A Study of Three Schools' Use of Data to Improve Practice and Indigenous Student Outcomes

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Introduction

While there is plenty of optimism from proponents of data use, mountains of policy and reform activity focused on using data, and a plethora of literature touting the potential benefits of data use in schools (see, e.g., Datnow, 2011; Datnow et al., 2007; Davin et al., 2014; Love et al., 2008; Sharratt & Fullan, 2012; Symonds, 2004), "empirical research on data use continues to be weak" (Coburn & Turner, 2012, p. 99). Leading academics in the fields of school effectiveness and improvement, educational administration and data use have been calling for more thorough examinations of data use by teachers and school leaders for many years (e.g., Hallinger et al., 2013; Sun & Leithwood, 2012). Yet, despite these and other critiques emerging in the first decade or so of the new century, the processes by which data influence or inform leadership and/or instruction in K-12 schools continue to receive insufficient attention (Beaver & Weinbaum, 2015; Curry et al., 2016).

There are also surprisingly few systematic reviews that focus on the practice of and outcomes from data use in schools – particularly with respect to the processes and mechanisms schools use to make sense of, interact with and analyse data to inform school improvement efforts (Coburn & Turner, 2012). Because data-driven decision-making has emerged as a crucial technique for school development and improvement (Coburn & Turner, 2012; Massell, 2001), it is critical to obtain a greater grasp of data-driven practices that can boost both instruction and school leadership productivity.

Consequently, the established objectives of the present study are two-fold. First, we provide a truncated overview of our recent scoping review examining the literature associated with the processes educators use to transform educational data into evidence to inform instructional and leadership practices in K-12 schools along with the conceptual framework we developed to account for how schools use data to enhance evidence-based school improvement. The second section of our paper relates finding from a study of the ways in which three Western Canadian schools identified provincially as being particularly effective at using data to inform both instruction and leadership practices in their efforts to improve outcomes for Indigenous students.

Scoping Review: Data Use Practices in K-12 Schools

Our scoping review drew on the current literature related to K-12 data use processes to better understand how data inform instructional and leadership practices. The articles reviewed reframe the small but growing body of research on how school actors interpret and utilize data. We believe that, by examining the mechanisms and processes of K-12 data usage, we can reveal when and under what circumstances data can become evidence to contribute to improvements in schools overall; but, especially with respect to both classroom instruction and leadership practices.

Broadly, we were interested in gleaning from the extant literature a robust picture of the ways that K-12 classroom teachers and school administrators use data to inform instructional and leadership practices. However, to help us structure the scoping review analysis process, we unpacked the broad question into three sub-questions including:

- How do data help schools to make informed decisions on school improvement plans?
- How can K-12 schools' data use practices be conceptualized?
- What data do teachers and administrators perceive to be (more or less) useful?

Ultimately, drew from this work a conceptual framework for effective data use to use as the basis for our research in this field.

Scoping Review – Methods

Scoping reviews are useful for synthesizing research evidence and are often used to map the nature, features and volume of extant literature in a particular topic (Arksey & O'Malley, 2005). For this project, we employed the steps delineated in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Pioneered by researchers such as Aromataris and Riitano (2014) and Moher et al. (2009), the PRISMA statement describes the steps to define and identify criteria of quality for search terms and categories that are used to support a scoping review.

We employed several planning and implementation stages, the first of which was the creation of a protocol. A scoping review protocol explains the rationale, questions and planned methods of the review. According to Peters et al. (2015), the protocol should be written before the review begins and used as a guide to complete the scoping review. The protocol for our review established (i) search terms, descriptors and databases, (ii) research questions and (iii) inclusion and exclusion criteria (see Table 1).

Search Strategy

We conducted the literature search in the chosen databases, refined the search filters, extracted the information and populated a data grid before performing the data representation. We focused on the following databases: ERIC Ovid, Education Database and ProQuest Dissertation and Theses (Global). We also employed USearch, a library search engine designed by the University of Saskatchewan which pulls together resources from multiple sources and displays them in a single list of relevance-ranked results. The selection of these databases was motivated by their prestige and the quality standards they use to index articles. These databases encompass an array of academic literature in the fields of education, humanities, social sciences and arts. With the aid of the Boolean Operators (OR, AND) the search terms included: [data-informed OR data-driven] AND [educational leadership practices] OR [classroom instructional practices] OR [educational decision making] OR [leadership management] OR [educational management] AND [K-12 schools].

Table 1

Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
Journal articles	Book chapters, books or other types of non-peer-reviewed publications
Empirical research	Conceptual studies
Articles written in English language only	Articles not written in English language
Articles published between January 2010 to when this paper was written (November 2021)	Articles published before January 2010
Research conducted within Canada, United Kingdom, United States of America, Australia, and New Zealand	Research that was not conducted in Canada, United Kingdom, United States of America, Australia and New Zealand
Studies that involve school leaders, policy experts, teachers, and students as research participants	Research participants are not school actors (school leaders, policy experts, teachers and students)
Studies that explore topics relating to how schools use data to inform instructional practices, leadership practices, and school improvement	Research does not discuss data use in schools
Articles that are freely available	Articles are not freely available/accessible (require subscription)

We opted to widen the search beyond the databases we used initially in order to guarantee that the assessment was as complete as possible. We used Google Scholar, a leading educational search engine, to search the "grey" literature and review the references of the publications we found. Thus, once the databases were chosen, the descriptors were established and the search equations were formed (see Table 2).

To limit the possibility of study selection bias (Hinojo et al., 2019) and enhance interrater reliability, both of us were involved in the article selection process and the application of the search protocol's rules. During the selection and screening of relevant articles/studies, we used the PRISMA protocol to ensure that no arbitrary decisions were made during the review process. The process involved four stages (see Figure 1), the first of which was the identification phase. We kept track of all the articles we found after using the search terms during the identification process. The items were reduced in the second stage, which was the screening stage. We removed duplicate papers at this stage. We imposed limiters (inclusion and exclusion criteria) for the review and grouped studies (e.g., methodology, context) for the synthesis in the third step, which is the eligibility stage. Finally, we identified the studies to be included in the review and then synthesized the findings.

Table 2

Search Topics

Database	Search descriptors
ERIC Ovid	((((data-informed or data-driven) AND "educational leadership practices") OR "classroom instructional practices" OR "educational decision making" OR "leadership management" OR "educational management") AND K-12 schools) Limiters applied: Document type = Articles Time period = 2010 to 2021 Country = Canada, USA, UK, New Zealand, Australia Language = English
Education	"data-informed" AND ("educational leadership" OR "instructional practices") OR "educational leadership practice" AND ("K-12 school") OR elementar* OR secondar* Limiters applied: Document type = Articles Time period = 2010 to 2021 Country = Canada, USA, UK, New Zealand, Australia Language = English
ProQuest dissertation and theses (Global)	"Data-driven" AND "instructional practices" AND "K-12 schools" OR elementar* OR secondar*

*Note*. * is used in order to be able to collect all the keywords that begin with those words.

Scoping Review - Findings

Data are the currency of educational institutions and they come in many forms, including large-scale test results (both standardized and otherwise), classroom assessments (both summative and formative), graduation rates, attendance, grade promotion practices and many others (Beaver & Weinbaum, 2015). Data have the potential to shine "a clear unambiguous light on how to strengthen school performance or at least where [schools] should direct their efforts" (Honig & Coburn, 2007) and it is evident that using data to inform school policies is extremely popular in the education field (Finnigan et al., 2012); thus, much of the attention paid to data use in K-12 schools is driven by the potential for schools to pinpoint their area or areas of weakness and then devise solutions that fit the specific problems they face (Beaver & Weinbaum, 2015), which in turn could lead to achievement gains (Linn, 2005) and school improvement (Wayman, 2005).

Data are used for a variety of purposes and, according to PricewaterhouseCoopers (PwC) poll of more than 1,000 senior executives, highly data-driven firms are three times more likely than those that depend less on data to report major improvements in decision-making (Stobierski, 2019). Specifically, to K-12 schools, data are used to track students' progress, diagnose learning

difficulties, allocate resources, and assess program performance (Brindley, 2001; Newton, 2007).

Figure 1

PRISMA Flowchart of the Selection Process
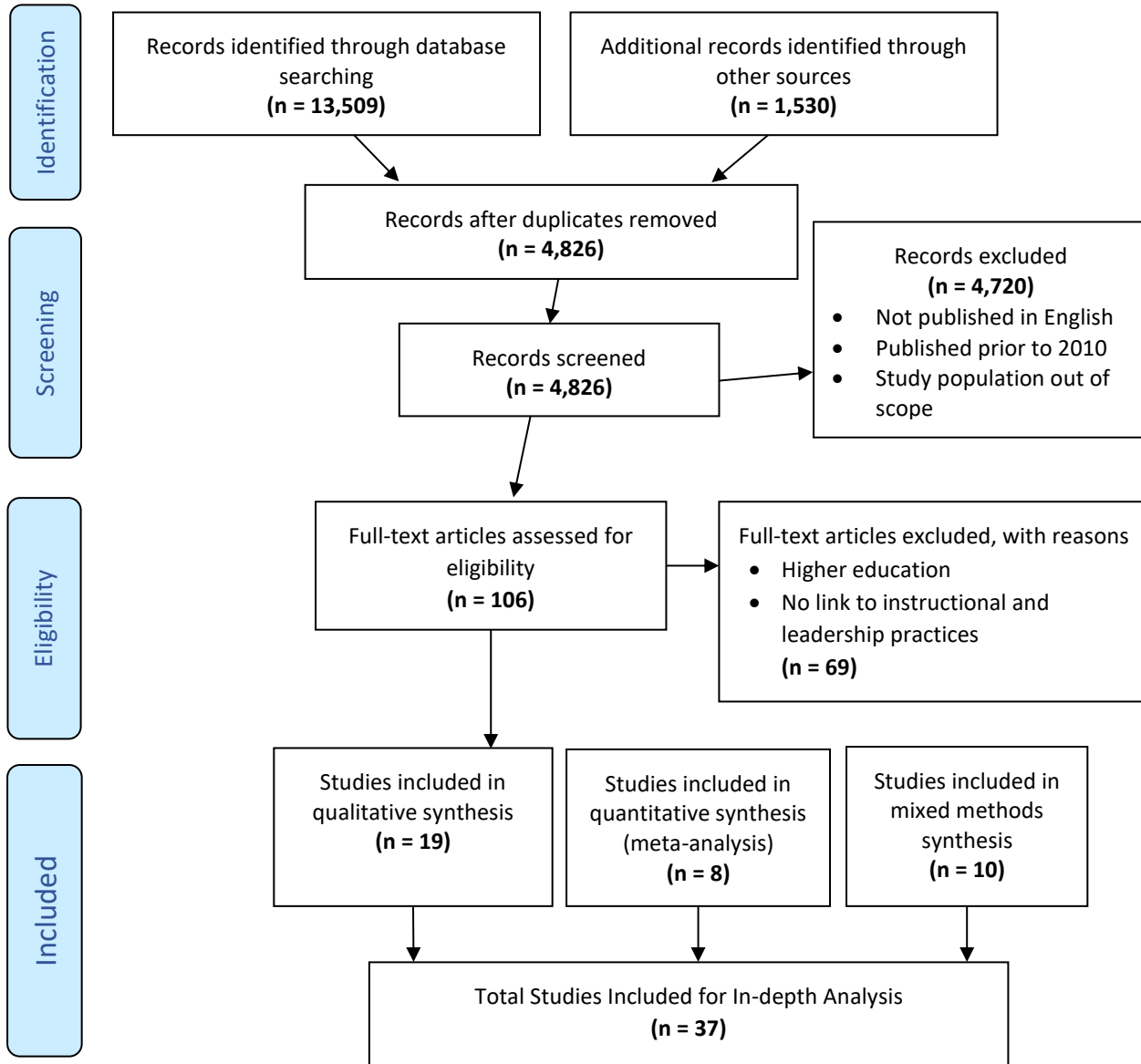
Despite the long-standing interest in school- and district-based data use, research demonstrates that data usage practices differ significantly from one setting to the next (Banilower et al., 2013; Farley-Ripple & Buttram, 2014). As a result, scholars have placed a lot of emphasis on the characteristics that help or hinder efficient data use rather than on what people in those settings actually do with data. Previous studies, for example, have investigated the impact of teacher beliefs (Dunn et al., 2013), professional development (Nabaa-McKinney, 2019), principal leadership (Wayman et al., 2007) and whole-school data culture (Henry, 2011) in promoting data use. Lack of time to engage with and analyze data (James-Johnson, 2019), lack of competence to understand and interpret data (Loete, 2014), and school actors' beliefs about the data's worth, validity, purpose and dependability are all major roadblocks to

promoting data-driven or data-informed decision making and/or practice (Pak & Desimone, 2019).

When it comes to framing the way data are used in schools, there are several terms that are employed. Data-driven decision making (DDDM) is a common term used in this space. DDDM refers to the process by which administrators and teachers allow the conclusions they draw from their data collection and analysis processes to "drive" their professional decisions (Copland et al., 2009). Similarly, according to Stobierski (2019), DDDM can also refer to the process of using data to validate a course of action before committing to it. Data-informed decision making (DIDM) is another of these terms and is defined in the education sector as "the practice of teachers and administrators systematically collecting and analyzing a variety of data to guide instructional decisions and advance the performance of students and schools" (Marsh et al., 2006, p. 3). We favour DIDM because, when educators use data to inform their work, they still rely on other sources of information – such as experience and intuition – as well. Nevertheless, the assumption underlying both DDDM and DIDM is that more data should lead to better decisions and, in turn, to new and improved educational opportunities and practices (Curry et al., 2016).

Regardless of terminology, both DIDM and DDDM view data use as the process of accessing and filtering data into information in order to gain knowledge and alter one's practice (Marsh, 2012). For DIDM and DDDM, a focus on data use examines how teachers and other school actors collect and analyze data, learn about their own and others' practice and make decisions about next actions (Coburn et al., 2009). Ezzani (2015) asserted that the strength of DIDM is that "analysis of student data will enable schools, districts, and states to target areas where progress is needed" (p. 3). Kerr et al. (2006) identified several factors that influence how schools use data. These characteristics include data accessibility and timeliness, as well as the level of staff support and training for data analysis and interpretation.

Following the extraction and organization of the data, we classified them into four categories that corresponded to the four research questions that guided our analysis.

Research Question 1: How Are Data Used to Inform Leadership and Instructional Practices in K-12 Schools?
We found that data were used to inform goal setting, create school improvement plans, track student achievement, identify student gaps, refine course offerings and materials, guide and prioritise school-level improvement efforts, change teachers' attitudes about the potential success of low-performing students, guide teachers' professional development, determine school resource allocation and link appropriate interventions across the literature reviewed. Four themes run through the findings: (i) schools' use of data, (ii) data usefulness, (iii) the impact of data use for decision making, and (iv) effective practices with data. The following discussion of these findings are organized according to headings suggested by these themes.

The scoping study also uncovered some minor discrepancies in how teachers utilize data versus how school leaders use data to inform their practices. We point out the discrepancies as we go.

Teachers' Use of Data

Teachers' use of data was referenced in 35 of the 37 articles analyzed for this study. Teachers, typically, use data to inform their teaching practices as well as to monitor and improve their students' performance. The data-related tasks in which teachers in the studies engaged to improve teaching and learning experiences include:

Assessment:
- Undertaking on-going classroom assessment during lessons (Curry et al., 2016)
- Determining students' level of achievement after instruction (Burrows, 2011; Reeves et al., 2016)
- Assessing and tracking students' overall performance (Beaver & Weinbaum, 2015; Farrell, 2015; Nabaa-McKinney, 2019)

Planning and Goal Setting:
- Engaging students in short-term goal setting (Farley-Ripple & Buttram, 2015)
- Planning for lessons and curriculum implementation (Moriarty, 2013)
- Tailoring teaching to identified learning needs (Beaver & Weinbaum, 2015; Starkey & Eppel, 2017)
- Intervening on behalf of and advocating for students' needs (Balicki, 2016)

Enhancing Instruction:
- Re-teaching lessons that students may not have understood based on their assessment results (Cohen-Vogel & Harrison, 2013)
- Changing instructional strategies (Price, 2018; Reeves et al., 2016; Schifter et al., 2014; Simpson, 2011)
- Improving decisions about instructional methods (Jim et al., 2017)
- Enhancing the organization of instruction (Custer et al., 2018)

Collaboration:
- Building relationships with other teachers and share skills/knowledge (Curry et al., 2016)
- Dialoguing collaboratively and sharing knowledge on data use (Ezzani, 2015; Burrows, 2011; Datnow, 2011; James-Johnson, 2019)
- Creating data teams to enhance data use practices (Beaver & Weinbaum, 2015)
- Organizing teachers' professional networks (Farley-Ripple & Buttram, 2015)

Communication with Parents:
- Creating a positive connection with parents (Simpson, 2011)
- Providing parents with information of how their child is succeeding or struggling (Curry et al., 2016)

By analyzing academic data, teachers report being able to identify instructional gaps and lapses, modify lessons (what to cover, at what level, and in what pattern), inform curriculum changes,

reflect on their teaching practice, styles, or approaches, revise their teaching methods and develop innovative teaching styles and practices while learning and sharing ideas during data team meetings, action walks, visibility wall walks, and/or co-teaching engagements.

School Leaders' Use of Data
Data are primarily used by school leaders to inform their leadership practices and school-wide reform activities. We found that school leaders use data to (i) make informed decisions about curriculum changes (see, Beaver & Weinbaum, 2015; Bigner, 2017; Custer et al., 2018; Henry, 2011; Simpson, 2011), (ii) make informed decisions about school improvement plans and strategies (see, Pak & Desimone, 2019; Price, 2018; Rhoads, 2019; Schifter et al., 2014; Starkey & Eppel, 2017), (iii) design teacher professional development offerings (see, Brown & Zhang, 2017; Dunlap & Piro, 2016; Gleason et al., 2019; Jim et al., 2017; Loete, 2014; Marsh & Farrell, 2013), (iv) examine school performance by grade level and subject (see, Henry, 2011; Sergis & Sampson, 2016), (v) communicate students' performance to stakeholders (see, Henry, 2011; Schifter et al., 2014; Sergis & Sampson, 2016), (vi) guide school resource allocation (see, Bigner, 2017; Custer et al., 2018; Henry, 2011; Price, 2018), and (vii) evaluate the effectiveness of school programs and make necessary changes or adjustments (see, Custer et al., 2018; Rhoads, 2019).

Based on our findings, we can safely conclude that data are used in three ways to inform leadership and instructional approaches. For starters, many teachers and administrators utilize data as a *springboard for further investigation and planning*. For example, when schools organize an action planning team or form data teams to evaluate data, identify shortcomings in school curriculum, remediation or instruction they are using data as a place to start professional enquiries (Datnow et al., 2012; Ezzani, 2015; Farley-Ripple & Buttram, 2015; McClain, 2016). Moreover, data are used by school leaders to look for trends that may indicate where they should focus their efforts in future years (Beaver & Weinbaum, 2015; Henry, 2011).

Secondly, it is clear from the literatures studied that schools *employ data to track students' development individually and/or in groups*. Data are utilized in the classroom to identify students who need remediation, design individualized education, and reorganize students into classes/groups based on their performance levels.

Thirdly, data are also utilized to *guide and prioritize school-level improvement activities*. Aligning curriculum to standards, identifying and planning professional development for teachers, and allocating and/or realigning school resources are all examples of leadership and instructional strategies in this area (Beaver & Weinbaum, 2015; Bigner, 2017; Dunlap & Piro, 2016; Marsh & Farrell, 2013; Starkey & Eppel, 2017).

Research Question 2: Data Usefulness
Our second research question asked *What data do school leaders perceive to be (more or less) useful?* Perhaps not surprisingly, teachers tend to place a higher value on teacher-generated classroom data (e.g., daily observations, homework, quizzes, classroom essays, anecdotal notes and records resulting from daily practice) than state- or

provincially-mandated standardized assessment data because such data are typically derived from a single assessment and do not provide robust details about students' learning (Balicki, 2016; Curry et al., 2016; Datnow et al., 2012; Davin et al., 2014). Furthermore, teachers tend to believe that data collected in a single measure is less relevant to them than data gathered on a daily basis in the classroom through interactions with pupils. Beaver and Weinbaum (2015) referred to standardized assessment data as "just one piece of a much more complex puzzle" (p. 492).

In terms of teacher-generated data, in-the-moment data is regarded highly. Data generated in the course of teaching is known as in-the-moment data. These data aid in the diagnosis of student learning problems, allowing teachers to re-teach or devise new instructional approaches or strategies to address students' learning difficulties and needs. Generally, teachers indicated that they valued formative data more than summative data and they preferred to use multiple data sources rather than data from a single source to drive their instructional decisions.

Ironically, school leaders place a higher importance on summative data (e.g., systemwide assessment data, district benchmark test results) than formative data since it assists them in making large-scale programmatic decisions (Beaver & Weinbaum, 2015; Datnow, 2011; Reeves et al., 2016). We recommend that schools figure out how to use both formative and summative data to improve teaching and learning, make large-scale choices and fulfill the needs of external stakeholders.

Research Question 3: The Impact of Data Use for Decision Making
Our next research question asked *How do data help schools make informed decisions?* We recognise that the answer to this question is aligned with the perceived benefit of data. In the papers examined, Beaver and Weinbaum (2015) and Moriarty (2013) claimed that some data do not provide new or nuanced information about students. Ezzani (2015) concurred saying that while data do not always drive decisions, the use of data acknowledges the complexity and ambiguities that play into data use in K-12 schools.

Several studies noted that increased use of formative/summative data provides an important indication of the direction of student learning (Henry, 2011), has a favourable impact on students' math and reading scores (Chandler, 2020) and is essential for school leaders to make informed decisions (Henry, 2011; Simpson, 2011). Our findings show that assessment data paint a dynamic picture of student learning throughout the school year, influencing or informing school administrators' efforts and decisions to target remediation/instruction at the school level (Beaver & Weinbaum, 2015). Furthermore, our findings showed that perception data can provide school administrators with information regarding parent, student and staff satisfaction, allowing them to make informed decisions about how to improve.

Research Question 4: Effective Practices with Data
Our final research question – *What is Effective Practice with Data Use?* – helped us uncover what constitutes effective data practices, what makes data usage in schools effective, and how to improve effective data use in K-12 schools for instructional and leadership practices.

Based on the findings of our review, we believe that data has the potential to be a lever for school improvement. However, scholars have yet to determine what constitutes effective data use. Effective data practices, according to Gleason et al. (2019), begin with determining what data is required, that is, having a purpose in mind as it is easy to go off track or become overwhelmed. As a result, schools should start data collection and use by identifying what they need to know to improve. Because data without a purpose is pointless (Earl & Katz, 2006), effective data practices necessitate asking a number of questions and looking at different types of data that can help answer the question (Means et al., 2011).

A team approach is required for effective data use. Data utilization in schools and school systems, when engaged in isolation, is rarely productive or successful. Such processes necessitates collaboration and negotiation with others. When it comes to data use procedures and activities, school administrators should not be the only ones in authority. Collaboration at all levels should be a part of it (teacher-teacher, teacher-school leaders, school leaders-district leaders, teachers-district leaders and school-community) (Barmore, 2018; Datnow, 2011; Datnow et al., 2012; Ezzani, 2015; Reeves et al., 2016).

Asking teachers and stakeholders what their problems are and what data they need to see in order to help them understand that the school is progressing is critical to establishing successful data use practises in schools is an important step when using data effectively (Curry et al., 2016; Ezzani, 2015; Marsh & Farrell, 2013). During school and district data use planning, teachers and other stakeholders should be consulted and their opinions should be respected. If this is not done, school administrators may make assumptions about what the school actually requires.

The beliefs of teachers have a critical role in the effective utilization of data. For example, in a few of the papers reviewed (e.g., Brown & Zhang, 2017; Henry, 2011;), teachers often consider standardized test results as lacking either validity or usefulness for making decisions about student learning or teacher effectiveness. When teachers make instructional decisions, these beliefs influence the data they seek out and pay attention to. As a result, effective data practice will necessitate teachers/school leaders who comprehend the value of data in practice and school reform.

Data communication to stakeholders is essential. Sharing data in easy-to-understand visuals and brief, jargon-free reports aids stakeholder comprehension of school challenges and identifies ways they can help the school improve (Curry et al., 2016; Ezzani, 2015). Additionally, timely data access as well as timely information to parents about student accomplishment and school performance ensures that data are used when they are most required (Brown & Zhang, 2017; Burrows, 2011; Datnow, 2011). A key issue emphasized in the studies we looked at was

the importance of creating a data-friendly culture in which all employees understand their duties and responsibilities and are allowed some autonomy in gathering the correct sorts of data for their needs (Loete, 2014; McClain, 2016).

Data Use: A Skill that must be Developed
Although these findings are encouraging, our scoping review uncovered that just having a large amount of data stored on a computer does not improve instructional and leadership practices. To evaluate data and use it to lead and implement real reforms that improve the delivery of high-quality instruction, human capital is required. Meaningful use of data to inform practice and decision making, like any other skill that educators are expected to acquire, necessitates training, practice and ongoing interaction. Unfortunately, findings from the studies shows that educators generally lack the expertise and competencies to assess data and implement new evidence-based information into their practice and school districts rarely invest significantly in helping them to develop those skills (Beaver & Weinbaum, 2015; Datnow, 2011; Datnow et al., 2012; Farrell, 2015; Means et al., 2011).

Our findings suggest that data tend to be underutilized. While some educators and other school personnel take it upon themselves to develop the knowledge and skills to understand and properly utilize data to inform instructional and leadership activities, it is the exception rather than the rule. In the study conducted by Curry et al. (2016), teachers said that "successful data use "comes with experience" and that learning tailored to "instruction to meet student needs is a skill that is best learned in relationship with other teachers" (p. 98). As stated by Ezzani (2015), the potential benefit of professional development in data-driven decision making is to build capacity as well as ensure comprehensive and systemic learning in DDDM.

Therefore, in order to realize the benefits or gains of data, school employees must be able to make sense of data, have faith in what they say, select relevant school improvement initiatives in response to what the data reveal and implement new improvement programs (Barmore, 2018; Beaver & Weinbaum, 2015). As a result, we propose that school divisions invest substantially in data analysis skill development (Simpson, 2011) for all school staff (educators and administrators) so that they are more able to make use of the data available to them as well as to respond appropriately when data point to necessary changes either in classroom instruction or leadership strategies.

Investing in skill development or professional development, as it is referred to in the majority of the studies reviewed, can take several forms. Collaboration is one of these forms. According to Datnow (2011, p. 152), "without collaboration and collegiality, data use is impossible." Hattie (2015) argued that schools and districts must develop a collaborative "culture of evidence" in which educators are clear about "what success would look like and the magnitude of the impact "their instructional practice has on student learning (p. 16). Collaboration is critical, according to Hattie because while there is "differential expertise across our schooling systems … there is a remarkable spread of expertise that can be identified, nurtured, esteemed and brought together" (2015, p. 1) in service of greater understanding of what is really going on in our schools and more effective responses to students' needs. Similarly, according to Datnow (2011),

collaboration allows school actors to discuss data, which helps everyone involved learn how to use data, analyze data and establish action plans. Formal school trainings, workshops outside of the school, peer mentoring, and coaching (Ezzani, 2015) are all examples of professional learning or development.

Conclusion: Phase I
The scoping review examined the research on administrators' and teachers' use of data over the last 11 years (2010-21) and offered the evidence-based state of such practice in K-12 schools. The 37 studies included in Phase 1 of this research explored how and why teachers and principals utilize data, and how data influence instructional and leadership decisions.

Data provide evidence and limit emotion and animosity from the decision-making process. Choosing what data to collect is mostly determined by defining what schools need to know: student performance, teacher quality, parent and community satisfaction and other concerns related to the school. Data can assist schools determine the extent to which their vision and mission are being realized; hence, successful data-driven or data-informed decision making necessitates a shift in a school's culture that fosters the use and analysis of data without fear of reprisal. Such a culture demands active participation from all school actors in data gathering and discussion, as well as achieving clarity on the objectives of data collection and analysis. Because data-informed practice necessitates some level of facility with data, it is critical to provide training and assistance to teachers to help them build their data literacy skills. Principals and policymakers desiring to promote data use as a tool to improve instruction and school reforms can benefit from the findings of this study.

Phase II – Case Studies of Three FTV Schools That Use Data Effectively

The Truth and Reconciliation Commission of Canada, in its 2015 Calls to Action (CTA), declared that "much of the current state of troubled relations between Aboriginal and non-Aboriginal Canadians is attributable to educational institutions" (p. 285). Yet, the CTA acknowledge that educational institutions also have a critical role to play in fostering reconciliation. On one hand, reconciliation cannot happen unless gaps in academic achievement preventing First Nations, Métis, and Inuit peoples from participating, fully, in Canadian political discourse and economic prosperity are eliminated. Yet, on the other hand, Métis, Inuit and First Nations communities tend to view formal schooling through a historical-cultural learning lens informed by ceremony, tradition, language and shared community history (Morcom, 2014) seeing academic achievement as important but insufficient to sustain individuals on their learning journeys (Tunison, 2007).

At the heart of this study is an equation underlying K-12 education for Inuit, First Nations and Métis children. On the left side of the equation is two distinct variables: (i) curricular competencies that privilege Euro-centric notions of academic and socio-cultural competencies required for success in students' futures, and (ii) First Nations, Métis, and Inuit worldviews that explicitly value spiritual, physical and emotional growth as essential to individuals' and communities' collective learning. On the right side of the equation is what it means to be well prepared to live a fulfilling life. This side is an amalgam of Western and traditional epistemologies and competencies (Hansen & Antsanen, 2016) that requires a culturally safe place to blend and grow (Benally, 2014). The critical challenge, though, is to understand the right side of the equation well enough to make sure both components of the left side of the equation are represented in appropriate proportions.

K-12 systems across the country have developed and implemented change initiatives inspired by the CTA that target improvements for Métis, Inuit, and First Nations students. Unfortunately, most such initiatives have little or no likelihood of yielding improved student outcomes because they target structural "distractions" (e.g., class size, voucher programs, and tinkering with curricula) rather than what really nurtures improved outcomes; that is, what teachers know and can do in the classroom (Hattie, 2015a) and the nature of the student-teacher relationship (Bishop et al., 2013). To that end, Following Their Voices (FTV) has been developed and implemented in schools across the province as a means of promoting relational pedagogy toward enhancing the student-teacher learning relationship and, ultimately, improving outcomes for Inuit, First Nations, and Métis children and youth.

Methodology

Following Their Voices (FTV) is a large-scale made-in-Saskatchewan initiative focused on improving the schooling experience for First Nations, Métis, and Inuit youth. A central pillar of FTV requires data-related processes including: collection, interpretation, and response to a wide variety of data to inform instructional and administrative decisions. The purpose of this study was to examine the role that leaders (both formal and informal) play in fostering the FTV data use-related processes described above in three schools nominated by FTV leaders as being

highly successful both in implementing these data-related processes and in supporting First Nations, Métis, and Inuit students' learning. Primary research questions include:

- How do these highly successful schools collect, interpret, and respond to data? What roles do the formal and informal leaders in the school play in engaging teachers and students to use data in these ways?
- What aspects of the teaching-learning-leading process are not yet part of data collection efforts but are perceived as potentially valuable?

Conceptual Framework

Phase I identified dozens of studies that claim strong links among data from various sources, meaningful changes in pedagogy, and improved student outcomes; all the while facilitated by particular in-school leadership practices. Datnow and Hubbard (2016) observed that the underlying premise of data-informed practice lies in the belief that "by carefully analyzing evidence about student learning, teachers will be able to prioritize instructional time, better target instruction towards students' individual needs, and refine instructional methods" (p. 8); but initiatives to enhance teachers' skillsets for data use have been ineffective because, in large part, data use advocates "have neglected to say precisely *how* data might improve teaching and learning or to show teachers [and administrators] what data-informed practice looks like" (p. 51). In an effort to explicate these data-related processes, McDonald (2019) noted that teachers and administrators who use data effectively performed at least four tasks:

1. Proactively "generated their own [outcomes]-focused data by … engaging students in authentic … tasks and recording the results" (p. 52).
2. Incorporated a variety of data from other sources – including judgements informed by their own professional experience – to decide not only what to teach in the future but also what to teach in the moment.
3. Created robust and flexible data management systems to collect, use, and learn from the data by establishing mentoring groups.
4. Engaged students in collecting, curating, interpreting, and mobilising data to improve learning and instruction to meet their needs.

In an effort to bring the findings from Phase I of this study into a coherent picture to guide Phase II, we constructed a conceptual framework to account for both the literature and the local contexts (see Figure 2).

Figure 2
Conceptual Framework Map
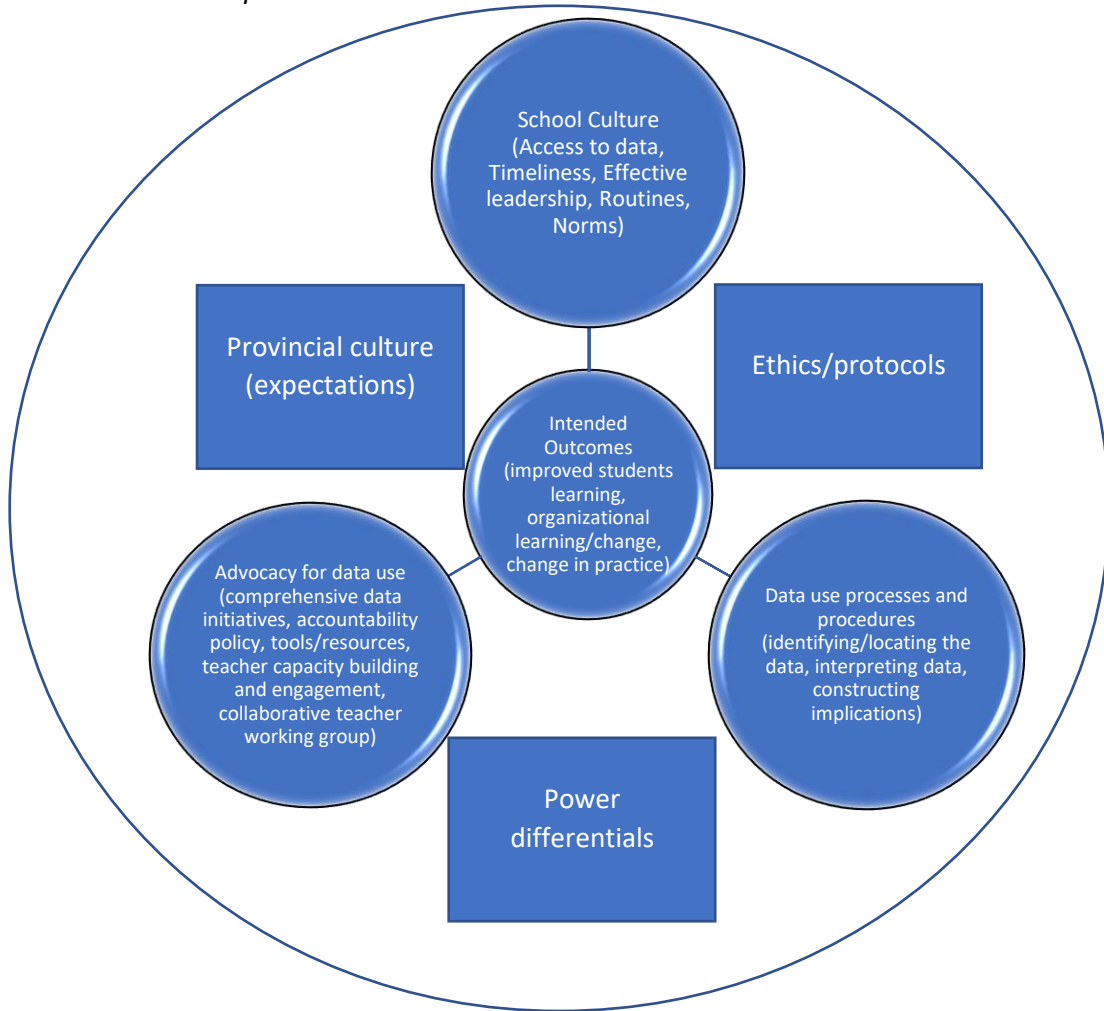
Factors Originating Outside the School

We contend that data-related processes in schools are influenced by at least three factors originating *outside* the school walls. We represented these factors in the conceptual framework using rectangles labelled: provincial culture (expectations), ethics/protocols, and power differentials.

Provincial Culture/Expectations

Saskatchewan's educational system is unique in that there is no high- or medium-stakes province-wide standardized assessment program (Tunison, 2020; James & Tunison, 2020). Despite the fact that all publicly funded schools in the province are required to (i) collect certain student learning (e.g., high school final marks, reading comprehension and mathematics computation results for students at certain pre-high school grades, etc.) and behavioural data (e.g., attendance) and submit them to the provincial ministry of education at various points during the school year, and (ii) report, publicly, aggregate summaries of these data; improving or declining performance is not tied to "consequences" or "rewards" for the division, school,

teacher, or individual student. Furthermore, the province's teachers' federation has been remarkably successful over the years in its advocacy efforts to resist implementation of such assessments – especially if there is any hint that they could be used to evaluate teacher performance.

Nevertheless, each school accepted into the FTV initiative agrees to implement certain data collection processes and use initiative-specific monitoring and assessment tools in return for access to the resources and personnel provided by the project. In previous FTV research (Tunison & Wallin, 2020), we found that, while most schools completed the data-related tasks reasonably well – some schools' commitment to the data tended more toward compliance than completing them because they valued the data and the processes associated with them intrinsically.

Power Differentials

As mentioned above, all schools participating in FTV are expected to participate in multiple data collection, analysis and use processes. While schools are required to appoint in-school leaders to facilitate much of the work; a Provincial Facilitator is also assigned to each participating school to add an external source of pressure and support. Even though the Provincial Facilitators are, for the most part, seconded teachers, the fact that they are assigned to the school by the provincial Ministry of Education creates a subtle but important power differential that acts as an "incentive" for schools to "follow the expected processes".

Ethics/Protocols

Individual FTV schools and teachers – as well as the initiative overall – are informed by a broad range of qualitative and quantitative data. FTV schools exist within the purview of the provincial education sector and are informed by metrics expected by provincial strategic plans. (NOTE: Some FTV schools are under the direction of First Nations education authorities but they follow the provincial measurement structures for the purposes of their FTV involvement). These measures include: student achievement, student, teacher, and parent perceptions; and attendance. Teachers also participate in several cycles of active observation of their classroom instruction and unpack the data generated from those observations with a colleague, set goals for improvement, and monitor progress over time. Given the personal nature of many of these data, there are multiple potential ethical challenges. The FTV initiative has gone to great lengths to create a secure data warehouse to store the perceptual and observational data – including assigning teachers an ID number that tags their data but storing the master lists offline at the local school level and having all perceptual surveys completed anonymously.

Factors Originating Inside the School

From the scoping review, we identified three interrelated factors originating inside the school – all of which originate with the school's leaders – that influence data-related processes. These include: school culture, data use procedures and advocacy for data use. We also noted that the entire process is (or should be) influenced by the intended outcomes – therefore, we placed this factor at the centre of the conceptual framework.

School Data Culture
The school's data culture refers to the ways in which teachers have access to data (beyond whatever they collect in their own classrooms). It is affected by the timeliness of the access, the routines and norms established for engaging with and responding to data, and the ways in which leaders communicate about both the data themselves and about the value of those data to influence, positively, instruction and leadership processes in the school.

Data Use Procedures
Related to the school's data culture is the procedures used in the school for engaging with data. In other words, once data have been collected, what do leaders do in service of identifying and/or finding the data and engaging staff in both making sense of the data identifying effective responses to them, and monitoring those responses to ensure that things are improving.

Advocacy for Data Use
The extent to which school leaders advocate for using data also has a profound influence on the nature of the data processes that emerge (or do not emerge) across the school. From our scoping review and our own experience, we note data-related processes are rarely a part of teacher- (and leader-) training. Furthermore, as pointed out earlier, Saskatchewan's education system tends to downplay data as an important source of information to guide practice. The reasons for this phenomenon are wide-ranging and a full chronicle of them is well beyond the scope of this project. However, given the volume of research that suggests this to be true, we accept that this is likely the case in many locales.

Intended Outcomes
Upon reflection about our scoping review findings, we contend that *intended outcomes* – or what we want to accomplish – ought to be at the centre of data-related processes. We noted three broad categories of outcomes in the literature: improved student learning, organizational change/learning and change in practice.

Method
Given this study's focus on investigating a particular phenomenon – the ways in which teachers and administrators use the plethora of data expected by FTV – a case study design was appropriate because such designs allow for the generation of thick description through "intensive examination of one phenomenon or a small number of instances of a phenomenon. The goal … is deep understanding of a small number of cases rather than broad knowledge … drawn from many cases" (Vogt et al., 2012, p. 336).

At the time of study, FTV was in place in approximately 60 Saskatchewan schools. As with any other initiative, schools' efficacy with implementing expected data-related processes is variable. A multi-site collective case study when investigating issues that may have subtle differences from one setting to another seemed reasonable as it should allow up to pick up on those variations and to rule out alternative explanations (Cohen et al., 2018).

This study was conducted in three FTV schools. Considering our research objectives to investigate the intersection between leaders' actions in fostering teachers' and students' engagement with data and improved learning, we asked FTV senior leaders to nominate schools that appear to be particularly successful both in implementing the FTV data-related practices noted above and in fostering First Nations, Métis and Inuit students' success. Since case studies "observe effects in real contexts … [which are] powerful determinant[s] of both causes and effects … in-depth understanding is required to do justice to the case" (Cohen et al., 2018, p. 376), it is important to examine the phenomenon in a variety of contexts representing the broad settings of the phenomenon.

Cohen and colleagues advocated for "working separately and asynchronously" (p. 378) when seeking to understand multiple instances of a particular phenomenon. Inspired by this advice, we included in this research one school from each of the broad settings in which FTV is situated: (i) remote pK-12 school, (ii) northern high school, and (iii) a large urban high school.

Data collection was tailored to each setting in the sense that I did not want the participating schools to alter their schedules to accommodate this research. Rather, I encouraged them to stick with their regular routines and collaborated with each school FTV team to identify a span of time when they would be engaging in most of the data-related activities I hoped to observe and that would mesh reasonably well with my schedule. Where possible, I hoped to engage in direct observation of a staff meeting during which data were discussed, two-three classroom (teacher-student) and collegial (leader-teacher) conversations focused on interpreting observation data and using them for administrative and instructional planning, two-three team Huddles, at least one Co-construction meeting, a Strategic Change Leadership Team (SCLT) meeting and any other data-related activities in which teachers and/or administrators might engage. The availability of personnel – including occasional individual bouts with COVID and other illness – and the schools' schedules resulted in some variation in terms of the data-related activities that took place while I was onsite at the schools. While the specific activities attended at each school are described in the next section, I will say here that I am confident that my visit(s) to each school afforded the opportunity to observe a healthy cross-section of data-related activities endemic to each location. Furthermore, key FTV leaders made themselves available for extended periods during my visits and for subsequent teleconference conversations for semi-structured personal and group conversations as a support for my analysis and interpretation of observation data and to extend the study into the other research questions.

Context
As noted above, this research took place in one school from each of the broad settings in which FTV is situated: (i) remote pK-12 school, (ii) northern high school, and (iii) a large urban high school. To provide context for the findings of the study, each setting is described briefly below.

Great Northern Walleye School – Remote pK-12 School
Great Northern Walleye School is located on a First Nation in northern Saskatchewan. At the time of study, it served the needs of about 300 students from nursery to Grade 12 and

employed approximately 20 teachers along with a principal and vice-principal and several educational assistants. During my visit to the school, I observed several FTV-related data processes including: a classroom Observation and teacher-facilitator post-conference, two team Huddles, and a SCLT meeting. I also conducted several informal personal interviews with school leaders, classroom teachers and high school students.

Due to multiple factors including inclement weather and successive waves of COVID infections, I was able to visit Great Northern Walleye School only once. During my visit to the school, I audited an FTV classroom Observation along with a follow-up Post-Observation meeting, a Co-construction meeting, a data team meeting, a SCLT meeting, and a team Huddle. I also held informal semi-structured personal interviews with the FTV School-based Facilitator and three teachers. Furthermore, I had the privilege of observing two learning activities. The first engaged the oldest students in the school (they pulled in their fishing nets that morning and were learning how to identify the fish species that were caught, the traditional ways both to prepare the fish and cook them). The second involved the youngest students in the school – the Kindergarten students taught me about the patterns and shapes they observed in their natural environment … entirely in their community's traditional language! I understood very little of what they said but loved every minute! There was such a joy and enthusiasm in the classroom and the students were clearly proud not only to be learning their language but also to be sharing their learning with a "professor from the university".

North Star Collegiate – Northern High School
North Star Collegiate is located in a town of about 4,400 in north-central Saskatchewan. At the time of study, it offered educational programming to about 600 students from Grades 7-12 and employed 27 teachers, along with a principal, vice principal and an array of educational assistants, counsellors, and other support staff.

During my two visits to the school, I observed two staff meetings – I co-planned and co-facilitated the first one and facilitated the second one so that the administrator and FTV facilitator could participate in the learning, two FTV Co-construction meetings, and a team Huddle. I also met several times with members of the SCLT and conducted informal interviews with both the principal and school facilitator.

Great Plains Comprehensive School – Large Urban High School
Great Plains Comprehensive School is situated in one of Saskatchewan's large cities. At the time of study, 45 teachers, a principal and vice principal along with a wide array of support staff served approximately 700 students from Grade 9-12.

During my three visits to Great Plains Comprehensive School, I observed a Co-construction meeting; a staff meeting; three classroom Observation and post-conference sessions; two team Huddles; an SCLT meeting; and a noon hour student "clinic" convened weekly by administration, guidance counsellors, and tutorial teachers. I also held several informal interviews with various members of the SCLT – both onsite and via teleconference.

Phase II Findings

Generally, we would report our findings in light of the full conceptual framework guiding the study. However, while the factors *outside the school* are an interesting and critical aspect of the conceptual framework, the schools involved in this study have little to no control over them. In previous FTV-related research (Tunison & Wallin, 2020), we established that all of these factors exist in FTV and they certainly have an influence on the data-related processes followed not only by the schools under study but also the schools across the entire initiative. Consequently, we report Phase II findings according to the four factors *inside the school* we identified in our conceptual framework and that the schools do have control over. In other words, we interpreted our school-based observations and conversations through the lens of the conceptual framework to determine both the veracity of the framework itself as well as the extent to which the four *within school factors* were present in the three schools involved in this study.

School Data Culture

All three schools participating in this research have established rich data cultures that featured agentic theorizing, visibility walls, and collective responsibility both for holding each other accountable to improve but also for ensuring that students do not "fall through the cracks".

Agentic Theorizing

During the various meetings I attended at all three schools, participants clearly demonstrated their understanding of the importance of agentic language and strength-oriented theorizing through their sharing of student progress and the data collected in service of tracking student learning and teacher practice for the overall goal of improving outcomes for students.

For example, during a Co-construction meeting, teachers at Great Plains Comprehensive School engaged in an extended discussion about Indigenous students' tendency to struggle silently with learning tasks rather than ask their teacher or a fellow student for help. Each teacher shared a story about a student with whom they had recently been working but had had limited success to date. In every case, the story started with the personal and academic qualities that made the student unique and interesting as a person; then the teacher highlighted the student's strengths and abilities; next, they shared strategies they had been using in class to encourage student growth in areas not as strong – almost always focused on behaviours. Once each teacher shared, they engaged in an extended discussion about whether "quiet" and "solitary" was problematic. A majority of the co-construction participants initially equated being reserved or quiet with disengagement. While most teachers were excited to see students speak up more often, one colleague cautioned that there was nothing inherently wrong about being quiet and reserved as long as doing so did not harm students' learning opportunities. After a short conversation, most of the teachers began to look at this behaviour in a different light. One of them summed up the conversation with the comment, "maybe they just don't need help right now". Another theorized that "maybe students just aren't comfortable to ask for help … yet".

North Star Collegiate teachers, during the Co-construction meetings and Huddles I attended, consistently framed their efforts with their "persons of interest" as challenges for them to figure out rather than as shortcomings displayed by students. Teachers regularly displayed their concern for their students by their efforts to learn about students' personal lives and recognized the effect "complex" living situations tended to have on students' learning.

During a data team meeting at Great Northern Walleye School, it was revealed that each student's progress is tracked as both an individual and as part of the cohort of students at any particular grade. Significant efforts were expended to use the data as evidence of student strength/need. For example, students' schedules were regularly restructured for short periods of time to create flexible ability-level groupings based on student learning data to ensure that any missing skills and/or curriculum outcomes were taught and achieved. Rejigging was frequent enough that it appeared just to be the ways things were done at the school – no stigma appeared to be attached to the process by either students or teachers. Everyone who shared about the process – including students during informal hallway conversations – recognized the inherent value of the opportunity to learn critical concepts regardless of the overall grade level of the individuals in the room.

Visibility Walls
All three schools engaged in designing and populating visibility walls.

At Great Northern Walleye School, the school facilitator's office walls were filled with data displays. Generally, they were aggregate representations of metrics such as the number of students "on track to graduate this year" or the number of credits students at each grade level had earned so far in the year. The data were a significant source of pride for the staff and students in this school and I met several students who were proud to be represented in the data displays.

North Star Collegiate had two levels of visibility wall. In the public hallway, a range of student perception data over time were posted along with brief analyses of the data and a list of efforts the school staff was making in response to the data. In the school's conference room, which doubled as the FTV workroom, a broad range of longitudinal data were displayed for easy access. During appropriate meetings, I occasionally observed teachers referencing the data and highlighting progress they had made on particular measures.

Great Plains Comprehensive School was early in its visibility wall development. The school facilitator was in her first year in the role. She had begun creating a large, engaging display of what it means to be an FTV school. While no outcome data were reported, the display provided a significant public declaration of what students could expect from their experiences at the school. For example, according to the visibility wall, *being an FTV school means* … (i) that we make the school *work* for *all* students because teachers will build relationships with student and their families, celebrate culture and diversity and decolonize school [practices and routines]; (ii) listen to students' voices by analyzing OurSCHOOL and FTV student survey data and ask students to complete class exit slips for feedback about lessons and teaching strategies;

and (iii) find better ways to support students because teachers will share power with students and set goals of their own to make sure they get better at supporting students.

Collective Responsibility
Teachers and staff at all three schools used data to demonstrate collective responsibility for student success and, in some cases, to encourage each other to improve their professional practice.

For Great Northern Walleye School teachers, FTV observational data were a powerful means of holding each other accountable to be the best teacher they could be everyday. One teacher remarked, "I'm glad that we have FTV data because they give me ideas for how I can get better [and] I also like that they hold me accountable to everyone else to improve my students' learning."

The "middle years" team of teachers at North Star Collegiate were very clear about their collective responsibility to set students up for success in high school. While they tended to focus on behavioural issues rather than academics during their Co-construction meeting, they appeared to know each others' students very well and freely shared strategies for engaging individual students in their learning or for coaxing students to become more involved/engaged in the classroom.

Teachers at Great Plains Comprehensive School had three distinct elements of collective responsibility borne of the data they collected and reviewed. First, was a central repository of student-specific data housing what the staff call *records of adaptations* (RoAs). These RoAs are populated by classroom teachers as they employ and evaluate instructional and intervention strategies that they use with individual students along with descriptions of the extent to which those strategies "worked". Second was a weekly student "clinic" attended by resource and tutorial teachers, guidance counsellors, and administrators. In its central repository of records of adaptations, Great Plains Comprehensive School teachers tracked multiple sources of information about student progress. Students were added to the clinic discussion list once teachers have recorded multiple less-than-successful attempts to support students. The clinic team discussed school-wide responses to students' needs. In particular, they focused on ensuring that students who require extra academic support would be approached by a significant adult in the school and encouraged to register for a tutorial class. Tutorial teachers played a huge role in this process. They frequently approached the students to invite them to join their tutorial, followed up with classroom teachers and focused on helping students backfill whatever was necessary to further student success. During these "clinic" meetings, each student's needs were named and discussed, and a concrete plan for support was developed. The clinic participants also monitor students previously identified for support to ensure plans are being implemented and students are achieving more success. The third effort to accept collective responsibility for student success took place during a staff meeting. The session was led by an administrator and was focused on ensuring that student records were up to date and accurate. Each homeroom teacher was provided with a list of their students and the school-based record of credits they had earned. Teachers were expected to cross-reference each

student's record against an official "list" of students' credits drawn from the "official" ministry database to ensure accuracy and minimize the possibility that a student might inadvertently register in a course for which they did not have the prerequisites or that they had already completed.

Data Use Procedures

As noted earlier, a school's data culture is defined by the procedures used in the school for engaging with data. I looked for evidence in each school that, once data have been collected, leaders actively pursue discussions in service of identifying and/or finding the data and engaging staff in making sense of the data, identifying effective responses to them, and monitoring those responses to ensure that things are improving.

I observed leaders in all three schools communicating clear expectations for data use. In each school, leaders facilitated group and individual processes to ensure that the procedures expected by both the FTV initiative and by their school districts were followed. Individuals in each school also noted that, while they knew where the data were housed, and valued the potential of the data to inform school practices, some data (especially aggregate perceptual data) remained largely underexamined. The reasons for this were varied. But two primary issues emerged. Firstly, leaders uniformly cited time as a major barrier to greater engagement with data. Secondly, leaders tended to be tentative in their understanding of data – especially aggregate data supplied/facilitated by FTV. On the other hand, they tended to be more confident in discussing data related to individual teachers and/or students; thus, it appeared that these data were put to greater use overall.

Generally, it appeared that, although data do play a role in FTV's schools, teachers and leaders alike continue to struggle with data conceptualization, interpretation, and mobilization. Universally, teachers are well aware that they are expected to use data to inform their work and, without exception, they were able to point to data that they felt they were using effectively. However, the data they cite as evidence of effect tend to be either too generic or too vague to be useful as signposts against which to assess progress.

For example, data cited as evidence of progress on North Star Collegiate teachers' leading indicator professional goal sheets a wide range of data. At one end of the data quality spectrum, educators cited generic data such as "exit slips", "more students will do their homework", "more students should be involved in class discussions", "students will be more independent with learning tasks" to indicate that they had been successful in their efforts to change practice. While each of these sources of evidence could be refined to provide specific data that might yield concrete evidence of teaching effectiveness, the statements, as framed in these documents, merely hint at data. At the other end of the data spectrum, other teachers displayed rather sophisticated data conceptualizations such as looking for "evidence that the formative feedback provided on students work influenced their subsequent submissions" or "students' demonstration of growth through their willingness to share their work with others".

A small group of teachers from Great Plains Comprehensive School continued to meet with me regularly following my last visit to their school. They expressed interest in "going more deeply" into data-related practice as they seek to transform their practice and I was only too happy to support their learning. Over a short period of time, I witnessed a growing sophistication in their conceptualizations of data and the ways in which data could be used to inform practice. Of particular interest to these teachers was to "share power" with students through a greater role afforded to student voice when planning lessons and providing options for students to demonstrate their learning; so, they actively explored with me and each other strategies to elicit student feedback and means they could use to analyse and mobilise what their students were telling them.

Advocacy for Data Use
At all three schools, leaders and teachers alike regularly mentioned that data are important sources of information to guide practice. They tended to remind each other to "go back to the data" to decide how they should proceed. The principal at Great Northern Walleye School proudly described the following scenario as evidence not only of the importance of using data to inform practice but also that data, if used judiciously, can help make important changes. Great Northern Walleye School uses "incident reports" to track aspects of student (mis)behaviour – teachers fill them out and pass them on to the school administrators for follow up. The principal noted that, when he started (about four years ago) in the school as principal, teachers wrote up literally thousands of incident reports over the course of a school year. He mentioned that, at one time, an entire shelf in his office was devoted exclusively to housing binders filled with these reports. He decided to engage teachers in conversation about the forms and encourage them to find positive ways to address student behaviours in class rather than exclude the students from class for a period of time while administrators caught up with the incident, investigated it, and decided what to do. Over the course of the four years the principal had been in place, his efforts to engage teachers positively in data conversations successfully reduced incident reports by over 90 per cent! He mentioned that he now has only one half-empty binder on the shelf that used to be full with such reports.

The staff meeting at Great Plains Comprehensive School, cited earlier in this report, was another strong leadership advocacy of using data to improve outcomes. The fact that nearly 90 minutes of valuable staff learning time was devoted to engaging in discussion and review of student credit completion data spoke volumes to teachers and staff alike. Not only did the process model effective use of data for a particular purpose, but also, it served to engage literally everyone in the room in meaningful data inquiries.

The principal at North Star Collegiate retains some teaching responsibilities. When it was her turn to speak during a Co-construction meeting, she shared her goals and the data she was using to inform her practice just like everyone else. She modelled authentic reflective practice and telegraphed to her fellow staff members that she was learning too. Later on, during a staff meeting at the school, she actually turned over facilitation of the staff meeting to me and told the staff that she wanted to learn more about data-related practices as well so she had asked me to facilitate … again demonstrating a clear commitment to using data more effectively.

Intended Outcomes

Intended outcomes, in the form of improved student learning, organizational change/learning and change in practice, are at the centre of data-informed practice as well as at the centre of this study's conceptual framework. Leaders and staff at all three schools were clear about intended outcomes for the long-term (e.g., transitioning from one grade to another, achieving good grades, graduating from high school); but, they tended to be less clear about short-term outcomes – especially for their own professional growth. Outcome statements for professional growth tended to be generic and/or focused on what they would ask students to do differently rather than on what they, themselves, would commit to change.

Conversations with leaders and teachers at all three schools reinforced my perception that, without exception, these professionals were committed to do whatever they could in support of student learning. With its relentless focus on goal setting, monitoring progress, and adjusting course when necessary, FTV was helping them focus their improvement efforts in many respects.

Leaders in all three schools mentioned that they would like to be doing more with the data but time and, to a degree, skillset limited their work in this area. One of the school leaders stated, "You would think that setting goals based on data would be easy but it isn't. I think the [FTV] initiative assumes that we know how but it is harder than it looks."

Conclusions

This research was a privilege. Staff at all three participating schools welcomed me warmly and enthusiastically included me in their work – despite the fact that they are very busy themselves. In fact, there were times when leaders and their colleagues were rather more candid than I expected them to be. The participating schools were identified because they are experiencing success in their efforts to improve outcomes for students in general and for Indigenous students in particular. One might expect that these schools were happy to share their successes – and they were! But, they also freely shared their struggles and questions. They appreciated having been identified as being successful but acknowledged that they still had plenty to figure out on their improvement journeys.

I will conclude with the following quotation from a teacher at North Star Collegiate, "We, as teachers, get to decide what takes place in our classrooms, we can control the activities to make sure that students get what they need. When we're stressed, we resort to 'old ways' – changing takes time and is hard work."

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Appendix

Evidence Table for Data-Informed Leadership and Instructional Practices in K-12 Schools

No.	Author/Study Title	Aim/Purpose	Methodology	Type of Data Used & Data Effectiveness	Data-Based Instructional Practices	Data-Based Leadership Practices	Facilitators/Barriers to Data-Informed Practices (DIP)
1	Curry et al. (2016). Getting assessment right at the classroom level.	To gain a better understanding of a district-wide, teacher-centred approach to data use.	i. Qualitative case study design in a suburban public school district in the Midwest. ii. Purposive sampling and self-determination theory. Participants were elementary school classrooms and grades 2-4 teachers, building leaders, and curriculum specialists. iii. Conducted interviews, observations, document analysis, and made field notes.	Formative data: e.g., daily observations, anecdotal notes and records resulting from daily practice.	i. Assess students while lessons are ongoing and adjust lessons. ii. Engage students in goal setting/revision and developing new strategies for effective learning. iii. Build relationships with other teachers and share skills/knowledge. iv. Share students' data and learning outcomes with parents and invite their support. v. Mentorship in data use practice among teachers.	i. District leaders built common schedules to help teachers meet and discuss. ii. To plan monthly 2hr meetings for teachers to discuss students' progress data collected in the previous month. iii. Administrators trusted teachers to create their own data. iv. Promoted collaborative data use practices. v. Curriculum/reading nights event for teachers and parents to deliberate on data use.	i. When teachers collaborate, have autonomy and competence to generate and use data, it facilitates data-informed leadership. ii. District-level structural and normative support. iii. Presence of a standard frame of assessment.
2	Datnow, A. (2011). Collaboration and contrived collegiality.	To explore teacher collaboration in the current educational reform on data-driven decision making (DDDM) in schools in Texas and California, USA.	i. Qualitative study design. ii. A case study in urban schools across the US. iii. Purposive sampling to select the two districts and schools. About 50 Participants; district admins (3), school admins (3) teachers from	i. Systemwide interim assessments. ii. A range of assessments (e.g., homework, quizzes, etc.) of student learning for formative purposes.	i. Collaborative dialogue and knowledge sharing on data use. ii. Build relationships and engage in data-use discussions and decide actions or strategies to implement for success. iii. They share ideas, lessons, and techniques.	i. School/district leaders encourage teachers to use different data types. ii. Invested in web-based information systems to store data for easy access. iii. Used staff at the system level to support teachers in managing and using data. iv. Emphasized the	i. Some teachers had challenges in understanding the data and how to navigate the information management system. ii. Teachers were overburdened with too many changes. iii. Lack of skills on how to translate data to action plans.

			various grades participated. iv. Data gathered through interviews, focus groups, observations, workshops, and documentary analysis.			need to use data to inform practice. v. Provided time for bi-weekly collaborative meetings among teachers. vi. Build trust and positive orientation in their teachers about data use.	
3	Davin et al. (2014). Converting data to Knowledge.	i. To examine how proficiency scores were used in conjunction with other sources of data. ii. To inform programmatic decisions in one of the largest urban public school districts in the United States.	i. Survey Monkey with pre-and-post assessment questionnaires. ii. About 154 foreign language teachers participated in the pre-test. iii. Also, 3,881 students in grades 7–12 participated in reading, writing, and speaking proficiency assessment tests. iv. About 120 teachers participated in the post-assessment survey. v. Data were analyzed using descriptive statistics.	Teachers used the following data forms: i. Created own data (52%). ii. Used the assessments from textbook series (30%). iii. Used standardized assessment (12%). iv. Did not give any assessments (5%)	Multiple data collection and analysis methods were used to identify learning outcomes and their influencing factors.	i. For school planning. ii. To make decisions on school programs.	i. School district organizational structure, lack of sufficient resources, and a change in leadership can affect data usage in schools. ii. There was a lack of a better placement strategy in the district. iii. Working with a large data set "is quite complex and requires substantial time, funding, knowledge of existing research, and data use skills" (p. 257). iv. For effective data usage, district-level officials need to be involved and collaborate with school-level leaders.
4	Ezzani, M. (2015). Coherent district reform: A case study of two California school Districts.	To understand how districts implement data-driven decision making to enhance student achievement.	i. Qualitative case study design. ii. Data were obtained from two California K-12 urban school districts (Buck Unified School District (BUSD) and	Varied data forms: i. classroom data ii. assessment data iii. summative grade-level data iv. district benchmark tests results.	i. "Teams" of teachers empowered to lead the improvement process at their schools through ongoing collaboration,	i. District and school leaders created events to develop relationships with teachers. ii. Promoted capacity building of school leaders in data use, analysis, and	i. Collaboration between district-level leaders, school leaders, and teachers enhance DIP. ii. Coordination and monitoring to support DIP practices - "what

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			D'Angelo Unified School District (DUSD)). iii. An elementary, middle, and high school were selected in each of the districts. Purposive sampling was used. iv. Semi-structured interviews, observations, and artifact analysis were used to gather data. v. District superintendents, school principals, and teachers were involved. vi. Knapp et al.'s (2006) data-informed leadership framework guided data analysis.		learning, and engagement in DDDM" (p. 8). ii. Collaboration – Principals, teachers, and students engaged in unconventional leadership roles. iii. New maths curriculum training which emphasized lesson design, pacing, and planning (instruction and assessment embedded). iv. Teachers meet periodically to discuss and share ideas and best practices on how to engage with student data.	facilitation to guide teachers in DDDM practices. iii. Year-long training workshop for leadership skills acquisition among principals. iv. Enhanced school-community relationship and support through media communication (monthly videos, monthly principal professional development sessions).	gets monitored, gets done" (p. 9). iii. Professional learning - formal district and school training; use of outside consultants; workshops outside of the district; peer mentoring; and coaching. iv. Leadership structure, professional development training, resource mobilization, and systematic coordination are key to DDDM. v. To enhance DDDM, schools and district leaders must invest resources to develop an integrated state data system, develop web-based guidelines for best practices, and invest in the human capacity to use data.
5	Reeves et al. (2016). Examining the landscape of teacher learning for data use: The case of Illinois.	i. To examine Illinois public teacher data use practices. ii. To examine how leadership and teacher beliefs influence data use practices.	i. Used an online survey method. ii. Participants included 329 teachers from 71 schools across at least 54 districts. The elementary level (grades K-5) had 102 teachers. Middle school level (grades 6–8) had 141 teachers, and High school level (grades 9–12) had 72 teachers.	Assessment data	Teachers use data for the following reasons: i. Determine students' level of achievement after instruction. ii. Identify next steps for instruction (e.g., move on and reteach). iii. Identify patterns in student thinking (e.g., errors and/or misconceptions).	School leadership who promotes data use culture enhances teachers' data use practices. For example, Offering in-service workshops on assessment, and data-driven decision making establish professional learning communities,	**Factors influencing data use practice:** i. Organization context and leadership – higher data use by school leadership leads to higher data use practices. ii. Assessment beliefs – assessment informs teaching.

			iii. Descriptive statistical analyses were performed.		iv. Evaluate the effectiveness of one's instruction (e.g., lessons and/or units). v. Modify instruction or lesson plans for current students. **Note:** Teachers took either undergraduate or graduate courses in data use practices.	data teams, and data coaching activities.	iii. Data use self-beliefs – one's ability to apply data to practice will lead to higher data use. iv. Receiving data use training or coaching promotes data use among teachers.
6	Beaver, J. K., & Weinbaum, E. H. (2015). State test data and school improvement Efforts.	To examine how schools use state assessments test data to drive improvement efforts in Pennsylvania, USA.	i. A qualitative case study design. ii. Data was gathered from 11 elementary and 9 secondary schools. iii. About 97 interviews with principals, administrators, and teachers were conducted. iv. A performance-based accountability theory - "No Child Left Behind" was used as a conceptual framework in the study.	State-mandated accountability assessment data (i.e., state test data for school improvement). **Data Usefulness** i. Teachers perceived school-generated data to be more useful than the state test data, as the latter is a single measure test and didn't measure students' progress over time. ii. Students didn't take the test seriously because it had less impact on them. iii. State test data did not provide new information about students.	How schools/teachers use state test data: i. To guide school-level test prep. ii. To develop benchmark exams or interim assessment plans. iii. To develop data teams for future data use practices. iv. To track student performance. v. To help teachers readjust instruction time for non-tested subjects, e.g., social studies and physical education. vi. To identify students needing extra attention or remediation vii. To design test-taking preps or skills.	School leaders use state test data to: i. design school-wide improvement actions (e.g., "aligning the curriculum to the state test, limiting instruction in non-tested subjects, or providing professional development for teachers" (p. 489)). ii. identify gaps in the curriculum. iii. provide professional development for teachers. iv. improve reading and math courses. **Note**: Unlike teachers, school administrators saw much utility in the state test data, as it was more useful for programmatic decisions than for instructional changes (p. 497).	**Challenges** Schools and teachers having trouble translating the state test or assessment data into actionable activities.

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7	Farley-Ripple, E., & Buttram, J. (2015). The development of capacity for data use: The role of teacher networks in an elementary school.	To explore the development of data use capacity in an elementary school through a social network approach.	i. A case study survey method ii. Data from 42 elementary schools (K-5) educators in two districts in the mid-Atlantic state, USA. iii. Descriptive statistics through SPSS and social network analysis (based on social network theory) were used to analyze data.	Used a variety of data types (though not explicitly stated).	Teachers use data to set short-term goals for the student.	School principal used data: i. for hiring teachers and instructional specialist (e.g., literacy, maths, and reading coaches). ii. to allocate time for teacher collaboration and professional development. iii. To identify and support struggling teachers and students. **Note:** Leadership should not be limited to school administrators alone, but must include instructional specialists.	i. Social networks, relationships, and collaborations appeared strong as a factor influencing data use practices. ii. "Strong instructional leadership, structures that support data use, and a school culture reflecting professional community" are crucial for data use (p. 24).
8	Datnow, A., Park, V., & Kennedy-Lewis, B. (2012). High school teachers' use of data to inform instruction.	To examine how high school teachers use data to inform instructional decisions.	i. A qualitative case study design was used. ii. Data was gathered in 4 public secondary schools in the US. iii. Interviews (n=50) were conducted in schools among principals, teachers, and central offices' admins in charge of assessment and evaluation. iv. Observations were also conducted at schools. v. Focus groups (n=6) were held with teachers, and documentary materials were collected.	i. Mid-quarter benchmark assessment data. ii. Teacher-created tests iii. State assessment reports. iv. Interim, weekly tests. v. Formative assessment data. **Note:** Teachers valued their own created tests more than state tests.	i. To guide instructions ii. To modify instructions and action planning. iii. Teachers use benchmark assessment data to assess students' progress. iv. To reflect on their teaching practices. v. Use "action walks" to observe and learn from their colleagues' teaching strategies. vi. To reteach some lessons based on student assessment data.	School leaders used data to allocate time for teacher collaboration and learning on data use practices.	**Barriers to data use** i. Difficulties navigating data use technology systems. ii. Not able to make sense of the data/reports. iii. Having too many data types to work on exasperated teachers. **Facilitators** i. Effective leadership. ii. Team building. iii. Relationships - teacher-teacher & teacher-student collaborations are crucial to data use.

						iv. Teachers having the freedom to share best practices and innovate new ideas.
9	Means, B., Chen, E., DeBarger, A., & Padilla, C. (2011). Teachers' ability to use data to inform instruction: Challenges and supports.	To understand teachers' proficiencies and difficulties in data use and its' implications for teacher preparation and training.	i. Exploratory case study. ii. Interviews were administered to 50 individual teachers and 72 small groups of educators from 21 elementary schools and 14 middle schools.	i. Teachers responded to a set of scenarios involving hypothetical student data. ii. To develop the data scenario, the research team assembled a group of internal and external experts in assessment and data-driven decision making. iii. Teachers were asked to locate data in complex tables and graphs.	i. To make instructional decisions. ii. To plan differentiated instruction based on student needs. iii. Synthesizing multiple data sources to inform instructional practices iv. Teachers use actionable data to adjust their teaching practice in ways that enhance student learning.	To allocate professional development time to data-driven decision making.	**Barriers:** i. Some teachers struggled to make sense of the data. "If teachers are going to make decisions based on data, they need not only to be able to find the desired data in a complex table, graph, or system interface but also to make sense of the data display" (p. 24). ii. Teachers struggled with how to develop diagnostic assessments for their class.
10	Farrell, C. C. (2015). Designing school systems to encourage data use and instructional improvement: A comparison of school districts and charter management organizations.	i. To understand what organizational factors shape data-use efforts. ii. To understand how these factors enable or constrain educators' use of data for instructional improvement.	i. Exploratory research. ii. Qualitative comparative case study. iii. Data was collected from 6 secondary schools in 2 districts and 2 Charter Management Organizations (CMOs) during the 2010-2011 school year. iv. Semi-structured interviews, focus groups, document analysis, and observations. v. Over 70 interviews were conducted with	Educators used multiple sources of data for instructional improvement: i. High-stakes, state assessment data. ii. Classroom data (student essays, readers'/writers' notebooks,and documented conversations with students). iii. College-ready indicators such as PSATs, SATs, and ACTs.	i. To measure student achievement. ii. To focus instruction on "power standards" (p. 450). iii. To provide immediate feedback concerning students' understanding of a concept. iv. To allow an instructor to adjust teaching and reteach when necessary. v. For college preparation "CMO teachers reported using data from the PSATs and SATs, along	i. For student placement: "Administrators in District A used state assessment results for classroom assignment and student scheduling, placing students who scored far below basic or below basic in double periods of resource classes, whereas students who scored proficient or advanced were placed in Honors classes" (p. 451). ii. For expansion	**Barriers:** i. Educators may not have the knowledge and skills to identify questions, select appropriate metrics, analyze results, and create actionable solutions. ii. Structure. "Hierarchical, centralized structure limited collaborative structures between sites around data and instruction" (p. 455).

#	Citation	Purpose	Methods	Data Sources	Findings		Facilitators
			teachers and school and system leaders.		with knowledge of students' reading levels, to weave appropriate high-frequency SAT vocabulary into their lessons" (p. 450).	"One leader felt the current charter landscape was "crowded," and their authorizer, the local school district, may be less likely to grant charters to new schools in the future. High scores on the state assessment would provide evidence to "prove the success" of the model and support the case for future replication" (p. 452). iii. Marketing and Community Accountability. "Data displays of college-ready metrics established the CMOs' "reputations" and were included in recruitment materials, the organizational websites, and as part of the parent/student handbooks" (p. 453).	iii. Financial resources (Overall constraint for resource mobilization). **Facilitators** i. Human capital. ii. Technology & tools. iii. Processes & practices. iv. Reserved time for in-school data analysis. v. Cross-network collaboration to collectively analyze data and share instructional strategies.
11	Barmore, J. M. (2018). Journey from data into instruction: How teacher teams engage in data-driven inquiry.	To unpack the cognitive and social processes by which teacher teams gain knowledge from assessment data and then use such knowledge to shape instruction.	i. Exploratory study. ii. Qualitative case studies. iii. Data collected from three teacher teams from one urban school district. iv. Participants were 13 female teachers. v. Data was gathered through interviews with	i. Used multiple data sources including running records, concepts of print, sight word inventories, and student essays to diagnose student learning challenges. ii. District-administered assessment results.	i. **The Honeycomb kindergarten team** used multiple assessment data sources to focus on reading skills development. ii. Student performance data were also collected in excel spreadsheet with the same color coding for		**Facilitators** i. Teachers' depth of knowledge about data. ii. Their beliefs on data relevance and students' ability to learn. iii. Teachers' collaboration and team learning

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			teachers and observation of teacher team inquiry cycle meetings (n=33). Each team was treated as a case.		each student in rows to track students' learning challenges. iii. Students' reading video data were analyzed to identify their reading strategies, mistakes, and ways to overcome them.		iv. Teachers' expectations about student learning is a crucial facilitator of data use among teachers. **Barriers to data use** i. Lack of knowledge on how to collect and organize data. ii. Difficulties in data interpretation. iii. Limited knowledge of content and assessment (i.e., no focus on what to monitor). iv. Low expectations of student performance.
12	Simpson, G. H. (2011). School leaders' use of data-driven decision-making for school improvement: A study of promising practices in two California charter schools.	To investigate promising practices specific to school leaders' use of data-driven decision-making for school improvement at two California charter schools.	i. Qualitative case-study. ii. Multi-site case study: Coastal Academy (K-8), Synergy Academy Charter (K-5) and Synergy Kinetic Academy (6-8). iii. Interviews (school principals, other administrators, teacher leaders). iv. Review of archival documents. v. Observation of professional development meetings related to the use of data to influence teaching and promote student achievement.	i. Measures of Academic Progress (MAP). ii. Reading Plus iii. Lexia iv. Saxon Math v. Teacher made assessments connected to State Standards vi. Formative assessment (student portfolios, group projects, journaling, and enrichment games). vii. STAR testing **Evidence of Impact** All stakeholders felt strongly that data-driven decision-making had a positive impact on students based on two	i. To customize the instructional program for each child. ii. To develop strategies to help the child strengthen their learning weaknesses. iii. The greatest impact of using data-driven decision making was on results of high student achievement and on the improvement of teaching strategies to meet student needs. iv. To evaluate academic growth. v. To determine student comprehension levels. vi. To evaluate	i. To make decisions regarding personnel, intervention, discipline, and curriculum. ii. To make informed decisions related to planning and school improvement. iii. To plan professional development sessions.	**Facilitators:** i. Professional development ii. Budget iii. Time (Time was defined as the participation by teachers and staff to look at reports, analyze data results, ask questions, and have conversations about how data affects each child (p. 77)). **Challenges:** i. A challenge cited by the school principal was how to convince the public that data-driven decision-making was not teaching to the test, an added teacher duty, or a

#	Citation	Purpose	Methodology	Data sources/types	Data use	Leadership	Barriers
			vi. The units of analysis for this study were strategies used by the school leaders at each charter school to bring about effective data-driven decision making.	sources of student outcome data: i. High test score results of 860 on the 2010 California Academic Performance Index (API), and 2) Most students were proficient or above in English or language arts 69.1% and mathematics state standards 65.9% (CDE, Accountability Progress Report, 2010).	standards based math proficiency. vii. Helps the teacher create a positive connection with parents and takes the "Drama out of parent conferences because data provides us something quantitative to look at and I can show parents specifically where and how their child is succeeding or struggling" (Teacher Leader III, interview, September 27, 2010). (p. 67)		way to get rid of personnel. ii. For teachers, the greatest challenge was finding an assessment that would pinpoint the learning needs of some children.
13	Burrows, D. C. (2011). Teacher use of data to guide instructional practice in elementary schools.	To provide a descriptive picture of the extent and manner in which elementary school teachers utilize data to guide educational practices and instructional decisions.	i. Descriptive cross-sectional survey design. ii. Data obtained from 15 elementary schools with a sample population of 262 participants. iii. Used a random sampling framework. iv. Data analyzed using descriptive statistics.	Teachers used multiple data sources or types: i. 70% of student learning data (tests, authentic assessments, grades, teacher observations). ii. School processed data (administrative data). iii. National Assessment data. iv. School demographic data (were less used by teachers).	i. To determine student mastery of material. ii. To determine lesson effectiveness. iii. To motivate student learning outcomes **Data use practices** i. Collaboration with professional colleagues to use data- 70%. ii. Teacher data use practices were informal. **How Data is used to influence Practice** i. Provide individualized instructions-85%. ii. Revise teaching styles - 74%. iii. Allocate more time to some lessons - 85%.	i. Limited leadership approaches to data use (no systematic school policy on data use). ii. Common mode of access to data was computer printouts.	**Barriers to Data Use** i. Lack of time to focus on data. ii. Inadequate opportunities for professional collaboration on data use.

				iv. Contact parents of some students - 80%.		
14	Nabaa-McKinney, B. (2019). Impact of data-driven instruction and the use of data walls on reading and mathematics achievement.	To examine the impact of data-driven instruction, and the use of data walls have on reading and mathematics achievement.	i. Mixed-method cohort study. ii. The cohort model enabled the researcher to conduct a longitudinal study over two academic school years iii. Two groups (**Cohort 1: students in** grades 2-8 in 2016-2017 academic session - whose teachers had not been introduced to data-driven instruction and the use of data walls, **Cohort 2:** students in grades 2-8 in 2017-2018 academic session students had teachers who were introduced). iv. Total sample student population was 168. v. A collection of data from ITBS, Star360, focus groups, principal, and teacher surveys. **Qualitative measures:** **vi.** Two separate focus groups with teachers, an open-ended question on the principal survey. **Quantitative measures:** vii. Student achievement data and Likert scale principal and teacher surveys.	i. School's annual standardized assessment. ii. Interim assessment results. iii. The Star360 assessment. iv. The Iowa Test of Basic Skills (ITBS).	i. To gain better insight into student performance. ii. To differentiate learning. iii. To adjust instruction.	School-wide improvement.	**Barriers:** i. Time ii. Location of data wall iii. Accessibility iv. Training **Facilitators:** i. Collaboration and teamwork. ii. Leadership support.

15	Chandler, H. M. (2020). The effects of data-driven instructional leadership on student achievement.	To examine the outcomes of data-driven instructional leadership practices on student reading and math achievement within the context of social cognitive theory.	i. A quantitative, causal-comparative study. ii. Compares schools that use data-driven instructional practices vs. schools that do not. iii. 81 elementary and middle schools participated. Control group (n=42 schools), treatment group (n=39 schools). iv. Used the Partnership for Assessment of Readiness for College and Careers (PARCC) assessment.	i. Used reading and math scores from the Partnership for Assessment of Readiness for College and Careers (PARCC) Assessment. *Dependable variable = reading and math scores. *Independable variable = instructional leadership practices.		i. To create time for collaboration. ii. To plan trainings and professional developments programs. *Results provide evidence that leadership has a positive impact on data-driven practices and students' math and reading scores.	i. Good leadership creates a collaborative environment for teaching and learning. ii. Train leaders with skills in data-driven practices.
16	Henry, S. S. (2011). Principals' use of assessment data to drive student academic achievement.	To examine how secondary school principals use summative and formative assessment data to improve student academic achievement.	i. Used a sequential qualitative-quantitative mixed-methods design. ii. Qualitative data gathered with an initial interview with a high school principal and analysed thematically. iii. Quantitative data collected with a survey questionnaire (n=68). iv. Third phase collected qualitative interview data from the 69 participants.	i. Formative data. ii. Summative data	Teachers place a higher value on formative data than summative data. i. Indicator of student learning. ii. To determine programmatic changes. iii. To provide a picture of success. iv. To improve curriculum content. v. To improve instructional practice. vi. Powerful sources of information for teachers and department leaders.	Principals felt more prepared to use summative data. Principals use summative data: i. To examine performance by subgroups of students. ii. To examine performance by subject. iii. To evaluate program effectiveness. iv. To identify areas that need improvement. v. To communicate to stakeholders. vi. To guide school resource allocation.	For formative data to be useful teaching staff must be involved in its generation **Barriers to data use** i. Time availability. ii. Pressure from accountability system. **Facilitators** i. Data availability. ii. Staff knowledge of assessment data. iii. Technological literacy. iv. School collaborative culture.
17	James-Johnson, A. (2019). Exploring teachers' intention to	To identify, analyze, and address issues concerning math	i. Mixed methods action research case study approach.	Student assessment or achievement data.	i. To improve content delivery.	i. To plan for and improve instructional practices.	**Barrier to data use** i. Teachers' perceptions of hierarchical roles can

	use data to inform instruction.	teachers' beliefs regarding and intentions to use data to inform instructional practices.	ii. Data collected using interviews, observations, and a survey among 8 teachers at Thomas High School. iii. Data was analyzed and interpreted using Theory of Plan Behaviour.		ii. To enhance creative instructional processes. iii. To promote collaborative instructional support. iv. To help teachers innovate new instructional models.	**Note**: Reviewing data with school administrators was less helpful for teachers compared to working with their peers.	affect use of data for instruction. ii. Limited time for data use practices. iii. Lack of training and data use skills.
18	Loete, C. K. (2014). Data collection and progress monitoring in special education: Factors that influence the use of data.	i. To examine teachers' perceptions about progress monitoring. ii. To identify barriers to using data to inform instructional practices. iii. To offer suggestions for effective data use practices.	i. A Mixed-methods, non-experimental research design. ii. Used surveys (n=163) for quantitative data. iii. Used interviews with 15 special educators and 8 administrators for qualitative data.	**Types of data mostly collected** i. Academic data. ii. Student behaviour data. iii. Standardized assessment data.	i. To identify student's skill gaps. ii. To inform curriculum changes. iii. To identify innovative practices. iv. To develop behavior plans. v. To guide student's placement.	i. To provide training opportunities for teacher capacity building (e.g., district-wide trainings, school site trainings, school-zone level training. **Promoting data use** -requires more practical training -time allocation for teacher meeting and collaboration.	**Barriers** i. Time limitation. ii. Resource limitation. iii. Lack of training iv. Lack of knowledge about data collection and analysis processes. v. Lack of leadership guidance on data use. vi. Lack of confidence to use data.
19	McClain, L. (2016). A case study of the impact of teacher data usage on instructional practice.	i. To evaluate how third grade teachers utilize benchmark assessment data in measuring the academic growth of at-risk students and creating appropriate instructional decisions to foster academic achievement in Halifax County Schools.	i. A qualitative case study design. ii. Data gathered using interviews and observations from 9 third grade teachers, 3 instructional coaches, and 5 school admins. from five elementary schools.	i. Standard reading passage. ii. Weekly common formative assessments. iii. Quarterly benchmarks.	**Data use practices** i. Data team meetings to learn and share ideas and strategies about data use. ii. Teachers conducted weekly assessments and used the data to identify students with learning needs. iii. They use data to inform instructional delivery (e.g., reteaching some lessons, using student peer teaching,	i. Principals had high expectations and provided space for data use learning Note: principals and coaches played active roles in data use learning communities (p. 68).	**Barriers to data use** i. "Teachers did not have full ownership of their data even though they also had access to the reports" ii. Limited time to learn and engage with data use practices.

					group students based on their performance, etc.). iv. Instructional coaches supported teachers in data analysis, lesson planning-based student needs, and co-teaching.		
20	Moriarty, T. W. (2013). Data-driven decision making: Teachers' use of data in the classroom.	To gain a deeper understanding of how classroom teachers engaged in data-driven decision making.	i. A qualitative case study design. ii. Data gathered from 2 elementary schools in San Diego County, USA. iii. Conducted interviews (n=13), observations, and document analysis. iv. Teachers, principals, and superintendents participated.	**Data Types** i. Formal assessment results. ii. Benchmark assessment results. iii. Informal assessments. iv. Homework. v. Classroom assignments. vi. Teacher logs.	**Ways data are used** i. For lesson and curriculum planning (what to cover). ii. To evaluate lessons and student learning process. iii. To identify and group students based on their learning needs. iv. To guide instructional decision making and strategies. v. To determine students' in-the-moment learning outcomes.	**i.** To plan and build teachers' capacity for data use.	i. Teachers' capacity to use data influence their data use practices (e.g., ability to generate data, to understand data, use it to guide practice). ii. Data use practices depend on the nature of the data (i.e., periodic data vs. real-time data). iii. Teacher autonomy in data use practices.
21	Brown, C., & Zhang, D. (2017). How can school leaders establish evidence-informed schools: An analysis of the effectiveness of potential school policy levers.	i. To examine the notion of evidence-informed practice and its benefits. ii. To examine four distinct but overlapping and interdependent factors that school leaders need to consider if they wish to establish evidence-informed practice.	i. Quantitative Methodology. ii. Survey iii. 79 primary schools (School leaders and teachers), 797 responses.	i. Survey ii. Additional questions to examine key overarching factors such as trust and the strength of interpersonal relationships within schools. iii. Cause and effect type variables. iv. Data mining approach.	i. To improve teaching practice. ii. To stimulate conversation/dialogue around an issue. iii. To inform staff about potential improvement strategies.	i. For developing school improvement strategies. ii. For planning staff engagement and professional development.	<u>**Facilitators:**</u> i. **Leadership:** school leaders should engage in acts of transformative leadership which encourages staff to participate. ii. **Enabling environment:** an environment where teachers are encouraged and where concrete effort is made to support them.

						iii. **Time**: school leaders free up time within the school day to enable teachers to spend quality time engaging with evidence or in action research activity; ensure the school timetable facilitates collaboration between teachers. iv. **Receptiveness:** the receptiveness of teaching staff to new ideas.
22	Marsh, J., & Farrell, C. (2013). How leaders can support teachers with data-driven decision making.	To present the practices and artifacts employed in data use capacity building interventions (CBIs), challenges to their enactment, and conditions that appear to mediate the CBIs.	i. A qualitative comparative case study. ii. Data gathered from six low income, secondary schools in four districts in the USA. iii. Data were collected using interviews with district leaders (n=13); school administrators, CBI leads, and case study teachers (n=79). iv. Focus groups (n=6) with non-case study teachers (n=24). v. Observations (n=20). vi. Document analysis. vii. NVivo software was used to guide data analysis based on sociocultural learning theory.	Assessment results	**Teachers' data use practices** i. One-on-one coaching on instructional content, curricular, and data analysis. ii. Group meetings to analyze assessment results and plan instructional responses. iii. Assessing teacher needs to create specific goals for their data-use on termly basis. iv. Modeling data use. Thus, explain and demonstrate ways to interpret, respond to, and act on data. v. Analyzing students' work and provide expertise and feedback.	**Leadership on data use** **i.** To create environments for dialogue, discussion, and questioning. ii. To provide training and data use strategies. iii. To provide teachers with conceptual tools (e.g., a framework for thinking about the data-use cycle) and practical tools (e.g., a worksheet for recording analysis).	**Facilitators** i. Intrapersonal (e.g., prior understandings about data use and content knowledge, personal values, experiences, and expectations). ii. Interpersonal (e.g., trust) iii. Structure iv. Organizational and environmental factors (e.g., strong district and school leadership, ongoing professional development and allocating dedicated time for data analysis/use).
23.	Starkey, L., & Eppel, E. (2017). Digital data in	i. To examine the types of data available in New	i. Both qualitative and quantitative methods.	i. Student achievement data.	i. To evaluate and inform teaching practice.	i. For accountability purposes, strategic	**Challenges:**

	New Zealand schools: Policy reform and school leadership.	Zealand schools, how they are used and how principals, as leaders in these self-managing schools, would like to be able to use the data. ii. To explore the influence that national policy has on the use of data, on power relations between schools and the national policymakers, and on challenges faced by schools.	ii. The interpretive case study method. iii. The unit of analysis within this study was the school. iv. 16 schools: The sample included 4 secondary schools, 2 composite schools and 10 primary schools across New Zealand. v. Semi-structured Interviews. vi. Surveys.	ii. Student and parent perception data. iii. Me and My School data. iv. Other data types identified included behavioural, perception, demographic, financial and risk management data.	ii. To plan teaching according to identified learning needs and to group children with the same needs together. iii. To monitor achievement and address achievement gap. iv. To target interventions at the classroom level (use the data to set up programs to assist students at risk of not attaining government targets of achievement). v. Achievement data was also used for student goal setting and motivation.	planning, interventions, and management decisions. ii. The secondary school principals analysed data in order to obtain a strategic overview to inform school improvement.	i. **Accountability**: The use of student achievement data was strongly influenced by government accountability policies. They were considered to be narrow focused, a crude measure that did not reflect the complex nature of the context of schooling and change. ii. **Digital data expertise:** While the principals may have embraced the use of data positively, they expressed the view that not all staff were enthusiastic about analysing and using data to inform teaching practice because they lacked the skills or expertise. iii. **Data compatibility:** A key issue mentioned by all participants was the gaps in data between the sectors: first, between early childhood and primary and between primary and secondary; and, second, across different themes, such as health data, qualifications data and information from professionals working

						with a child. This hampered good data record keeping, especially for transient students, and the longitudinal analysis of a student's progress.
24	Dunlap, K., & Piro, J. S. (2016). Diving into data: Developing the capacity for data literacy in teacher education.	i. To explore how pre-service educators determined what worked in a data literacy intervention. ii. To investigate the implications for practice.	i. The research was conducted using teacher-researcher methodology (p. 4). ii. Research participants were students within a pre-service teacher candidate instruction and assessment course. iii. 54 participants from two sections in two semesters of an academic year. iv. Thirty hours of classroom observation.	i. Authentic State of Texas Assessment of Academic Readiness (STAAR). ii. Standardized test datasets. iii. post-intervention survey.	i. To make instructional decisions. ii. To identify the gaps that existed between instruction and assessment. iii. To identify areas of instruction the teacher needs to work on. iv. To identify objectives [that] students master and those that are challenging to students. v. To differentiate lessons and facilitate cognitive development. vi. For reflection on effectiveness of the teacher's practice.	i. For training purposes. ii. To design teacher preparation program.	**Challenges:** i. Discomfort with understanding data "I didn't know what constituted data. I also didn't know you could read data." "I had no ideas about what the numbers meant or really that I needed to be concerned [with the data]." (p. 7) ii. Unpreparedness.
25	Balicki, C. (2016). Teacher perceptions (K-8) of data-driven decision-making practices: A case study of one urban Saskatchewan school district.	i. To examine the current data culture and the extent to which teachers valued data-driven decision making practices. ii. To examine K-8 teacher perceptions in relation to data-driven decision-making practices and what might improve these practices.	i. Used a sequential mixed-method explanatory case study approach. ii. An online survey (n=109). iii. Follow-up interpretation panel to examine the quantitative data. iv. Qualitative data collection and analysis.	Used multiple data types: i. Language assessment. ii. Academic and cognitive test data. iii. On-the-moment data. iv. Classroom-based teacher generated data. v. Formative assessment data.	**Teachers' data use practices** i. To plan intervention for students' needs. ii. For instructional planning.	**Leadership on data use** i. To allocate time for teachers to discuss assessment and data with colleagues.	**Data use facilitators** i. Having organized and easily accessible data. ii. Providing professional development on data use. iii. Data use mentorship. iv. Collaboration and knowledge sharing. **Barriers to data use** i. Limited capacity or training to use data.

			v. Data gathered in one urban school district in Saskatchewan.				ii. Limited time to collect and use data.
26	Bigner, S. Z. (2017). Teacher and principal experiences with data-driven decision making, school improvement plan quality, and academic growth.	i. To examine the influence of data-driven decision making (DDDM) and school improvement plan (SIP) quality on student achievement. ii. To identify best practices in DDDM and school planning.	i. A mixed methods study. ii. Surveys (n=162). iii. Interviews (n=9) iv. Participants included principals and teachers from ten elementary and middle schools in Texas.		**i.** To set teaching goals. ii. To guide instructional decisions. iii. To assess the effectiveness of curriculum changes and instructional strategies. iv. To focus on student learning outcomes. v. Use assessment data to identify students who are not experiencing academic success. vi. To try out new teaching strategies.	i. School and district leaders' use student achievement data to determine resource allocation. ii. To align classroom improvement efforts with state standards. iii. To create open and honest discussions about data.	**Facilitators** i. Easily accessible district data system. ii. Accurate and complete student performance data in school and districts. iii. Available multiple data sources to assess effectiveness of educational programs. iv. Training on data use and analysis. v. Collaboration between teachers and principals is significant in driving instructional and leadership data use practices among teachers and school leaders. **Barriers** i. Teachers make less significant input into data management. ii. Teachers lack data use capacity. iii. Limited time for data use activities.
27	Custer, S., King, E. M., Atinc, T. M., Read, L., & Sethi, T. (2018). Toward data-driven education systems: Insights into using information to	i. To examine the use of data by education policymakers in decision-making. ii. To take stock of what information decision-	i. Literature review. ii. Surveys (Listening to Leaders Survey, Education Snap Poll). iii. Survey participants included senior and mid-	i. Disaggregated data. ii. Performance indicators and targets. iii. Education Management	i. To fuel progress toward improved student learning. ii. Organization of instruction	i. To allocate resources (target resources efficiently to areas of greatest need or highest return).	**Barriers:** i. **Operational Challenges** (e.g., lack of training for data usage, funding issues).

	measure results and manage change.	makers use to measure results and manage change.	level government officials, in-country staff of development partner organizations, and domestic civil society leaders. iv. Listening to Leaders (LtL) Survey captured the views of nearly 3,500 participants in 126 low- and middle-income countries from 22 policy domains, including education. v. Education Snap Poll: Approximately 180 leaders from 78 countries responded to the 2017 Education Snap Poll.	Information System (EMIS). iv. Learning assessments (PISA).		ii. Plan programs and evaluate results (formulate school action plans). iii. Close programs that do not work. iv. Increased equity. v. Personnel management vi. Stronger accountability relationships.	ii. **Data Challenges** (e.g., Untimely production and dissemination of data, lack of reliable and quality data). iii. **System Challenges** (e.g., System capacity issues). iv. **Leadership Challenges** (e.g., Lack of data culture, Lack of clear vision and support).
28	Hora. M. T., Bouwma-Gearhart, J., & Park, H. J. (2014). Using practice-based research to frame and focus pedagogical reform: Exploring the use of data and other information to guide instructional decision-making.	To explore how postsecondary faculty think about and use data when making decisions about their teaching.	i. Descriptive Case Study. ii. Interviews. iii. 59 faculty at 3 large public research universities in US and Canada. (Participants represented the following disciplinary groups: biology (n=19), mechanical engineering (n=12), geosciences (n=15) and physics (n=11)). iv. Observation.	Forms of Data Utilized in the 3 Universities are: i. Numeric data. ii. Verbal data. iii. Narrative data. iv. Personal data. v. Informal student feedback. vi. Student assessment (e.g., homework assignments). vii. Curricula artifacts (e.g., Syllabi is used to guide decisions about course design). viii. Education research data. ix. Personal memory.	i. To support and improve practice at the classroom level. ii. To identify topics that have proven to be challenging in the past, in order to anticipate the next group of students having similar issues and adjusting instruction accordingly.		**Barriers** i. Complicated process of translating raw data into useable information and actionable knowledge. ii. Lack of staff competence to effectively analyze data. iii. Lack of time due to workload. iv. Timing of data. **Facilitators** i. Local data-focused interventions. ii. Social networks supportive of instructional data use.

							iii. External accreditation policies. iv. Policies for course, program, or departmental reviews.
29	Jim, C. K., Schultz-Jones, B., & Ledbetter, C. (2017). The challenges of implementing a data driven framework in K-12 education.	To examine the challenges of data management and use in K-12 education.	Literature review.	i. Student demographics. ii. Attendance. iii. Grades and test scores. iv. Teacher evaluation report.	i. To improve decisions about instructional programs, student placement, and instructional methods. ii. To improve learning outcomes.	i. Internal accountability. ii. Professional development.	**Barriers:** i. **Technical Challenges** (e.g., hardware and software use and upgrades). ii. **Knowledge and application challenges** (e.g., staff struggle to validate and evaluate data, lack of statistical knowledge). iii. **Climate and Cultural Challenges** (e.g., conditions under which staff work, lack of strong leadership, no collaboration opportunities to review data).
30.	Pak, K., & Desimone, L. M. (2019). Developing principals' data-driven decision-making capacity: Lessons from one urban district.	i. To explore the challenges and opportunities associated with data-driven decision-making (DDDM). ii. To develop principals' capacity to analyze, manage, and make good use of their school-level data.	i. Case study. ii. Conducted in an urban district in the U.S. iii. Interviewed 20 central office staff members, 4 principal supervisors, and 1 external consultant. iv. Focus groups with 12 elementary, middle, and high school principals who had participated in the data-use PD workshops.	i. Attendance data. ii. Data on grades. iii. Suspension data. iv. Assessment data.	i. Diagnose student needs. ii. Implement targeted supports. iii. Improve student performance.	i. To design school improvement plans.	**Barriers:** i. Many principals and teachers distrust the validity and reliability of the data. ii. Many also disagree with the metrics used to measure indicators such as climate, student proficiency, and college readiness, especially when the quantitative data appear to conflict with practitioners'

							working knowledge about those indicators. iii. Technical demands of managing, retrieving, and analyzing data. iv. Lack of capacity. **Facilitator:** i. Sponsored bi-monthly PD series to help principals learn how to use the data to more effectively meet several outcome goals for the elementary, middle, and high schools throughout the district.
31	Price, J. J. (2018). The relationship between teachers' perception of data-driven instructional leadership and their sense of efficacy and anxiety for data-driven decision-making.	i. To ascertain the relationship between teachers' perception of data-driven instructional leadership and their sense of self-efficacy and anxiety towards data-driven decision-making. ii. To examine if teachers' school level (elementary or secondary) influenced their perception of data-driven instructional leadership and their sense of self-efficacy and anxiety towards data-driven decision-making.	i. Correlational research design. ii. Non-experimental quantitative research method. iii. Survey iv. 300 full time certified educators in a rural school district.	i. Data-informed School Leadership Framework (DISL) and Data-driven Decision-making (DDDM) Efficacy and Anxiety instruments (3D-MEA). ii. Assessment data.	i. To improve students' achievement and educational outcomes. ii. To adjust instruction.	i. A driver for school improvement planning. ii. To determine the allocation of school resources.	**Facilitators:** i. Strong instructional leadership. ii. Individual support for data use. iii. Climate of trust and collaboration - school culture that promotes and integrates DDDM. iv. Evidence of professional development programs.
32	Rhoads, M. (2019). Educational leadership efficacy: The relationship between data use, data use confidence,	i. To explore the relationships between how educational leaders use data, levels of leadership efficacy with	i. Mixed methods research design. ii. 6 quantitative and 2 qualitative research questions.	i. Demographic data (e.g., enrolment by gender, transportation data).	i. Student achievement ii. Needs assessment iii. Planning professional development.	i. For school improvement planning. ii. For setting and monitoring goals.	**Barriers:** i. Lack of time ii. Lack of capacity to use data.

	leadership efficacy, and student achievement.	which they use data, and the relationship between data use, efficacy toward data use, and student achievement in K-12 school settings. ii. To understand how data practices and data-driven cultures are being established and utilized by educational leaders in different leadership positions at K-12 schools and school districts.	iii. A correlational research design was employed for the quantitative questions. iv. Grounded theory was employed for the qualitative questions.	ii. Test score and student grade data (e.g., reading and mathematics assessment score data). iii. School-wide programmatic data (e.g., free and reduced lunch data and minority enrolment data). iv. Staff data. v. Perception and advisory data (e.g., parent, staff, and student satisfaction survey data).		iii. To detect trends and patterns.	iii. Resistance from staff and teachers. iv. Lack of resources to implement data-driven cultures. **Facilitators:** i. Providing data analysis courses as part of administrative preparation programs.
33	Schifter et al. (2014). Data-driven decision-making: Facilitating teacher use of student data to inform classroom instruction.	i. To learn how to help teachers analyze student data that were generated by student actions within the virtual environment modules. ii. To understand how to turn raw data into contextualized knowledge that informs practice.	i. A case study of one National Science Foundation (NSF) funded project. ii. Participatory Action Research (12 teachers came together with researchers to create a participatory action research team). iii. Immersive virtual environments. iv. Survey.	i. Student performance data. ii. Inquiry based assessment modules (two introductory modules and four assessment modules). iii. Portfolio iv. Data from multiple-choice questions (drawn from various high-stakes district-, state-, or national-level tests).	i. Used data to identify student scientific misunderstandings. ii. To change instructional strategies. iii. To track students' performance. iv. Allowed teachers to see class trends in students' investigation techniques. The NSF-funded project database collected students' performance data, which were accessed via the project dashboard. The dashboard was designed to serve both administrative, researcher, teacher, and student needs simultaneously. Of interest here is the teacher dashboard	i. For accountability ii. For school improvement.	**Facilitators:** i. Professional development for teachers. ii. Collaboration amongst staff (collaborative teacher working group). **Barriers:** 1. Timely availability of data (timeliness). ii. Accessibility of data.

				section, used to aid teachers' tracking of student performance and to obtain the necessary data to make informed decisions about their students' learning.		
34	Sergis, S., & Sampson, D. G. (2016). Data-driven decision making for school leadership: A critical analysis of supporting systems.	i. To perform a critical quantitative analysis of existing school leadership decision support systems (SL-DSS). ii. To gather insights and draw conclusions to drive future implementations of SL-DSS toward providing more effective data-driven decision-making for school leaders.	i. A quantitative study. ii. Used 70 existing SL-DSS documents. iii. Quantitative and qualitative meta-analysis were performed on the documentary materials	A variety of learner performance data, including: i. assessment results; ii. summative assessment score data; and, iii. retention and attendance rates.	i. Learner performance monitoring ii. Learner performance evaluation	**School leaders' data use** i. Learner performance monitoring (94 %) ii. Learner performance evaluation (79 %) iii. District stakeholder accountability (87 %), iv. Learner data management (89 %). **Note:** External regulatory accountability to policymakers and parents about learners' assessment results and retention rates, influenced much of school leaders' data use practices rather than the quality and appropriateness of teaching practices.	
35	Marsh, J. A., Farrell, C. C., & Bertrand, M. (2016). Trickle-down accountability: How middle school teachers engage students in data use.	To provide an in-depth, exploratory analysis of how teachers and administrators in six low performing middle schools engaged students in analyzing and responding to students' learning data.	i. Used a comparative case study of six low-performing middle schools. ii. Interviews (n=79), focus groups (n=24), and observations (n=20) were conducted.	Students' scores and other assessment data.	**Why engage students in data use** i. "Teachers and administrators believed that if students saw their data, then they would work hard, take assessments seriously,	**Other ways of engaging students in data use** i. Adopted a "correct and reflect" method, which required students to write a narrative reflection on "Where did I go wrong?" and "Why is it wrong?" (p. 258)	<u>**Barriers and Facilitators**</u> i. School policies and routines around data walls and charts in classrooms. ii. School leadership's orientation to data use.

#	Citation	Purpose	Design	Data Sources	Purposes of Data Use	Capacity/Practices	Barriers
			ii. 13 district wide leaders were interviewed. iii. Participants included school administrators, non/case-study teachers.		and invest more in their own learning" (p. 254). **Ways to engage students** i. Using copies of students' multiple-choice answer sheets and work with students to correct the results and provide feedbacks on student needs. ii. Using intangible rewards to emphasize key messages about progress.	ii. Peer-to-peer engagement where high performing students supported their peers to work out solutions to questions the others got wrong. iii. Teachers re-taught not-well-understood materials. iv. Whole class error analysis of after test questions.	iii. District-level policies and norms about data use.
36	Cohen-Vogel, L., & Harrison, C. (2013). Leading with data: Evidence from the National Center on scaling up effective schools.	To understand the ways in which educators in high schools use and think about performance data as they make decisions in increasingly complex schooling contexts.	i. Used comparative case study design with 4 schools in Florida: two higher value-added and two lower value-added schools. ii. About 104 interviews and 16 focus groups were conducted among students, teachers, and principals and assistant principals.	i. Used a variety of data sources, including performance data (scores on the Florida Comprehensive Assessment Test (FCAT), and scores on district benchmark tests, students' attendance records, academic history, schedules, and test scores). ii. Teachers in all four schools expressed a greater reliance on, and trust in, internally generated performance data (teacher-developed assessments, students' grades, and informal feedback from students).	i. To guide the structure of the learning environment. ii. To inform the instruction of students. iii. To target certain students for instructional intervention. iv. To modify classroom practices. v. Used externally generated performance data for student placement. **Data use practices** i. Using "data chats"- teachers and leaders met to collectively analyze data.	i. To assign teachers to grade levels and tracks. ii. For capacity building - systematic supports were put in place to build educators' capacity to make use of performance data in their practice. iii. To build strong data use culture, where data is seen as a beneficial part of school and teacher practice.	**Barriers to data use** i. Teachers had negative perceptions regarding data-driven practice being influenced by strong emphasis on accountability and a practice of "shaming" teachers with data. ii. Less collaborations between and among teachers and school leaders.

			iii. Accessible district wide data warehouse (Virtual Counselor).			
37	Gleason et al. (2019). Evaluation of support for using student data to inform teachers' instruction (NCEE 2019-4008)	i. To provide support to school leaders and teachers on how to analyze data and select appropriate instructional strategies through training, coaching, or facilitated collaboration with others.	i. An experimental study that used a random assignment design. ii. Intervention based study to equip school leaders and teachers the needed skills for data use practices. iii. Used a two-day introductory session and six subsequent one-day sessions to train school leaders and coaches. iv. About 102 schools in 12 districts were randomly assigned to the treatment group or the control group. v. Interviews and logs with coaches, surveys with principals and teachers, and student data.	Student-level administrative data.	**Teachers training focus** i. Met regularly with data coaches to analyze student data ii. Identified and used promising instructional strategies aligned with support and guidance from school leaders **Outcomes** i. Teachers and school leaders used data to set and monitor student progress. ii. Teacher reported adjustments to instructional practice to address students' needs and achievements.	**School leaders training focus** i. They met regularly with data coaches to identify instructional focus for their schools. ii. To set and monitor achievement goals iii. To provide guidance and support on data use to teachers iv. To plan collaborative team meetings for data use activities.	