

L I T E R A T U R E
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L I T E R A T U R E R E V I E W

A report examining data utilization applicable to Educare Schools

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Measuring Data Utilization in the Educare Learning Network:

Review of Literature

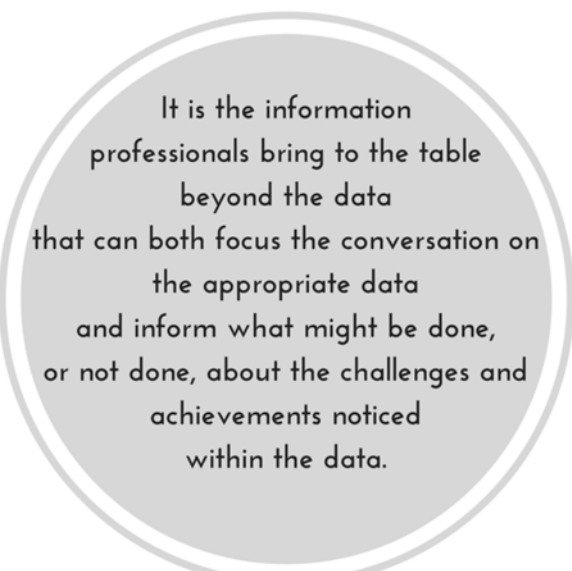
Data utilization, also known as data-based decision-making, has recently been called a “phenomena” (Spillane, 2012). The popularity of data utilization to inform education policy and practice is important for many reasons, including accountability purposes, such as Head Start reporting requirements, and for individualized use of data that inform strategies of interacting with children (Carta, Greenwood, Baggett, Buzhardt, Walker, 2012; National Center on Program Management and Fiscal Operations [NCPMFO], 2013a; Walker, Carta, Greenwood, Buzhardt, 2008). However, it is important to note that data utilization is not new. Use of information produced by assessments of learning and development is the underlying purpose that validates the existence of such assessments. As far back as 1897, Joseph Rice developed a spelling test to demonstrate that more time spent on spelling drills did not increase spelling proficiency, and thereby made the case that more instructional time be spent on science (Thorndike & Thorndike-Christ, 2010). A long-standing history of expecting data to be used also exists in early childhood education, as evidenced by NAEYC’s long-standing position on assessment that early care professionals use assessment as a tool to improve child outcomes (NAEYC, 2003; Bredekamp & Rosegrant, 1992).

Recent developments, however, have focused on the steps of using data. A common framework for data use includes a cycle of turning data into knowledge through processes of collection, organization, analysis, summary, synthesis, and prioritization within a context of organizational support (Mandinach & Gummer, 2012; National Forum on Education Statistics [NFES], 2012). Many frameworks also include the development



of goals, such as in the “plan, do, study, act” cycle borrowed from business fields or the “prepare, interpret, implement, evaluate” cycle advocated by ELN staff (as cited by Derrick-Mills, Sandstrom, Pettijohn, Fyffe, & Koulish, 2014; Krugly, Stein, Centeno, 2014; NCPMFO, 2013a). The Head Start Program Planning Cycle offers a framework within a framework, where goals are made for a five-year period, but course corrections occur continuously within the five year period (NCPMFO, 2014a). The goal-oriented data cycle frameworks are common in ‘how-to’ guides, while the individual-organizational interaction frameworks are theoretically-based applications used in qualitative studies of data utilization.

In contrast, other frameworks focus on the interaction between a variety of individual and organizational characteristics (Marsh & Farrell, 2015; Spillane, 2012). These frameworks, rooted in a constructionist epistemology, provide a theoretical background to the complex interactions that data utilization entails. Spillane (2012) emphasizes the routines of data use as either facilitators or barriers to change, with either result being potentially good or bad for the educational program (Colyvas, 2012;



It is the information professionals bring to the table beyond the data that can both focus the conversation on the appropriate data and inform what might be done, or not done, about the challenges and achievements noticed within the data.

Spillane, 2012). Like other researchers (Love, Stiles, Mundry, DiRanna, 2008), Spillane (2012) emphasizes that data have no meaning except the meaning which educators and other stakeholders bring to it. Specifically, it is the information professionals bring to the table beyond the data that can both focus the conversation on the appropriate data and inform




what might be done (or not done) about the challenges or achievements noticed within the data (Mandinach & Gummer, 2013). Similarly, Marsh & Farrell (2015) bring sociocultural learning theory into a synthesis of data utilization studies. This entails an emphasis on learning occurring through joint work and the development of shared meaning about data. Marsh & Farrell's (2015) study of data use capacity-building for educators supported a sociocultural learning framework as the foundation for future research on data utilization by acknowledging the complex intra- and interpersonal dynamics that support data use behavior. Marsh & Farrell's (2015) application of sociocultural learning theory and Spillane's (2012) emphasis on interactions between individuals provide essential structure to this literature review.



Marsh & Farrell's application of **sociocultural learning theory** and Spillane's emphasis on **interactions between individuals** provided essential structure to this literature review.

The structure and content of this literature review synthesizes the recent theory and research on data use with practice guides on data use by focusing on a common theme in both types of literature - the culture of data use. The essence of an organizational culture is to have shared meanings and shared assumptions about how we go about our shared work (Gerzon & Guckenberg, 2015; Schein, 2010). Collaborative inquiry-based culture is widely touted as an important support for effective data utilization (Derrick-Mills, Winkler, Healy, Greenberg, 2015; Ford, Sickel, & Brunson, in press; National Center on Parent, Family, and Community Engagement [NCPFCE], 2014; NCPMFO, 2013b; Thomas & Huffman, 2011). The cohesion of data use research




and practice is evident in a common call for a ‘culture of data use’ that is built through shared experience (Schein, 2010; Derrick-Mills et al., 2015; Gerzon & Guckenberg, 2015; Yazejian, 2014).

Measuring Data Utilization within Educare Schools

The challenge and promise of data utilization hinges on the ability to use data to differentiate instruction to children, to support the efforts of staff, and to tailor services to families based on the best available information and knowledge. If data utilization is a driver of the success or failure of the children we serve, we have a responsibility to implement this process well (Love et al, 2008). If we are to implement data utilization well, a measurement of this ‘wellness’ will be helpful. Hence, this project to measure data utilization within Educare Schools has the purpose of documenting variations in data use to understand how we can support people and organizations to use data effectively, ethically, and for the all-encompassing goal of improved outcomes for children and families.

What is data utilization?

Data, for the purpose of this document, is defined as any systematically collected information that relates to professional work with children and families in Educare. Data utilization is the use of information (data) to make decisions. Therefore, studies and articles about data use often use the phrase *data-based decision making* (DBDM: Buzhardt et al., 2010; Gottfried, Ikemoto, Orr, Lemke, 2011; Spillane, 2012). The field of evaluation has overlapping foci on the use of information to improve outcomes, particularly approaches such as developmental evaluation, empowerment evaluation, and utilization focused evaluation (Fetterman & Wandersman, 2007; Patton, 2010;



Preskill, 2013). The need to define data utilization itself is the first step on our path to understand, measure, and continue to develop our data utilization practices, decisions, and reflections inspired by data.

Assumptions gleaned from the literature about data utilization include 1) data needs people to interpret it 2) data can be used with positive or negative consequences, with intended and unintended results 3) effective data use will result in learning 4) effective data use will link learning to strategies (Bambrick-Santoyo, 2010; Colyvas, 2012; Love et al., 2008; Mandinach, 2012; Means, Padilla, DeBarger, & Bakia, 2009; Preskill, 2013).

Assumptions of Data Utilization

1. Data needs people to interpret it.
2. Data can be used with positive or negative consequences.
3. Effective data use will result in learning.
4. Effective data use will link learning to strategies.

Data utilization is defined as the process by which people interact with one another to make meaning of data, gain new knowledge from the interaction, and apply the knowledge to practice with children, families, or school staff.



Which data, for what purpose, by which users?

Types of Data. Educare teachers have access to multiple forms of data, though access varies across sites. The Local Evaluation Partners (LEP) collect standardized, norm-referenced data that has been developed under psychometric standards and found to have acceptable reliability and validity for evaluation and research purposes. Classroom Observations are also systematically collected to assess the quality of classroom practices, with widely accepted face validity and a body of validity evidence from studies documenting moderate links between child outcomes and these quality measures. The Parent Interview asks for a variety of information about home life, health, stress, and relationships that have been found to be important in other early childhood studies.

In addition to the data collected by the Educare Implementation Study, curriculum-embedded assessments are one source of data that teachers reported relying on in the study of Data Utilization in Educare Early Education Schools (Data Utilization Study) (Yazejian, Bryant, & Freel, 2014). These assessments were reported to be used more frequently by teachers than the Implementation Study measures for planning and individualization (Yazejian et al., 2014). Assessments linked to the objectives of a curriculum are easier to connect to instruction. A literature review focused on tailoring teaching from continuous assessment noted that these types of assessments are commonly used for data-based decisions because the measures contain a continuous standard for comparison and are curriculum-based (Akers et al., 2014). Despite these advantages and the reduction of assessment burden on both




programs and children through naturalistic assessment rather than standardized assessment, these measures tend to have low validity evidence (Akers et al., 2014).

Final types of data that are likely used by Educare leaders and staff include data collected for the primary purpose of providing care or meeting Head Start guidelines. Many of these data, if collected systematically, can also be used to inform teachers of the ongoing needs of children, directors of the needs of their staff, and programs of the needs of the families they serve. Some data, such as data from a site's Program Information Report, can be used to assess change over time and to provide triggers for follow up on family needs (NCPMFO, 2013a).

Purpose of data for various data users. Data utilization, as described by the Educare Model Framework, includes two components – use of a research base and use of locally gathered data (ELN Working Group, 2014). Use of a set of research-based knowledge is important to implementing high quality practices with children and families, but it is classified within an individual's capacity for using data (see *pedagogical data literacy*; Mandinach & Gummer, 2013). While a research base is important, the focus of this review and subsequent measure will be the use of the locally gathered Educare data.

The Data Utilization Study clarified the use of locally gathered data by outlining efforts and plans to use child and family data to plan individualized classroom and family engagement strategies (Yazejian et al., 2014). The study also documented the use of classroom observations and child assessments to plan individual professional development (Yazejian et al., 2014). While planning for children and families



differentiates services to individuals, planning for professional development uses data to adjust the program.

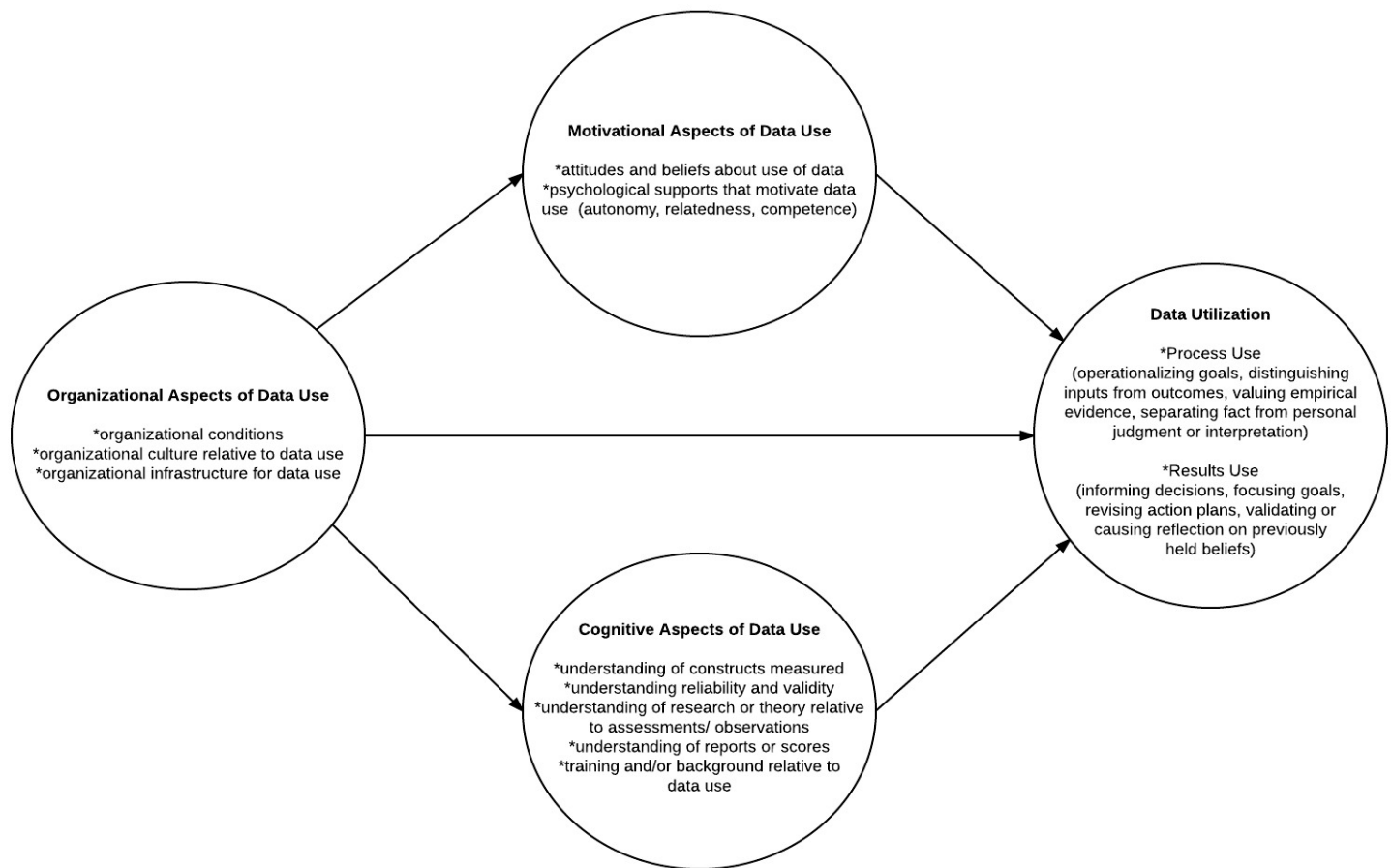
While individual data can be used for *differentiation of services*, patterns in aggregated data are helpful to program planning. Educare leaders use data to plan staff trainings and program initiatives (Yazejian et al., 2014). That is, the bigger data inform the bigger decisions. Decisions at the program level are likely to need an integration of types of data to inform multiple components of a program that interdependently impact progress toward program goals. This type of data use aligns with the field of *program evaluation* more than it does with individualized differentiation strategies. While these processes are parallel, the distinction is that different types of data are used for different purposes – with differentiation and evaluation used herein to describe use of individual data and use of interdependent aggregate data, respectively.

Literature Review Purpose

The purpose of this literature review is to gather information to develop a measure of the components of data utilization. Articles were reviewed within a framework presented with the application for this project (Figure 1), which was generated from previous work on data utilization (Alley-Melchior, Guss, & Horm, 2014; Guss, Norris, Horm, & Monroe, 2013a; Guss et al., 2013b). An application of self-determination theory (SDT) to data utilization warrants examination of individual, organizational, and motivational factors that shape data utilization (Guss et al., 2013a; Ryan & Weinstein, 2009; Adams et al, in press).



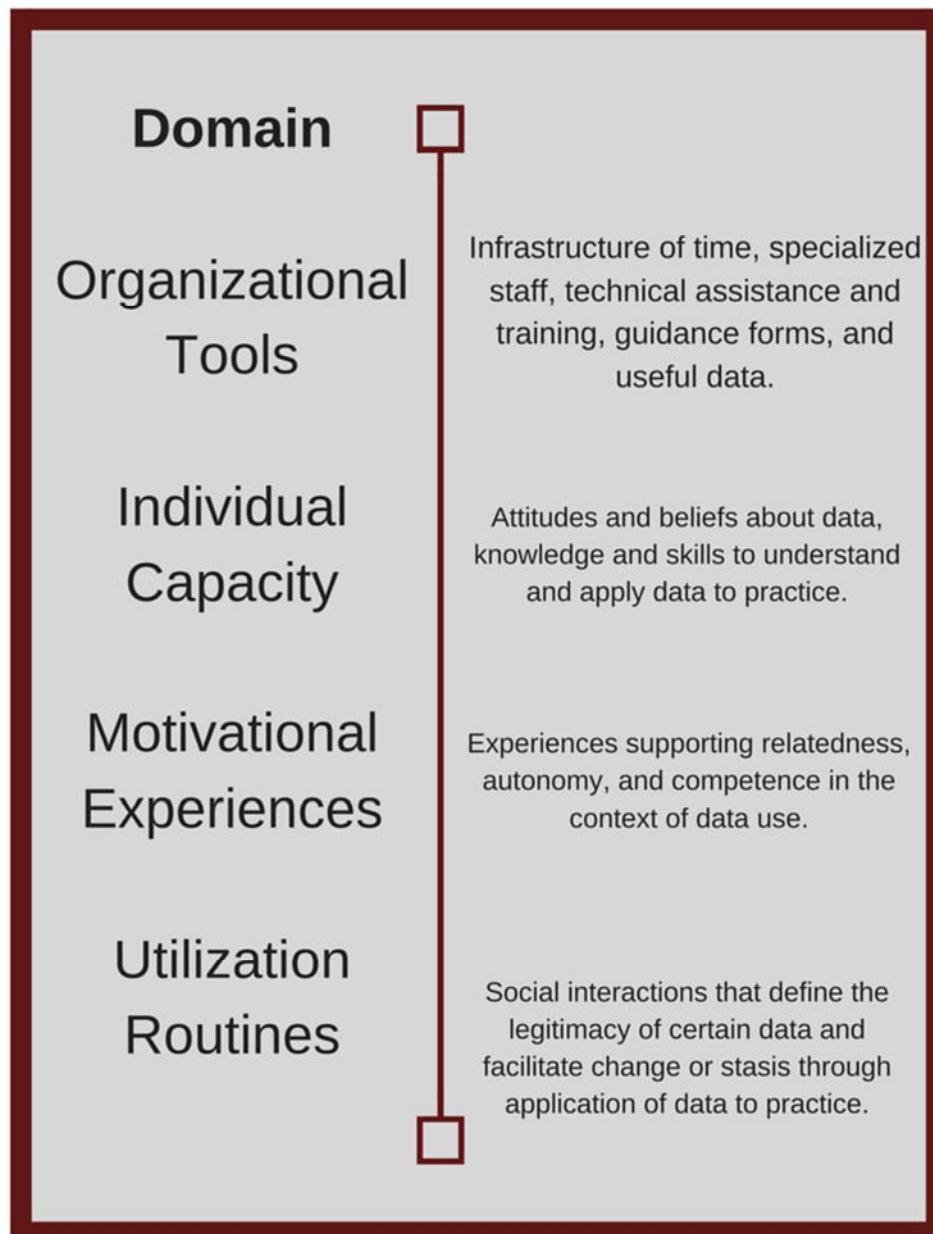
Figure 1.



The original proposed framework identified organizational aspects of data use contributing to two individual aspects of data use – motivational and cognitive. These aspects were conceptualized as contributing to actual data utilization of two distinct types – Process Use and Results Use. Literature synthesized for this report largely supported this framework, with theoretical papers from data use researchers presenting similar social interaction frameworks (Marsh & Farrell, 2015; Spillane, 2012). Where this was not the case, additional notes were added, and in some cases an additional dimension was considered (e.g. leadership as an organizational facilitator of utilization,

social justice as a motivator of utilization). The original framework has now been refined through the process of this literature review. While a winnowing process must occur to further narrow final constructs suitable for measurement, definitions of potential constructs have been updated to reflect the literature reviewed for this project, shown below.

Table 1.






The evolution of the original framework to the dimensions shown in Table 1 are largely informed by the theoretical frameworks set forth by Marsh & Farrell (2015) and Spillane (2012). *Organizational Tools* are the resources available to data users within the context of their organization. *Individual Capacities* are the types of knowledge that data users bring to the process of data utilization. *Motivational Experiences* include interactions that support or hinder data users' feeling of competence, efficacy, and connection to others. These experiences are theorized to support basic psychological needs. When different people, with different tools, motivated at different levels, come together to use data often, they form habits and ways of doing things. These ways of doing things are defined as *Utilization Routines*. While most of the literature was explored in the form of the original framework, this review will be organized using the updated framework.

Measures of Data Utilization

In our review, we found few attempts to measure data utilization. However, we did find some useful tools that identify various aspects of data utilization supports. Johnson (2002) has a variety of self-assessment tools. Similarly Bambrick-Santoyo (2010) provides a rubric of data-driven instruction and assessments for schools. MEASURE Evaluation has a series of assessments to identify facilitators of data use and a way to map information flow for decision making (Measure Evaluation, 2011a; 2011b; 2011c). Hall & Hord's measure of readiness to adapt evidence-based practice has been used with 'early years' practitioners and provides a parallel for the development of data users – from novice to expert (as cited by Brown & Rogers, 2015). Evaluators working from an empowerment approach have checklists for accountability



that are the basis of helping programs improve services (Meyers, et al., 2012). None of these attempt to measure data utilization, but they do outline data use practices incorporated in this review.

Measures used in research on school reform in Philadelphia included a measure about data use; it asked specifically about use of curriculum with benchmark assessment data (Christman et al., 2009). The scales had acceptably high reliability and were used with a large sample of teachers in 86 schools (Christman et al., 2009). Another study surveyed teacher's access to data and changes made with data (Pierce & Chick, 2011). Some of the items from this small study (N=74) had low variability and therefore created difficulties for analysis. The U.S. Department of Education (USDOE) and the Office of Planning, Research, and Evaluation (OPRE) used surveys about efforts to build capacities of schools to use data. The surveys showed that efforts to use data were increasing, but the measure did not capture the level of integration of data use within the organization (Means, Padilla, & Gallagher, 2010; Sandstrom et al., 2015).

The framework for an upcoming measure of teachers' use of ongoing child assessment to individualize instruction has recently been released. Reports on the concept framework, measurement plan, and literature review that support the measure were release in two volumes in June 2014 (Akers et al., 2014; Atkins-Burnett et al., 2014). These works have informed this review, particularly as it relates to use of data to inform work with young children. An update on the project released in September 2015 outlined a multi-method plan of triangulating data collection through document analysis, video observation, and teacher interview (Monahan, Atkins-Burnett, Wasik, Akers,



Hurwitz, & Carta, 2015). While this style of investigating data use will produce deep knowledge about the process, the burden of assessment and collection is heavy.

Methods

This review explored empirical studies, literature reviews, websites, practice guides, and expert recommendations to synthesize current research and theory on data utilization. While evaluation and organizational literature were used, data utilization in educational contexts was the primary target for this data utilization literature review. Particular attention was paid to articles set in an early childhood context. The most prominent examples of early childhood related literature on data utilization were recent literature reviews published through the Office of Head Start (OHS) and OPRE on data utilization and the development of a measure of teachers' use of ongoing assessment noted on the previous section (Derrick-Mills et al, 2014 & 2015; Akers et al., 2014; Atkins-Burnett et al., 2014).

Understanding how data use leads to improvement in child outcomes is underdeveloped (Goren, 2012). If we were to look for a null hypothesis, it would be that data use does not improve outcomes. If this null were not falsified, we may be able to explain the correlation between data use and improved outcomes as an underlying trait of data users that is the actual driver of the effective teaching and subsequent outcomes. It may be that effective teachers use data, but could be effective without it. Similarly, data users could have access to actionable knowledge, but also have traits or attitudes that are personal barriers to using data effectively. This is important to mention only because the study of data use, as we hope this literature review will make clear, is very complex because the process itself is dynamic and ever-changing.



The Four Domains of Data Utilization

Individual Capacities

Attitudes and beliefs. Users of data may have underlying assumptions that impact their use of data (Johnson, 2002; Marsh & Farrell, 2015). This may be particularly true in terms of child assessments. Teachers may be concerned that assessments take away from children's opportunities to learn (Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006). Early childhood teachers, in particular, may be concerned about the developmental appropriateness of assessment (Ford et al., in press; Wortham, 1990). The rapid developmental trajectories of young children create challenges with both the measurement and interpretation of measures assessing children less than 5 years of age.

Individual beliefs may orient teachers more positively or less positively toward data utilization. The rapid development of young children may also convince some practitioners of the benefit of data use at these ages, as early intervention supports development during sensitive periods (Wortham, 1990; Carta et al., 2012). However, teachers may not see the value in multiple data points for tracking child progress (Ford et al., in press).

Teachers who orient positively toward data believe that using assessments can inform instruction (Marsh & Farrell, 2015; NCPFCE, 2011). These practitioners may be particularly reflective in terms of data - translating data into actionable knowledge (NCPFCE, 2011). Prior training may have provided teachers with a formal understanding of the usefulness of data for selection of services, making fair comparisons, determining the level and pace of instruction, and monitoring progress in



specific domains (Wortham, 1990). Due to varying experiences and attitudes, teachers will make sense of data in different ways (Marsh & Farrell, 2015).

Skills to understand. Literature from both research and practitioner articles note that data literacy is an important aspect of data use with which many teachers struggle (Kerr et al., 2006; Johnson, 2002; Sandstrom, Isaacs, & Rohacek, 2015; Gerzon & Guckenberger, 2015; Gottfried et al., 2011; Means et al., 2009; Means et al., 2011; Derrick-Mills et al., 2014) . Data literacy is a set of skills with which a practitioner can interpret assessments well enough to appropriately apply them (NCPFCE, 2011). Lack of these skills may increase the potential unintended consequences of data utilization. Capacity to analyze data can be either a barrier or a facilitator (Derrick-Mills et al., 2014). Recent studies in Head Start indicated that program leaders believe their programs have the capacity to collect data to inform school readiness goals, but may have some trouble understanding reports (Sandstrom et al., 2015).


Data literacy includes the ability to locate the appropriate data in a graph or table, comprehend what is being presented well enough to make comparisons and draw conclusions, and understand that distribution, sample size, and measurement error matters (Means, Chen, DeBarger, & Padilla, 2011). An understanding of how descriptive statistics, such as averages, can be affected by outliers helps teachers understands the limits of assessment (Horn, in press; NCPFCE, 2011). Interpretation can be hindered by difficulty with math in general (Means et al., 2011; Johnson, 2002). Additionally, understanding design and purpose of a measure can help teachers interpret the differing uses and limitations of standardized, norm-referenced



developmentally appropriate practice and stances on assessment that honor the whole child have changed very little. Assessing data use needs, such as data literacy and struggles at various stages of the data utilization process, might prevent poor practice and misinterpretation of data (Marsh & Farrell, 2015). Some researchers define the above skills as assessment literacy, a component of data literacy (Mandinach & Gummer, 2013).

Skills to apply. Recent work in data-based decisions for educators defines assessment literacy as one component in *pedagogical data literacy* (Mandinach & Gummer, 2013). This broader definition of data literacy incorporates pedagogical knowledge (knowledge of evidence applicable to best practices for teaching) with content knowledge (knowledge of what to teach). This perspective on data literacy views the assessment literacy as fairly useless without pedagogical skills that translate interpretation to action. These broad pedagogical data literacy skills have been found important, as teachers and those coaching them use data to improve instruction by forming appropriate questions, seeking answers within data, and identifying solutions aligned with instructional expertise (Ford et al., in press; Marsh & Farrell, 2015; Kerr et al., 2006; NFES, 2012). Data users have to speak multiple languages – data, practice, and content (Goren, 2012).

Development of data users. Another view of data user capacity is a stage model of development (NFES, 2012; Brown & Rogers, 2015). In a model presented by the National Forum on Education Statistics ([NFES] 2012), data use development begins with using intuition or anecdotal knowledge. It then evolves through checking one's compliance with external expectations, using data to reach for higher levels of



implementation, deciding between methods, evaluating among methods, and acting to change methods. Data users synthesize data with practice expertise and develop tailored methods at the highest level of expertise (NFES, 2012).

Similarly, Brown and Rogers (2015) referring to Hall and Hord's measure of readiness-to-change noted a development sequence of moving from being told what evidence should be used to seeking out evidence to inform decisions independently. This novice-to-expert development begins with building expertise and ends with the capacity to generate new knowledge. Brown and Rogers' (2015) synthesis of Hall and Hord's measure with other stage models noted that the high level expert would interact with knowledge by forming and testing hypotheses (Brown & Rogers, 2015).

Interestingly, data users need to be at this highest level of expertise to complete the most basic cycle of data use.

Cycles of data use (discussed further on page 33) typically start with looking at the data, then move into making decisions based on what is thought about the data, and conclude with evaluating actions (Derrick-Mills et al., 2015; Mandinach & Gummer, 2012).

Stages of Data Use Development


- Use of intuition or anecdotal knowledge.
- Use of data to check whether compliant
- Use of data to check fidelity of implementation.
- Use of data to decide between recommended methods.
- Use of data to evaluate among methods.
- Use of data to change or develop own methods.



This process entails the forming and testing of hypotheses – a high level of expert development (Brown & Rogers, 2015; Earl & Katz, 2005).

The NFES (2012) developmental framework includes a spectrum from accountability to inquiry, following a similar development observed in other data utilization studies (Derrick-Mills et al., 2014; Derrick-Mills et al., 2015; Means et al., 2010). It may be that the development of data use is at the organizational level, as well as the individual level (Means et al., 2010). As researchers on this topic continue to emphasize building a culture of data use that values learning rather than compliance, it is possible that the data users can forego the compliance-oriented stages.

Leaders as facilitators. Leadership is a data utilization component noted by the Data Utilization Study and other studies of data use (Derrick-Mills et al., 2014; Yazejian et al., 2014; Gerzon & Guckenberg, 2015; Earl & Fullan, 2003). This emphasis is backed by recent studies noting that teachers' and instructional coaches' content knowledge matters (Marsh & Farrell, 2015). While all principals in one study report valuing data, many leaders will acknowledge that data application may vary among staff in their school (Kerr et al., 2006; NFES, 2012). Capacity is important at all levels of the organization and knowledge will vary based on the role (Goren, 2012; NFES, 2012). Some roles have the responsibility and training to be assessment and analysis experts (e.g. LEP), while others have expertise related to improving classroom practice (e.g. Master Teachers). While data coach expertise varies, data teams may ensure that data users have access to both assessment experts and practice experts, whether the expert is one person or a group (Marsh & Farrell, 2015).



In addition to leadership capacity in data use, leadership variance in attitudes and beliefs influences framing of data utilization (Lachat & Smith, 2005). Leaders both examine data and link data to decisions (Thomas & Huffman, 2011). When communicated effectively and persistently throughout the organization, leaders define data utilization as a norm (Cosner, 2011). By overemphasizing certain indicators to the detriment of professional expertise application, leaders have the capacity to focus data

Summary of Individual Capacities

- Attitudes and beliefs about data may orient data users in positive or negative ways.
- Skills to understand data include understanding of reports, statistics, and the purpose and design of assessments.
- Skills to use data incorporate knowledge of teaching practices and content knowledge, labeled together as pedagogical data literacy.

utilization in a negative way. Data-based collaboration may evolve over time, and its leaders with it (Cosner, 2011). Creating a stable, but adaptable, framework depends upon consistently and collaboratively being curious and trying to make sense of how data connects to shared work (Cosner, 2011). To that end,


leadership holds a critical role in introducing and facilitating the tools discussed in the next section (Cosner, 2011).



Organizational Tools

Organizational Tools, as defined herein, are the perceived availability of infrastructure that supports data utilization. The Data Utilization Study mentioned several of the facilitators and challenges to data utilization included in this section, because many of the same challenges are also seen in the broader literature on data utilization (Yazejian et al., 2014). These facilitators include time, staff, meaningful data, systems for sharing, training to use data, and tools to analyze and plan with data.

Time. Time is one of the most frequently mentioned facilitators and barriers of data utilization (Bambrick-Santoyo, 2010; Johnson, 2002; Kerr et al., 2006; Marsh, Pain, & Hamilton, 2006; Marsh & Farrell, 2015; Means et al., 2009; Sandstrom, 2015; Thomas & Huffman, 2011; Yazejian et al., 2014). Advocates for data use note that time must be available for data use processes to be effective. Lack of time to access and use the available systems render those systems impractical (Kerr et al., 2006). The time to apply expertise and other tools to data benefits the quality of data use (Marsh & Farrell, 2015). Time to analyze data is important to both teachers and leaders, with some principals spending an average of 5 hours a week reviewing data (Kerr et al., 2006; Sandstrom et al., 2015). Provision of protected time to use data is seen as a needed support provided by school leadership (Means et al., 2009). A recent guide on using data to improve instruction identifies lack of time for data as a pernicious mistake that can harm effective data utilization (Bambrick-Santoyo, 2010). Interestingly, data was seen as a time saver by a participant in one study, as it expedited the process of understanding a child's missing skills (Means et al., 2010).



Staff. Staff who understand the data available are an essential tool in the data utilization process. If teachers are developing through stages of competence with data, access to a more competent user may be essential to the quality of decisions and the ongoing development of the teacher (Marsh & Farrell, 2015). One data use guide states that a data use facilitator be available to guide processes (Johnson, 2002). The Data Utilization Study noted that evaluators' knowledge served to assist with data utilization (Yazejian et al., 2014). Across the Educare sites, the LEPs and Master Teachers are seen as resources for data use, with some site to site variation on role expectations (Yazejian et al., 2014). Recent qualitative studies note that specialized staff are helpful in assisting teachers and leaders to use data effectively (Coburn, 2012; Ford et al., in press). In some schools, the Principal, Assistant Principal, or Instructional Coaches target teachers who need more assistance with setting rigorous goals using data and tying the data to instruction (Ford et al., in press; Honig & Venkateswaran, 2012). Leaders can build the skills of their staff by modeling data analysis, interpretation, and application (Means et al., 2009).

Technical Assistance and Training. For staff members who are still building their skillset, the technical assistance and training that is made available by a school can facilitate development of data use expertise (Gerzon & Guckenberg, 2015; Kerr et al., 2006). The broader context of whether training and resources exist impacts the boundaries in which school staff can use data (Goren, 2012). Provision of training on data systems and professional development on using data facilitates the decision making processes (LaPoint, et al., 2009). The modeling, training and activities used to




start and sustain data use facilitate the development of data use practices (Means et al., 2009).

Guides. Forms, dashboards, data presentations, and discussion guides are tools that facilitate data utilization. Dashboards and other visual presentations of data may ease analysis. Discussion guides and planning forms can facilitate conversations about data (Gerzon & Guckenberg, 2015). These tools define and redefine what assists staff and programs to do their best work (Marsh & Farrell, 2015). Forms that are completed may focus attention on certain data, guide the connection of data summaries to tasks, and elicit a plan of who will implement tasks. Resources that help data users to make meaning and tie the meaning to practice serve as scaffolds for effective data use (Gerzon & Guckenberg, 2015; LaPoint et al., 2009; Means et al., 2009).

Usable Data. The usability of data is broad and complex, with many opportunities for the data to become unmanageable, even when accessed by a competent and motivated user. Characteristics of data that impact usability include accessibility, the amount of data collected and reported, the connection of data to objectives of program or classroom practice, and validation of data through triangulation, accuracy, and trustworthiness.

Accessibility. Access is likely to be an important factor for practitioners who are seeking information. However, in some studies, access had little effect on how potential data users actually used data (Means et al., 2009). For those who are seeking information, accessing data may include gathering the data independently. Results from data, to be used, have to be within the reach of data-based decision makers within a timeframe that is relevant to the decisions being made.



One way to improve timely collection of data or access to data is through technology (Buzhardt, Greenwood, Walker, Carta, Terry, Garrett, 2010). A literature review of ongoing assessment noted that outcomes were improved when teachers had technology that facilitated access to the data and strategies that applied to the data (Akers et al., 2014). Online systems, in addition to being timely, have the potential to maximize information and minimize efforts so that all data is used (NCPFCE, 2011). Because the Model framework notes that a goal is to use all data, providing practitioners and leaders quicker access to data may be helpful (Bambrick-Santoyo, 2010; ELN Working Group, 2014).

Amount. Program leaders who carefully consider the amount of data they collect and the usefulness of each piece of data can reduce assessment burden on children and monetary and opportunity costs to the program (Zweig et al., 2015). The Data Utilization Study found that too much data reduced usability because it slows down production of results, as well as provides an overwhelming amount of information to process and prioritize (Yazejian et al., 2014). Other studies found that data is seen as both unhelpful and duplicative (Kerr et al., 2006). However, more data on families, infants and toddlers, processing skills, leadership, and organizational functioning are also desired by consumers of data (Yazejian et al., 2014). This paradox can be understood within a framework of the usability of data. The desire to have more data on infants and toddlers, organizational functioning, and leadership are directly related to data users' desire to improve their work in these areas.


Connectedness. Data that are connected enough to apply to practice may differ based on their purpose. For data on child assessments, scholars in both early



childhood and school-age data use recommended frequent formative assessments (Carta et al., 2012; Bambrick-Santoyo, 2010). Infrequent assessments reduce teachers' ability to see change over time. Alternatively, the quick, but frequent, play-based assessments like the IGDIs provide this frequent data in a way that most early childhood caregivers can appreciate, as they systematically capitalize on the natural playful behavior of young children (Walker et al., 2008). The TS GOLD® assessments are also collected frequently and teachers reported using it for their individualizations more often than the LEP data (Yazejian et al., 2014). The assessments chosen for the Implementation Study may give us useful data for research and aggregate outcomes, but data may not function effectively across purposes (Christman et al., 2009).

If disconnected from the functions of work that need to be done, data are not useful (Colyvas, 2012). A clear and open understanding of the measure may remove barriers of connection to practice (Colyvas, 2012; Bambrick-Santoyo, 2010). While transparency of a measure may also invite gaming or deskilling, clarity on measures in a context of learning to achieve outcomes for children may improve the breadth and depth of use. Whether too much data drowns out quality decisions, or too little data leaves decision makers in the dark, the desire to learn and make better decisions is at the heart of these problems.

Integration of data sources. A common approach to using multiple sources of data is triangulation - using multiple sources of similar data to improve clarity of measurement and interpretation (Jonas & Kassner, 2014). These methods explore the validity of a measure by measuring a construct in various ways. It is possible that in Educare, TS GOLD® assessments around language and literacy would have similarities




with LEP collected measures of vocabulary, auditory comprehension, and academic concepts.

Another way of using multiple data sources is to integrate different types of data – such as family data with child assessment data. The ELN training on data use provides examples of integrating multiple types of data to better tailor services and learning opportunities (Stein & Krugly, 2013). This approach, particularly the use of family data, is not common in discussions of data utilization in schools. However, services to families, including building on strengths and assisting with access and development of resources, could be informed by data such as life stress and parent-child relationship (Walsh, 2006; Walsh, 2013). This approach has promises and pitfalls, with promises of providing services attuned to the needs of families and a pitfall being the protection of confidentiality.

Usability may be improved or reduced when data are related to families, attendance, attrition, and staff survey data that may be difficult to connect to practice, as there are multiple variables affecting these outcomes that are addressed by various program components. Therefore, multiple components of a program need to be strategically linked and informed by data. For this reason, the ideal program will be designed with an evaluation in mind – including data collection methods and research questions for each essential program component (Preskill, 2010). These methods provide more complex information that is needed for more complex decisions.

Accuracy. The TS GOLD® assessments, commonly used across sites, are based on the objectives and domains covered by Creative Curriculum. However, TS GOLD® received varying reviews for its usability from practitioners in the Data



Utilization Study (Yazejian et al., 2014). Some master teachers found it helpful for coaching, but many concerns about variation in scoring were expressed (Yazejian et al., 2014). If these data are not considered valid due to scoring error, the curriculum alignment will not be a useful feature. While connection to curriculum is commonly seen as a benefit for data-based decision making, this component of usefulness is underdeveloped in early childhood (Akers et al., 2014; Bambrick-Santoyo, 2010).

The organization and presentation of data also facilitate accurate interpretation.

While data must be summarized and made understandable, oversimplification of data may risk misinterpretation. For

example, the lack of confidence intervals reported with data may prevent users from gaining access to the important statistical concept of measurement error (American Educational Research Association [AERA], American Psychological Association [APA] National Council on Measurement in Education [NCME], 2014).

Ranges, standard deviations, and distribution information can also

assist with appropriately

interpreting average scores that include missing data or outliers.

Summary of Organizational Tools

- Data use is facilitate by Organizational Tools of time, specialized staff, technical assistance or training, and forms that guide analysis and application.
- Useful data is an Organizational Tool identified by being accessible, available in analyzable amounts, connected to practice, integrated with other data, and accurate.



Motivational Experiences

Data can be mobilizing for parents, educators, and the communities joined to improve outcomes for children and families (Johnson, 2002). One of the foundational ideas behind this project was the application of self determination theory (SDT), a theory of motivation, to the use of data (Guss et al., 2013a; Ryan & Weinstein, 2009). This theory is essential to our understanding of data utilization because data can be used for good or ill, to motivate or discourage people, to focus teaching practice or to inappropriately narrow it. Three basic psychological needs theorized to support motivation in SDT are competence, autonomy, and relatedness. When applied to data utilization, *competence* can be defined as a teacher's confidence about understanding and applying data. *Autonomy* is the perception that one has some control over the outcome of using data, a belief that efforts will matter. *Relatedness* is a social connection to people with whom we use data, with theoretical roots in Attachment Theory (i.e. Bowlby, 1969).

Motivation is affected by how voluntary the choice is to use data (Coburn, 2004; Ryan & Weinstein, 2009; Ryan & Deci, 2003). Voluntariness has a spectrum from *regulative*, following rules due to monitoring/sanctioning, to *normative*, following expectations based on personal value (Coburn, 2004; Ryan & Deci, 2003). This is the same spectrum noted by a recent literature review on data utilization for Head Start, outlining a development of data use from one of compliance to one of continuous improvement (Derrick-Mills et al., 2015). When applied to Ryan and Deci's (2003) continuum, the regulative to normative continuum of voluntariness affects the regulatory processes of teachers from being compliant, externally motivated individuals to internally motivated individuals who work based on a congruence of the work



environment with their personal values. The more teachers feel that their use of data is not voluntary, the less engaged they will be, thereby reducing the quality of the work done with data.

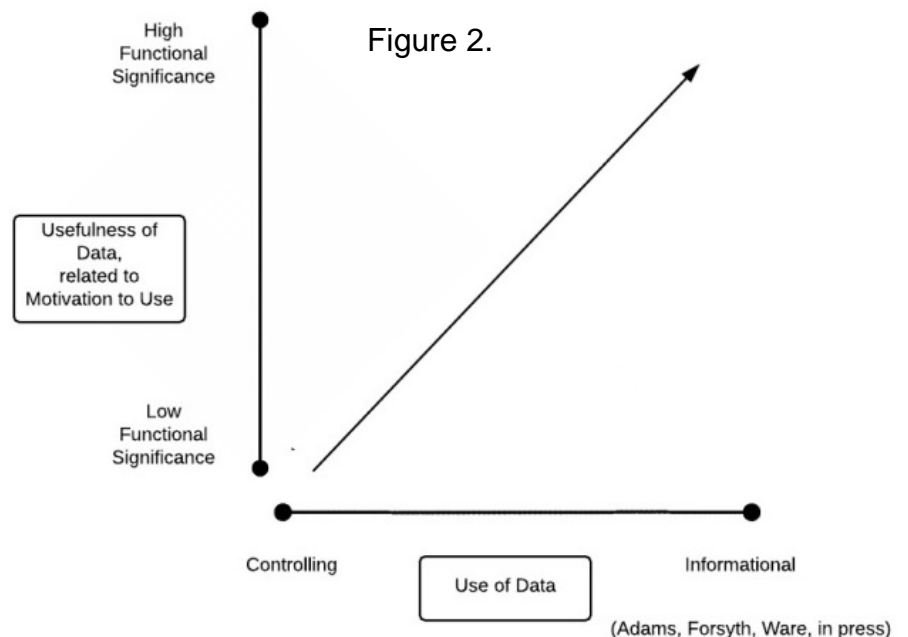
When teachers' values are only moderately aligned to the work expected of them, there is a risk of turning the intended use of data into poor practice because the action steps are implemented without the underlying rationale of the practice being understood (Ryan & Deci, 2003; Coburn, 2004). That is, if teachers do not understand why they are doing what they are doing, even if it is data-driven, they will be vulnerable to making mistakes.


In contrast to data used to control, informational data opens doors for the learning of teachers, parents, leaders, and other stakeholders such as funders and political leaders. This is the ambitious vision Educare proclaims as a program, partnership, place, and platform for change. The innovative core of the continued vision for the Educare Learning

Network is the need to learn.

Informational data will provide the learning opportunities needed to connect to practice, programming, and policy.

Informational data has been theorized to lie on a continuum, at the opposite end of controlling data (see Figure 2).





One of the myths of data use is that it should be used for accountability (A. Datnow, personal communication, October 21, 2015).

The normative versus regulative culture of data use is documented in many studies on data use. Normative cultures see data as one tool in a professionals' toolkit and continuous improvement is the goal (Derrick-Mills et al., 2014; Earl & Katz, 2005; Coburn, 2004; Gerzon & Guckenberg, 2015). The use of data primarily for monitoring and accountability is common in regulative cultures and reactive management styles (Coburn, 2004; Derrick-Mills, 2014; Yukl, 2006). In contrast, the style of leadership recommended to facilitate a culture of data use is transformational leadership, which focuses on building skills of staff for collective efficacy (Derrick-Mills, 2014; Gonzalez, 2015; Yukl, 2006).

Competence. Competence, as defined by SDT, is a feeling of confidence about a task or set of tasks. The subtasks of data use include the interpretation and analysis of numbers. Because of this, fear of math is one of the first barriers to data utilization. Feelings of incompetence can stall data users from trusting their interpretations and sharing their insights (Johnson, 2002). Lack of understanding may create fear that data will magically uncover problems the teacher was unaware of herself (Earl & Katz, 2005; Ford et al., in press). Teachers will make mistakes in data use, and master teachers or other data coaches can provide strategies to scaffold the development of these data users (Marsh & Farrell, 2015; Earl & Katz, 2005). However, the meta-cognitive strategies that data users develop within a well-established culture may not work if the environment is uncertain (Marsh & Farrell, 2015; Derrick-Mills, 2015). Developing competence within a changing environment is of particular importance in early




childhood, a field that is plagued with high turnover of both staff and the children we serve. Experiences that build understanding of data and feelings of confidence may increase motivation to use data.

Autonomy. Views on high-level data use emphasize that data are a tool that enhances the professional practice of teachers, administrators, and other school staff (A. Datnow, personal communication, October 21, 2015). In this view, professional educators have the expertise to make decisions that will benefit the children with whom they work. The professional who sees herself in this way will have a sense that her decisions and actions will have the intended effect, per her plan. This sense of efficacy is labeled *autonomy* within SDT (Ryan & Deci, 2003). The experience of freedom to make professional decisions supports professionals' autonomy to adapt as needed (Forsyth, Adams, Hoy, 2011).

An often expected data use practice is to set goals (Sandstrom et al., 2015; Krugly, Stein, & Centeno, 2014). In a recent qualitative study, some schools participated in collaborative planning that engaged educators in creating goals, while other schools' management set unattainable goals (Ford et al., in press). While the experience of collaboration and planning would support feelings of autonomy, the perception of unachievable goals would reduce it.

Relatedness. The third basic psychological need proposed in SDT is relatedness. This need is met within data use circles when the data user experiences trust, rather than fear of negative perception (Johnson, 2002). High-performing data use schools are distinguished by collaboration between the central offices and school leaders, and school leaders with leadership staff (Ford et al., in press; Honig &



Venkateswaran, 2012). A practice within Educare that is particularly well-suited to the needs of relatedness is reflective supervision. Over time, these practices build interpersonal ties and a predictable group dynamic. Trust facilitates data use and reflective practice, while lack of trust breeds resistance (Marsh & Farrell, 2015). This is true for families as well, as noted by the four Rs of data sharing with parents – respectful, relationship-building, relevant, and reliable (NCPFCE, 2011).

Leaders as Motivators. Leaders of schools have the capacity to support or hinder all of the basic needs of data-using school staff. Competence can be supported when leaders provide clarity of purpose (Gerzon, 2015; Derrick-Mills, 2015). Regular feedback that is emotionally safe and supportive facilitates relatedness (Ford et al., in press). The management style of leaders will impact feelings of autonomy. Feedback using data is likely to be a leader behavior, as leaders can review classroom observation data or patterns in child data that inform where changes may be needed (Guss et al., 2013b). In contrast, supervision that is impersonal and controlling may diminish autonomy and be associated with maladaptive behavior (Bartholomew, Ntoumanis, Ryan, Bosch, and Thogerson-Ntoumani, 2011). Leaders may place undue boundaries on teachers, reducing feelings of autonomy, particularly if the teachers are perceived to lack competence with data (Heck & Hallinger, 2009).

Transformational leadership has recently been identified as a conduit of creating cultures of inquiry and continuous improvement (Derrick-Mills et al., 2014; Gonzalez, 2015). Transformational leadership comes from a personal respect and an alignment of values that inspire staff (Yukl, 2006). Additionally, transformational leaders focus their energies on identifying the needs of staff and developing individual skills for the purpose

of gaining collective efficacy and a culture of data use (Gerzon & Guckenbert, 2015; Gonzalez, 2015; Yukl, 2006). This style of leadership generates experiences that support all of the basics needs - skill development supports competence, respect supports relatedness, and alignment of values supports autonomy when decisions with data match leader intentions. These experiences, whether with colleagues or supervisors, generate patterns of language, work protocols, work rules, and work norms that are a part of utilization routines (Spillane, 2012).

Summary of Motivational Experiences

- The quality of work linked to data is tied to user's motivational experiences.
- Management styles, whether regulative or transformational, hinder or support motivation to use data and implement high quality teaching practices tied to data.
- Experiences that support autonomy, competence, and relatedness support staff well-being and the quality of work done with data.



Data Utilization Routines

Routines are behaviors that have been implemented consistently enough to become institutionalized (Spillane, 2012). The utilization of data, as defined by its Routines, brings together the organizational infrastructure's tools and the individual data user's capacities in an interaction that produces new knowledge. The quality of the new knowledge is also mediated by the motivation of individuals involved in the interaction.

The intensity and pervasiveness of routines will increase the depth of enculturation (Coburn, 2004). As applied to data utilization, some routines define the legitimacy of certain data, while other routines move data into action by planning, implementing, and following up on data-enhanced strategies. These two types of routines are labeled *ostensive routines* and *performative routines* by the original theorist (Spillane, 2012). Similar concepts in evaluation literature are *process use*, generated from clarifying the evaluation questions and ways to answer such questions, and *results use*, which is the common idea of interpreting and making decisions about the results and recommendations of an evaluation (Patton, 2007). Both types of use occur within an interactive context, with variations of intensity and pervasiveness, as data use is “not a solo act” (Coburn, 2012; Goren, 2012).

Manifestations of Data Utilization Routines


Creation of data use culture. Organizational culture comes from interactions over time that create shared meanings and social norms (Schein, 2010). Utilization routines are the mechanism through which a culture of data use is generated. As there are healthy organizational cultures, there can also be unhealthy cultures that focus on data to narrowly focus on data deemed important by social structures.



Early childhood programs are vulnerable to unhealthy cultures of data use, as a recent literature review providing recommendations to Head Start notes (Derrick-Mills et al., 2015). The review highlights the need for programs to focus on learning and improving through data, rather than focusing on ending data use after compliance standards are reached (Derrick-Mills et al., 2015). Like the development of individual data users, cultures of data use are hypothesized to have developmental stages, from examining data to remove pressure, then examining data to attend to individual's outcomes, and finally to sharing data in collaborative efforts to maximize collective efficacy (i.e. share effective methods; Means, et al., 2010). This development relates to the normative-regulative spectrum discussed in the section on Motivational Experiences and the development of data users discussed in the section on Individual Capacities. It appears again in Routines, as the intensity and pervasiveness of messages along the normative-regulative spectrum manifest in routines. These are recursive processes of sense-making in which staff and leaders make decisions within organizational boundaries of time, learning objectives, program goals, and available support (Coburn, 2012). The embedded message of a culture of data use is that data utilization equates to professionalism (Gerzon & Guckenberger, 2015).



Change and stasis. Routines will either facilitate change or enable stasis, with potentially helpful or harmful results (Coburn, 2012; Spillane, 2012). Routines are as



likely to lead to continuity of action as they are to change (Spillane, 2012). For instance, an effective continuation of an action plan may occur when data show that a plan is working. Inaction may also be preserved because data are not used effectively enough to identify problems and consider solutions. Whether effective, or ineffective, routines create patterns of interactions that define and move data utilization (Spillane, 2012). Many practical guides provide frameworks, forms, and tips relative to data utilization routines. The patterns of routines which are of interest to data utilization are those that create change or validate continuity.

Coupling. A term used to describe the connection between data and practice is

Coupling: a term used to describe the act of connecting data and practice.

coupling (Coburn, 2004; 2012). It is an electrical term that involves twisting the frayed ends of wires together so that a constant flow of electricity can flow from one wire to the other. In effective performative routines, the wires are bound together through the

interactions of people in the data use group – sharing ideas about practice, validating thoughts about interpretation of data, and providing additional contextual information to triangulate the information from their own experiences (Marsh & Farrell, 2015; Bambrick-Santoyo, 2010). Design and redesign of tools, artifacts, and routines can also improve coupling between administrative plans and teachers' ideas of how to implement data-based decisions.


Communication. Conversations around data generate patterns that close down or create opportunities for learning and decisions (Coburn, 2102 A. Datnow, personal communication, October 21, 2015). If conversations allow for learning, data users identify needs and pursue strategies to address the need (Kerr et al., 2006; Earl & Katz,

2005). When these conversations clarify or reiterate plans or expectations, the conversations support disciplined practice, direct attention, and allocate resources (Colyvas, 2012). It should be considered equally likely that these conversations focus attention or resources on practices that reduce the quality of services to children and families. As communication becomes more intense, these conversations may become more sustained or more formalized. As communication becomes more pervasive, the messages of these conversations become more ingrained in the work environment.

Use of cycles. Data cycles define the steps of routines. Cycles of data use are recommended at the program level (Derrick-Mills et al., 2014; Preskill, 2013; NCPMFO, 2013a), as well as at the classroom level (Krugly et al., 2014; Mangione, 2006). Cycles can be simple or complex, as long as they use the informational tools in the environment to better serve children and families. These cycles provide the structure within which culture is built and change is operationalized. Many cycles have been presented as they are developed in various contexts. Several cycles are presented below.

| Johnson (2002) | Krugly et al. (2014) | Derrick-Mills et al. (2014) | Mandinach et al. (2012) | Mangione (2006) |
|----------------|----------------------|-----------------------------|-------------------------|-----------------|
| Summarize | Prepare | Create goals | Collect | Watch |
| Analyze | Interpret | Gather data | Organize | Ask |
| Interpret | Implement | Analyze | Analyze | Adapt |
| Plan | Evaluate | Synthesize | Summarize | |
| Act | | Prioritize | Synthesize | |
| Follow Up | | Implement | Prioritize | |
| | | Monitor | | |
| | | Evaluate | | |

Guides for data utilization provide overviews of plans for feedback loops. A simple cycle of data use is the Watch, Ask, Adapt cycle (Mangione, 2006). This cycle



outlines a routine intended to increase responsiveness of care to infants. We have discussed classroom strategies and instruction throughout this review. When working with infants, a view on instruction is that the “curriculum is in the caring” (J. Gonzalez-Mena, personal communication, 2007). To provide an example of a data use routine applicable to infants and toddlers, the cycle that will be used to organize the remainder of this review – the Mandinach, Honey, Light, and Brunner framework (Mandinach et al., 2008 as cited by Mandinach et al., 2012) – will be synthesized with Mangione’s Responsive Process (Mangione, 2006). Collection and Organization of data can be done by *watching* the infant’s cues, reactions, and developmental skills. Analysis and Summary occurs when a caregiver *asks* what the behavior means, how it relates to previous observations, and how it would connect to information shared from family members or other caregivers. Synthesis and Prioritization occurs when the caregiver *adapts* to the needs of the infant in a culturally sensitive and individualized way that supports her learning and development.

Process Use

As noted previously, Process Use shapes and defines the way we look at data and legitimizes the knowledge generated from data utilization. These routines identify the important data and important data users through systems of data sharing that are explicit or embedded symbols of what data should be attended to, by whom, and for what purpose. The acknowledgement of symbols as part of social learning comes from the sociocultural learning framework within which this review considers data utilization to occur (Marsh & Farrell, 2015).



Collection and Organization Systems

Process use is defined by an interdependent system of social symbols (frameworks, data collection, data considered) and social structures (who participates, how often, for how long) (Marsh & Farrell, 2015). The system components documented in the Data Utilization Study included meetings, agendas, reports, and calendars (Yazejian et al., 2014). Greater pervasiveness of a system, as evidenced by a longer history of using a data system is associated with higher use schools where data utilization habits had previously been formed (Ford et al., in press). Careful planning of these systems, with involvement of the staff who will be asked to implement the procedures, can bring deeper meaning to the system in the eyes of the staff (Kerr et al., 2006). System components include frameworks to guide thinking, data collection, data consideration, designation of participants, and frequency of data-related interactions.

Some systems are used as an 'early warning system' to identify students, teachers, or schools needing support (Kerr et al., 2006). This is particularly true of systems designed by early interventionists whose universal screenings and ongoing assessments identify and track children at risk (Walker et al., 2008). An example of the system components working together is shown below.

Tools such as the IGDIs, come with strategies identified to address the domain of development identified as needing attention. Therefore, the system works as a whole when the universal screening captures the needs of children for the purpose of intervention, which are shared with teachers and parents on an ongoing basis until goals are reached.

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Frameworks. Routines that frame thought and action around data utilization may entail the presentation and discussion of frameworks for thinking about practice and programming. Frameworks may be mission statements or definitions of purpose. In program evaluation, logic models are often used to link program components to actions that need to be taken. An example is the Educare Theory of Change. This tool focuses attention of data users on our intended goal – school achievement for children and positive family outcomes. Because leaders are often challenged by being overly general or reactive in their data use, frameworks can clarify where else to look for sources of problems and targets of intervention (Marsh & Farrell, 2015).

Data Collection. Collection and Organization of data are first steps in cycles of data use. The data collected and regularly reported send messages about what data are important. There is a saying about classroom management that “What you pay attention to, you get more of” which might inspire teachers to give more positive encouragement. There is a similar saying in evaluation that goes, “What gets measured, gets done.” Data focuses our attention; the data chosen and the way data are collected and

Process Use as
an Organizer of Thought

Social Symbols

- Framework: the purpose of screening is to identify targets for intervention.
- Data collected: the screening is universal.
- Data considered: needs of children are identified.

Social Structure

- Participation: teachers and parents work in collaboration, with shared responsibility to interpret and act on new knowledge.
- Frequency: ongoing assessments captures progress.
- Duration: processes will continue until goals are reached.




presented define what data we are able to use (Johnson, 2002; NFES, 2012; Spillane, 2012).

Participation. Data needs people (Johnson, 2002; Love et al, 2008; Spillane, 2012). Participation in the flow of information is a key element in building a culture of data use (Gerzon & Guckenberg, 2015). The Data Utilization Study noted that all Educare staff are expected to use data. It was also documented that all Educare staff do use data in some form, but in different ways for different roles and purposes (Yazejian et al., 2014). While few teachers participated in the Research/Program Partnership meetings, many teachers met with Master Teachers and/or the LEP to make decisions about their classroom from child assessments and classroom observations (Yazejian et al., 2014). It is no surprise, then, that teachers considered the use of child assessment data to be their responsibility. These roles for data use are evident in a description of sharing data ‘up the chain’ by an Executive Director and to share data ‘down the chain’ by a School Director (Yazejian et al., 2014).

This role responsibility is outlined in data use guides for schools (Johnson, 2002). The messages sent by who participates can clarify roles, but they may also communicate that decision making is not extended to others (Heck & Hallinger, 2009). Leaders frame choices about data utilization, including making choices about who is engaged with which data and for what purpose (Lachat & Smith, 2005).

The expertise of the participants is a particularly unique component of Educare Data Utilization (ELN Working Group). While individual capacity, specifically pedagogical data literacy, has been mentioned as an important capacity of teachers in the data utilization process, other data users bring their experience too. A study found



that leaders were unlikely to provide teachers with data-based decision making responsibilities if the teachers were perceived to lack competence (Heck & Hallinger, 2009).

Large groups, such as the ELN Communities of Practice (COPs), or small groups within schools, such as professional learning communities (PLCs) may be conduits of effective data utilization. COPs may be a place in which to foster a culture of data use and increase pedagogical data literacy through ELN meetings and information sharing through Educare Connect (Yazejian et al., 2014). Similarly, PLCs can be places for reflection and communication about best practices (Thomas & Huffman, 2011). These communities, when marked by collaborative evaluation of practice and supportive distributed leadership can be a catalyst of change or stabilizer of expectation (Thomas & Huffman, 2011). Learning occurs through joint work, shared meaning, and increased understanding, which can be facilitated by a sense of belonging in a PLC (Marsh & Farrell, 2015).

The learning culture, acting and interacting from a place of curiosity and optimism, will increasingly share data broadly and comfortably. Data sharing with parents, and the family advocates who work with them, was a routine done more consistently at some Educare Schools than others (Yazejian et al., 2014). A recommendation to share data with parents in respectful, relevant, relationship-based ways was a recommendation of NCPFCE (2011). Sharing data respectfully and effectively is an area for development of early childhood educators (Zweig, Irwin, Kook, Cox, 2015). Community members, such as funders, policy makers, and other stakeholders, may also be more engaged, informed, and motivated to support process




when presented with data that frames the problems clearly. The intensity and pervasiveness of this process use is increased if community members are given an opportunity to interact with others who help them see their part in generating solutions (Johnson, 2002). Through personal interaction, data users participate in mutually developing questions, collecting information, interpreting results, deciding on next steps, and monitoring progress and plans for the future (NCPFCE, 2011).

Frequency and Duration. Spending time in data utilization processes has several potential functions – to become accustomed to the tools (the measures, the

How often and how long data users spend with their data and with each other will define and redefine the data's meaning to practice, as it increases understanding of the tools and social norms of data use

forms, the processes), to develop a shared understanding of the task, and to signal the importance of various data. As an ostensive routine, the frequency and length of data use signals the prioritization, as well as being a conduit of learning (Marsh & Farrell, 2015). How often and how long data users spend with their

data and with each other will define and redefine the data's meaning to practice, as it increases understanding of the tools and the social norms around data use (Marsh & Farrell, 2015). Seasons of data use that are more intense than other times of the year may be 'event markers' that take on meaning within the organizational culture (Schein, 2010). Time invested in data use strategies (formal school improvement planning)



generates better data utilization outcomes, as the shared work supports data's centrality to the goals (Kerr et al., 2006). As time is one of the most frequently mentioned barriers to data utilization, the provision of time to staff has broad implications. Not the least of these is the cost implication for coverage of classrooms while staff review data, LEP budgets related to producing data and providing support, and leadership time related to balancing their ever-changing duties with the need to frame and facilitate effective data utilization.

Results Use

A focus on the data utilization practice means that actionable knowledge connects to coordination of work activities, changes in instructional support, or organizational learning (Coburn 2012). The practices that shape the emphasis of work activities, instructional approaches, or learning have been referred to as *performative routines* (Spillane, 2012). Data users bring their skills, knowledge, and tools to make decisions, take action, and further develop ideas about how best to serve children and families.

The primary objectives for actionable knowledge are learning and decisions, which are arrived at by focusing attention and connecting data to action. When the results of data are used to connect meaning to practice, we implement Results Use. The routines involved in using results to connect to action include coupling and communication. The cycle used to organize this section follows the Collection and Organization of the last section and moves on to Analyze, Summarize, Synthesize, and Prioritize.



Analysis and Summary. The Research/Program Partnership meetings in the Educare schools are a place for deliberation of ideas using data. This is a primary forum for meeting the aspiration described in the model framework to use all data collected (ELN, 2014). A model put forth in the training on data utilization hosted by the ELN included reviewing data, identifying needs, and creating action plans with measurable objectives and deadlines (e.g. Specific, Measurable, Attainable, Realistic and Timely [SMART] goals). Because a SMART goal can be applied to specific behaviors with directly linked expected results, they connect data to practice. After reviewing data, practitioners ask what data need more attention, what other data are related to these, and what contextual variables affected these data. Answering these questions build information for the next steps in the process (Mandinach, 2012).

While goals and plans related to tailored teaching and family engagement include actions that connect to expectations for improved outcomes, the connection between action and outcomes is not a deterministic line. The children in Educare programs, due to being at risk of school failure, are likely to be developing less typically than other children (Ball & Trammell, 2011). They may be exposed to a number of environmental factors outside of the classroom which impact their development (Guss, Jones-Harden, Stein, Yazejian, & Forestieri, in review). Therefore, the actions planned, and the plans evaluated with these outcomes, should consider these needs as we work toward better outcomes for all children.

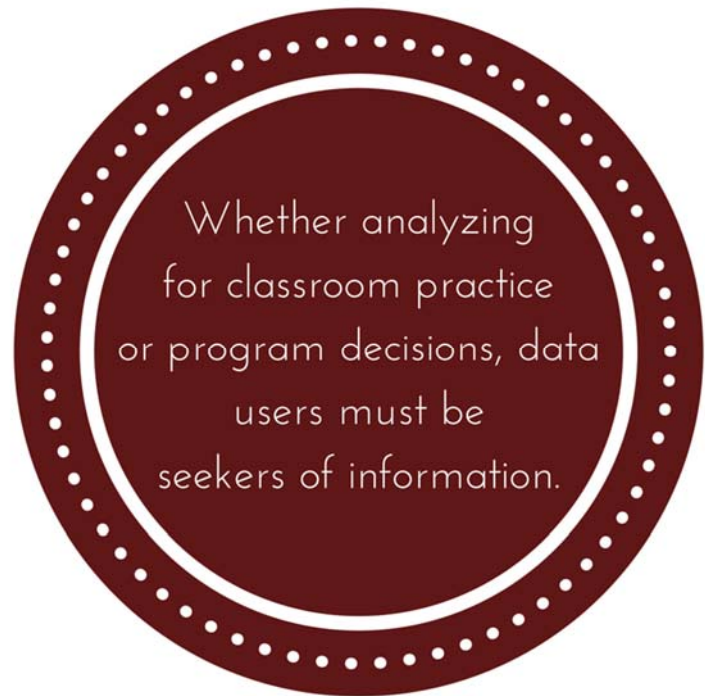
If our analysis focuses on partially uncontrollable outcomes, such as the scores alone, our follow up conversations will discuss failure. Therefore, the program evaluation piece of data utilization should come into play so that we can assess the

effectiveness of program components working in tandem to address broader needs of children and families. If the design of evaluation and assessment batteries and interactions around them highlight practice, they serve as a 'coupling' process and are more helpful to data users (Coburn, 2004; Colyvas, 2012; Kerr et al., 2006; Preskill, 2010).

Whether analyzing for classroom practice or program decisions, data users must be seekers of information (NFES, 2012). Deliberations that increase transparency of measures provide staff with data needed to make change (Bambrick-Santoyo, 2010). However, transparency could become a source of corruption (Colyvas, 2012). This double edged sword of knowing the assessment may give teachers the information they need to improve practice or it may

focus attention on a narrow slice of the world and promote gaming, which can involve teaching to a test, narrowing a curriculum, changing practice for the day of an observation, or focusing on measured variables (i.e. attendance) rather than the program as a whole. While much attention is given to data from child

assessments, data from classroom quality is also used to inform instruction and practice (Zweig et al., 2015). Analysis conversations, or data dialogues, can clarify how we






handle data, whether as a mystical item to be revered, the last bullet on a to-do list, or anything in between.

How school staff summarize data may be heavily dependent on the plans generated before examining the data and their previous experience with data (Kerr, 2006). With data that teachers previously found useful, teachers see problems and take action (Ford et al., in press). In contrast, summaries generated without a foundational plan may be vulnerable to reactive summaries and generalizations to future plans, rather than reflection on past cause of results (Marsh & Farrell, 2015).

Synthesis and Prioritization. The data use environment will include messages about the importance of certain data, interactions that support or hinder learning, and tools that focus attention in more or less effective ways. Repeatedly, this review has noted that data can inform instruction. Another large group of researchers have undertaken a project to understand deeply and broadly how teachers go about making that connection (Atkins-Burnett et al., 2014; Akers et al., 2014; Monahan et al., 2015). Unlike the methods planned to create the EDIT (Examining Data Informing Teaching), this review sought out components of data utilization that would be reachable with survey questions, even though we recognize that data is a complex and dynamic process. Because of this complexity, individual and organizational characteristics are being carefully considered as components to this important point in the data utilization process – synthesis and prioritization.

Data users have to synthesize the data at hand using their individual capacities and current level of expertise within current organizational conditions. Depending on



the teacher's motivational orientation, he may create higher expectations for himself and those around him, reinforce preexisting conditions, or resist current expectations (Coburn, 2012). Synthesis of data will apply previous knowledge and experiences to make sense of what may be influencing the outcome of interest.

The prioritization of data is influenced by the questions that are asked regarding who needs to be served and what the objectives of data use are. If equity between groups is a concern, data is analyzed by subgroups (Johnson, 2002). If data are thought to be the best measure of work performance, the data may be operationalized to formalize abstract ideas about work behavior (Colyvas, 2012). The goal setting process identifies which data should be considered (Sandstrom et al., 2015). The specificity of goals, benchmarks, number of goals, and objectives will further influence the prioritization of data to changes in practice (Sandstrom et al., 2015).

Adaptations. The final stages of data utilization include the generation of hypotheses about the data that have been examined. At this point, the data utilization process is more dependent on the expertise of people than the processing of data – formulating hypotheses, testing the ideas, and planning next steps in the process. This echoes the steps of Implement, Monitor, and Evaluate as the final step in another data use cycle (Derrick-Mills et al., 2014). The normative to regulative use of data resonates in the culture of the school through interactions that clarify and reify the purpose of data. The culture that manifests data use as a normative routine views teachers as professionals who need data to do their work more effectively. The purpose of data, in this environment, is to teach more effectively because the educator knows what the children need to learn or has identified the missing skills (Bambrick-Santoyo, 2010).

Unfortunately, data is rarely used for sustainable instructional change that benefits student outcomes (Marsh & Farrell, 2015). Applying these principles, promises, and challenges to data use in work with families and staff will be part of developing this measure.

Summary of Utilization Routines

- Change in practice occurs through data utilization routines that communicate "coupling" of data to practice within a culture of data use.
- Routines are organized in cycles, with interdependent social symbols and structures embedded in the cycles.
- Process use focuses data use, while Results Use pushes data into practice.

Application of Literature Review to a Future Measure

This literature review was conducted to test the alignment of the proposed framework against current thinking on data utilization. The framework was both validated and improved through this process. The domains of Organizational Tools, Individual Capacity, Motivational Experience, and Utilization Routines are modified and clarified based on recent research and thought on data utilization.



“Numbers are not all we need to tell us about children” (Kozol, 2006). Data use can be seen as a mechanistic process that turns children into numbers and removes us from our intention to be present with children and guide their learning and development. Praxis is the practice of transforming structures through a critical awareness of the conditions (Freire, 1970). Perhaps data can be used to bring this critical awareness as we move in concert to close the achievement gap and support equitable opportunities for all children.

This framework for measuring data utilization by identifying the individual capacities and organizational tools will provide a link to bolster these capacities and tools where they are lacking. The motivational experiences of data use will provide information to data coaches and leaders about the messages they inadvertently send when working with teachers and family support workers to address needs identified in data. Operationalizing the routines of data use around the culture being created and the intensity and pervasiveness of messages around data will be carried out for the purpose of understanding why data use works to improve professional development, family engagement, high quality teaching practices, and in tandem with these, the outcomes for children and families in Educare Early Learning Schools.

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