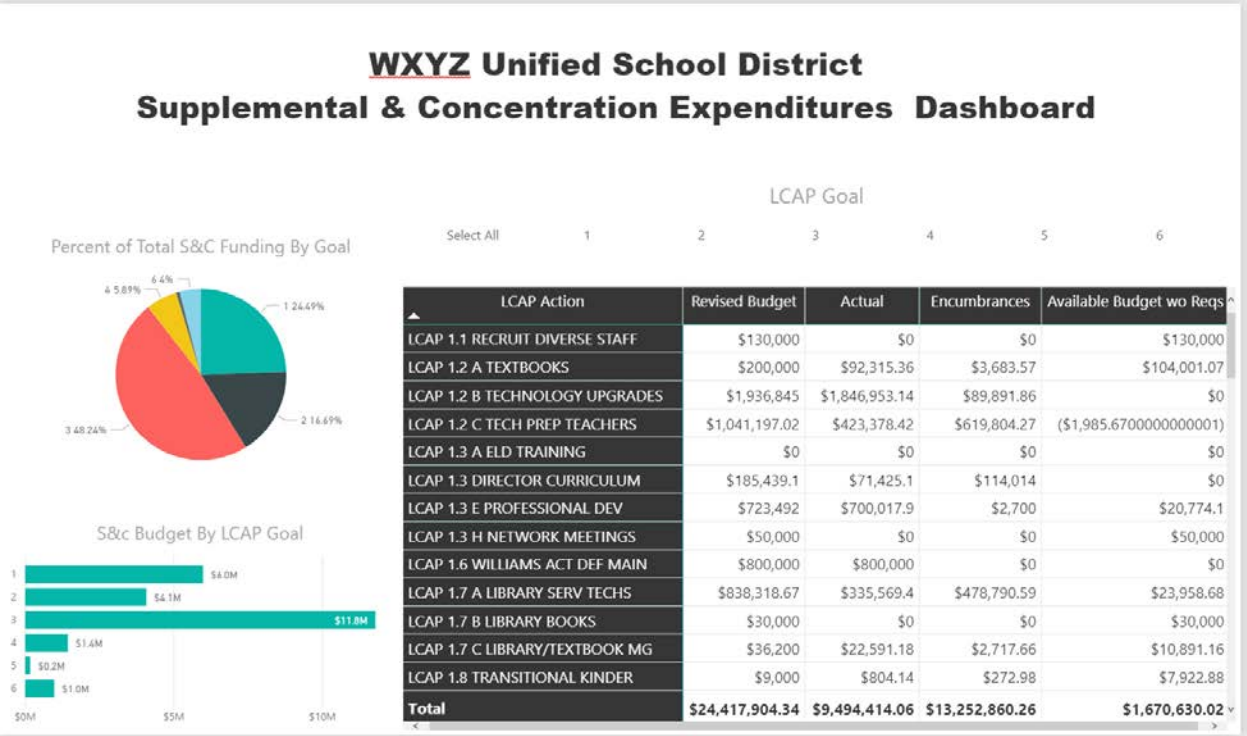
4. **Use the rubric above to rate to what extent in the district is data available and utilized to manage programs and inform decision-making?** *

Mark only one oval.

- Emerging
- Strong
- Exemplary
- Basic

5. **Based on yo rating what action steps do you think would help the district improve one or more rating levels on the Access and Use of Program Data rubric?**

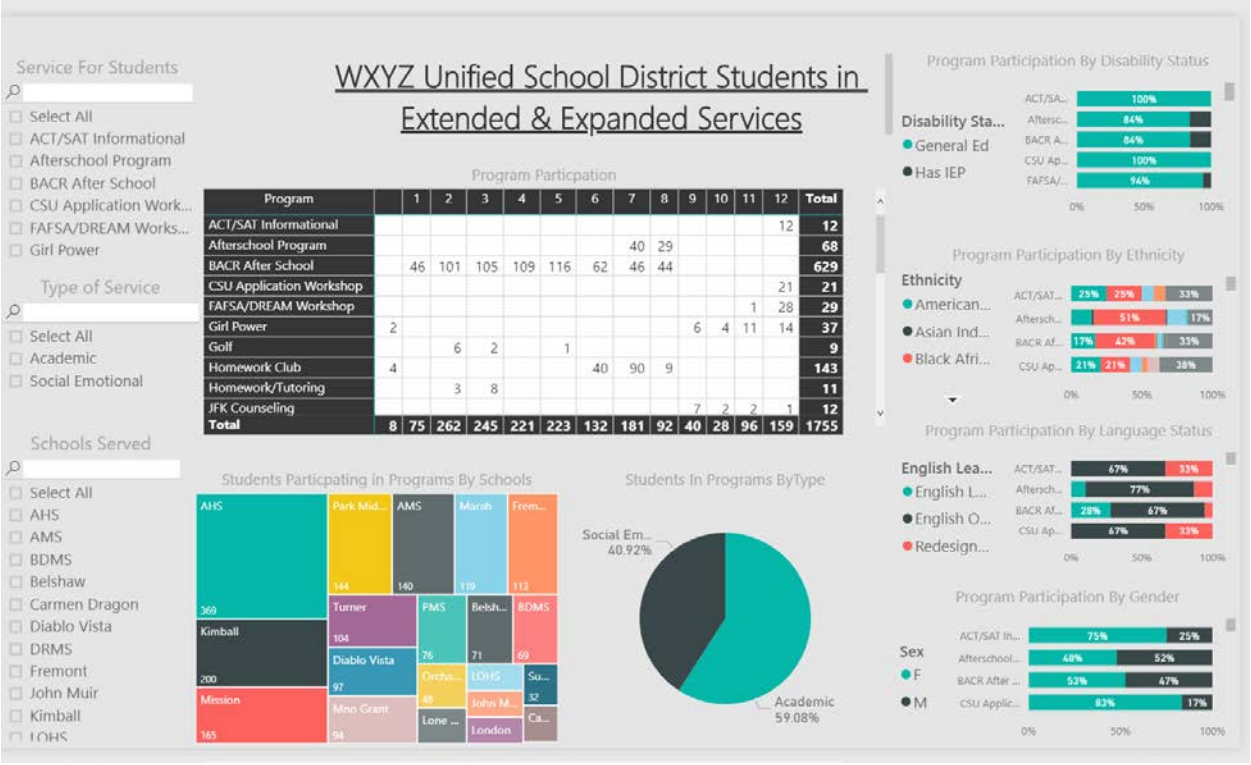
WXYZ Supplemental & Concentration Expenditure Dashboard



LCAP Action	Revised Budget	Actual	Encumbrances	Available Budget wo Reqs
LCAP 1.1 RECRUIT DIVERSE STAFF	$130,000	$0	$0	$130,000
LCAP 1.2 A TEXTBOOKS	$200,000	$92,315.36	$3,683.57	$104,001.07
LCAP 1.2 B TECHNOLOGY UPGRADES	$1,936,845	$1,846,953.14	$89,891.86	$0
LCAP 1.2 C TECH PREP TEACHERS	$1,041,197.02	$423,378.42	$619,804.27	($1,985.6700000000001)
LCAP 1.3 A ELD TRAINING	$0	$0	$0	$0
LCAP 1.3 DIRECTOR CURRICULUM	$185,439.1	$71,425.1	$114,014	$0
LCAP 1.3 E PROFESSIONAL DEV	$723,492	$700,017.9	$2,700	$20,774.1
LCAP 1.3 H NETWORK MEETINGS	$50,000	$0	$0	$50,000
LCAP 1.6 WILLIAMS ACT DEF MAIN	$800,000	$800,000	$0	$0
LCAP 1.7 A LIBRARY SERV TECHS	$838,318.67	$335,569.4	$478,790.59	$23,958.68
LCAP 1.7 B LIBRARY BOOKS	$30,000	$0	$0	$30,000
LCAP 1.7 C LIBRARY/TEXTBOOK MG	$36,200	$22,591.18	$2,717.66	$10,891.16
LCAP 1.8 TRANSITIONAL KINDER	$9,000	$804.14	$272.98	$7,922.88
Total	**$24,417,904.34**	**$9,494,414.06**	**$13,252,860.26**	**$1,670,630.02**

6. **Please use the link to visit the WXYZ Supplemental & Concentration Expenditure Dashboard. To what degree does this report address any of the action steps you identified in your response above. https://app.powerbi.com/view?r=eyJrIjoiMDYyNzQ5YWYtODA3OS00ZWZkLWI4NzYtMTc4NmU0MDEwOTMyIiwidCI6ImMyOGQ0MGU1LTE0NDgtNDBkZS05MjM1LWI5NzU1YTdkZDFlYSIsImMiOjZ9**

WXYZ Intervention Services Dashbaord



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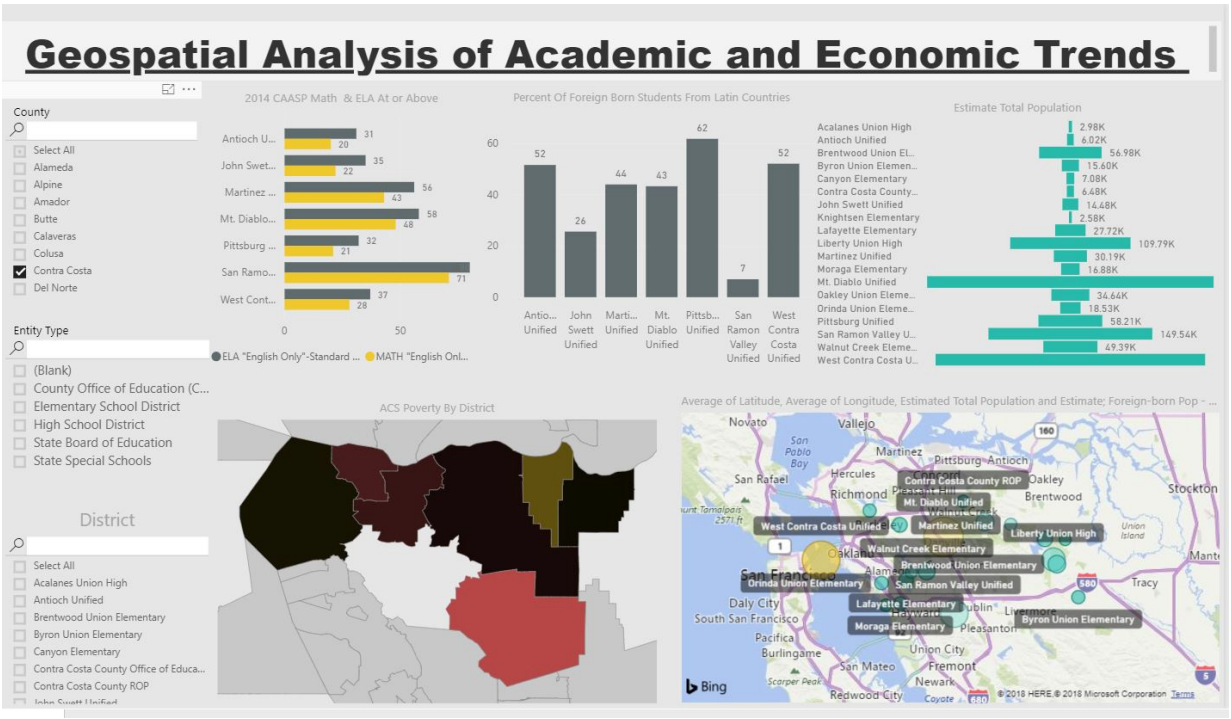
WXYZ Geospatial Analysis of Academic and Economic Trends



8. **Please use the link to visit the WXYZ Geospatial Analysis of Academic and Economic Trends Dashboard. To what degree does this report address any of the action steps you identified in your response above.**
https://app.powerbi.com/view?r=eyJrIjoiMTA4N2VlMjktODFkZC00ZDlhLWI3ZmQtOWQwYzBmZTVlODI0IiwidCI6ImMyOGQ0MGU1LTE0NDgtNDBkZS05MjM1LWI5NzU1YTdkZDFlYSIsImMiOjZ9

9. **Would the availability and regular use of these dashboards in WXYZ effect your**

current rating of the district's "Access and Use of Program Data" ranking?

Mark only one oval.

- Yes
- No

---

10. **If yes, what would your new ranking be?**

Mark only one oval.

- Beginning
- Emerging
- Strong
- Exemplary

* **If yes, why did it change your opinion?**

APPENDIX D: STRATEGIC USE OF DATA RUBRIC: PROGRAMS AND PROGRAMS AND MAJOR INIATIVES

Center for Education Policy Research
HARVARD UNIVERSITY

STRATEGIC DATA PROJECT

STRATEGIC USE OF DATA RUBRIC

The Strategic Use of Data Rubric *is a resource developed by the Strategic Data Project to provide direction and support to educational organizations in their efforts to transform data use. It is a tool that establishes a common language and a framework that enables a structured and systematic assessment of an organization's strengths and challenges around data use. Using the rubric as a basis for gathering evidence of data use across the organization allows educational leaders to identify specific areas for improvement and highlight specific steps to move the organization toward using data more strategically.*

Programs and Major Initiatives

	BASIC	EMERGING	STRONG	EXEMPLARY
Organizational Strategy *To what extent does the organization use a strategic plan to organize program and initiative priorities?*	No strategic plan; or if strategic plan exists, fails to inform major initiatives.	Strategic plan informs some major initiatives.	Strategic plan informs most major initiatives.	Strategic plan informs all major initiatives.
	Major initiatives/programs frequently generated, crisis-driven and uncoordinated with strategy.	Major initiatives superficially aligned with strategy.	Major initiatives significantly aligned with strategy.	Major initiatives tightly aligned with strategy; alignment understood well by agency.
	Limited understanding of current initiatives. No complete list of initiatives in one place.	Some understanding of current efforts.	Significant understanding of current efforts.	Deep understanding of current efforts. New projects not authorized without assessing current initiatives.
	No effort to avoid duplication across programs. No effort to eliminate or rationalize old initiatives.	Some effort to avoid duplication across programs.	Efforts exist to coordinate programs and avoid duplication	Limited number of major initiatives. No duplication across programs.
	BASIC	**EMERGING**	**STRONG**	**EXEMPLARY**
Goal-Setting *To what extent does the organization use data and analysis to set goals for programs and major initiatives?*	Major initiatives are introduced without outcome or implementation goals.	Major initiatives are introduced with established goals, but goals not informed by analysis, nor aligned with strategic plan.	Major initiatives introduced with goals, targets, and timelines; all aligned with the strategic plan.	Major initiatives introduced with goals, targets, timelines, responsibilities, and dependencies; all aligned with the strategic plan.
	Targets and goals non-existent.	Targets and goal exist but not created with evidence or analysis.	Targets and goals exist, established from trend data and research.	Targets and goals exist, are both challenging and realistic and have been established from trend data, research, and predictive analytics.
		Targets and goals are not well connected to implementation, operational outputs, or outcomes.	Targets and goals are largely connected to implementation, operations, outputs, and outcomes.	Targets and goals are always directly connected to implementation, operations, outputs, and outcomes.
	No monitoring of progress.	Little monitoring of progress.	Monitoring of progress largely focused on implementation, but not measurable outcomes.	Monitoring of progress includes review of implementation, measurement of outcomes, and use of predictive analytics to anticipate progress and adjust tactics.

CC BY NC

	BASIC	EMERGING	STRONG	EXEMPLARY
Access and Use of Program Data *To what extent are data available and utilized to manage programs and inform decision-making?*	Program data (e.g., school, classroom, student-level information) not housed centrally; some data not housed at all.	Some program data housed centrally, data often unreliable.	Most program data housed centrally and often reliable.	Majority of program data is reliable and housed centrally.
	No baseline (pre-program) data available.	Little baseline (pre-program) data available or collected.	Baseline (pre-program) data available but not consistently collected.	Baseline (pre-program) data consistently collected before program start.
	Little analysis of student data to determine program adoption decisions and program priorities.	Some analysis of student data used to determine program adoption decisions and program priorities.	Careful analysis of student data determines program adoption decisions and program priorities.	Rigorous, comparative analyses and predictive analytics drive program adoption decisions and program priorities.

	BASIC	EMERGING	STRONG	EXEMPLARY
Program Management and Monitoring with Data *To what extent are data used to understand, manage, and monitor current program operations?*	No monitoring of program operations.	Occasional monitoring of program operations.	Formal monitoring of program operations against goals, targets, and timelines established at program launch.	Formal monitoring of programs against goals, targets, and timelines. Examination of different scenarios that may alter program to increase impact, lower cost, or respond to change.
	Unaware of relevant research.	Awareness of relevant research, but not used to make decisions.	Awareness of relevant research; research used to make decisions.	Relevant research used to drive further internal research that informs and evaluates after pertinent information collected.
	No attention on results from prior programs.	Little attention on results from prior programs.	Some attention on results from prior programs that were evaluated with pre-established criteria.	High attention on results that use data from prior programs and were evaluated with rigor and explicit pre-established criteria.
	Similar programs not compared in terms of value to student outcomes	Similar programs superficially compared in terms of value to student outcomes.	Similar programs compared with some depth in terms of value to student outcomes.	Similar programs compared in terms of impact and cost-effectiveness.

	BASIC	EMERGING	STRONG	EXEMPLARY
Evaluation and Decision Making *To what extent does the organization evaluate the outcomes of its programs and major initiatives?*	No evaluation plans exist.	Some evaluation plans exist, often created after program start, but are often vague and lack actionable results.	Many evaluation plans exist before program start, are explicit and moderately strong.	Evaluation plans exist for all major initiatives, and are explicit (with strong designs, including randomization) to determine initiatives' impact and next steps.
	Outcome evaluation not considered in decisions to continue, expand, or terminate programs.	Outcome evaluations occasionally influence decisions to continue, expand, or terminate programs.	Outcome evaluations often influence termination or expansion decisions.	Outcome evaluations always influence closure or expansion decisions, including standard use of sunset clauses to allow program expansion to be periodically evaluated.
	Decisions based on prior beliefs and assumptions rather than evaluation results.	Decisions sometimes based on evaluation results, though these still may support prior beliefs or assumptions.	Decisions more often based on evaluation results and sometimes are contrary to prior beliefs or assumptions.	Decisions always based on and driven by evaluation results.
	Closure decisions made erratically due to politics, shifting priorities, or immediate resource needs (i.e., budget crises).	Closure decisions rarely based on results; more often based on politics, shifting priorities, or immediate resource needs (i.e., budget crises).	Closure decisions often based on results; sometimes politics, shifting priorities, or immediate resource needs (i.e., budget crises).	Closure decisions always based on results of evaluations; results generally immune to external influence.

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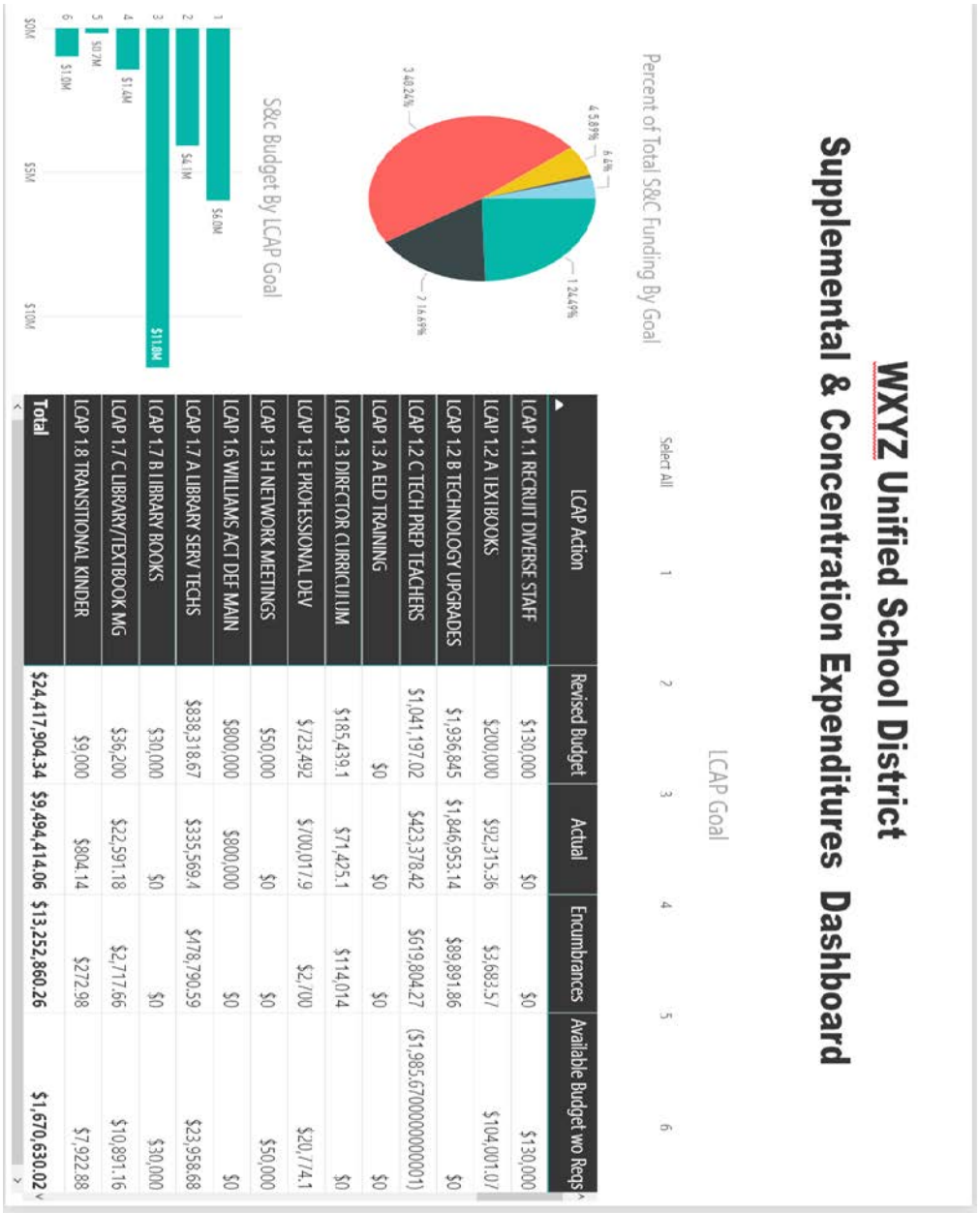
APPENDIX E: WXYZ SUPPLEMENTAL & CONCENTRATION EXPENDITURE DASHBOARD



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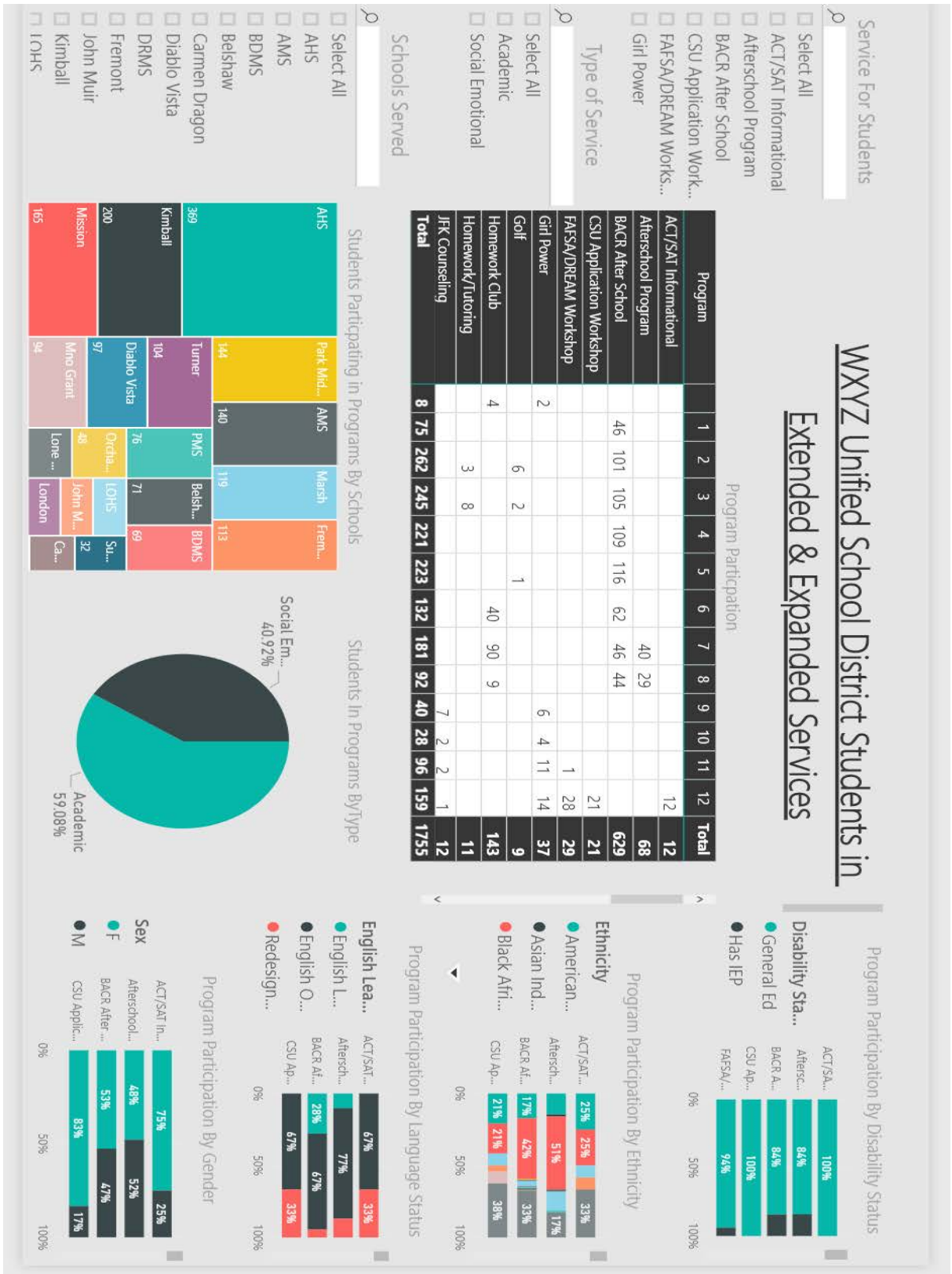
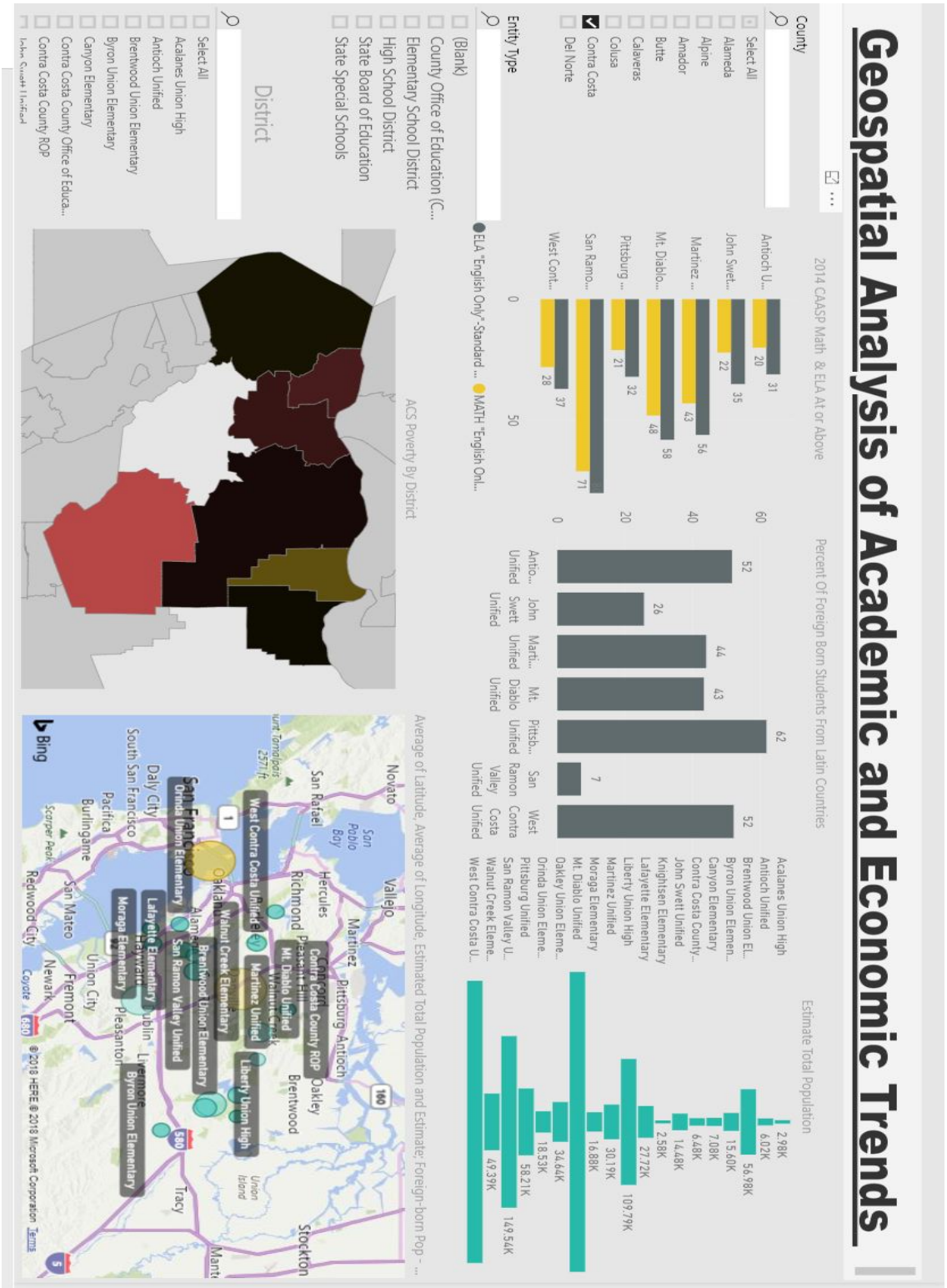
APPENDIX F: WXYZ INTERVENTION SERVICES DASHBOARD



APPENDIX G: WXYZ GEOSPATIAL ANALYSIS OF ACADEMIC AND ECONOMIC TRENDS