Improving schools through data-based decision making: an assessment of data use in primary schools in Ethiopia

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Summary

Data has received increasingly wider attention due to increasing emphasis to standard based accountability systems and research results implicating improved student outcomes. Hence, insight into how data are used in schools, its enablers and barriers, becomes crucial. Several studies have been conducted, most of which are describing data use in the developed part of the world (Europe, North America, Australia and New Zealand). Given the dearth of scientific studies and distinctiveness of data use in specific educational policy contexts, it is imperative to study data use in a developing country context, in this case Ethiopia. Moreover, the categorization of schools into different levels of performance, ranging from Level I to Level IV, on the bases of a mandated school improvement program was an additional impetus for the rationale. Based on a conceptual framework that captures types of data, data use purposes, and promoting and hindering factors, the study aimed to investigate how schools use data in the context of school improvement. Particularly the study aimed to assess commonly available and used data and examine for what purpose data were used. Further, the study sought to identify enabling and hindering factors and describe how they affect data use in schools.

The study employed an exploratory mixed methods research design where it blends quantitative and qualitative research methods. Data were collected from a cluster random sample of eight schools selected based on their ranking in the annual schools' inspection report which also includes the schools' self-evaluation assessment. As a result, four high performing and another four low performing schools representing each of the school levels were selected. Evidence for the study comes from the school data inventory (N=8 schools), a teachers' survey (N=235), and semi-structured interviews with principals (N=4, including assistant principals), PD facilitators (N=4), and teachers (N=4). Moreover, school documents, such as school development plans were mainly used for triangulation purposes. Concerning data analysis, descriptive statistics and One-way analysis of variance (ANOVA) were calculated to determine the level of data use; and multiple regression analysis to determine the extent to which data characteristics, user characteristics and school organizational characteristics influence data use for accountability, school development and instructional improvement purposes. To provide an in-depth phenomenon of data use, thematic analysis was included on the purposes of and factors influencing data use.

The findings indicate that both high and low performing schools had a wide range of input, process, context, and output data available. Certain kinds of data (e.g. socio-economic status) were only found in some high performing schools. High performing schools displayed slight variation in terms of the extent of data availability or pattern of disaggregation. Wider availability of data however does not seem to necessarily ensure its actual use as respondents recurrently mentioned only few kinds of data in their interview responses. Of which, most of the data were process data followed by output data. Regarding the purpose of data use, schools use data for accountability, school development and instructional improvement. High performing schools scored higher in all three scales than low performing schools, but it was not statistically significant. This means that although these schools are categorized differently in relation to their performance by the Ministry's standards, there is no relation with their extent of data use. The qualitative data however showed mixed results where high and low performing schools displayed similarities on certain aspects of data use while they differ on other aspects of data use. The difference was more observed within high performing schools than low performing schools which were more or less similar. Concerning the factors, data use for accountability is influenced by school organizational factors. The use of data for school development is influenced by data characteristics, user characteristics and school organizational characteristics. Also, the use of data for instructional improvement is influenced by data characteristics and school organizational characteristics. School organizational characteristics seem to influence all three types of data use, suggesting the importance of the factor. As data use involves a complex network of interpretive social processes, it is sensible to assume that these factors interrelate with one another. Examples of abuse of data were identified when teachers inflate student achievement scores and schools copy school development plans from another school due to high accountability pressure and lack of support.

Finally, for policy and practice, the study recommends strengthening existing professional development and making it more structured and systematic. Effective leadership in terms of the roles played by a school principal in the context of school improvement can also motivate teachers to engage in data use. Moreover, the findings imply effectiveness of the pre-service teacher education in preparing teachers and school leaders on competencies of data use for school improvement. A more observational and intervention based study on data use that involves different stakeholders is recommended for future research.

Key words: *data use, accountability, school development, instructional improvement, facilitating and hindering factors, Ethiopia*.

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CHAPTER ONE

1. Data-based decision making in education

1.1. Introduction

Data-based decision making and the quest for using evidence in educational decision making is nothing new because achievement tests have been administered for years (Shen & Cooley, 2008). Effective teachers and principals have been using data in some way to make decisions though the process was not systematic and automated. For example, teachers often ask questions, make observations, examine students' work products, and scan signs of understanding or misconceptions of students during and at the end of every classroom lesson (Mandinach, 2012). Then, they process the information in their heads to determine how well students are progressing with reference to learning goals, examine the content and structure of the instructional process, propose solutions to modify the instruction and meet student learning needs.

While data and the hoped-for data use are out there for a relatively long period of time, why is it so important to renew its significance at this moment? Two reasons recurrently appear in the literature as the main drivers of data use in education: accountability measures and the movement of school improvement (Anderson, Leithwood, & Strauss, 2010). Given the variations in the interpretation and emphasis of accountability measures across educational systems, schools are increasingly held accountable for student learning and achievement assuming that expectations for students will increase, teaching will improve and learning gains increase (Darling-Hammond & Rustique-Forrester, 2005). This perspective assumes that high stake-accountability measures (e.g. standardized achievement tests) will motivate students to be engaged much more in the learning process. The accountability system is also intensified by the decentralization of educational management that swept across educational systems and global mandates such as the Education for All movement.

A related but sometimes competing priority that make data use crucial is the school improvement process (Little, 2012;Young, 2006). Data use can lead to school improvement in terms of increased student achievement primarily when it can influence teaching in a meaningful manner (Carlson, Borman, & Robinson, 2011;Lai, McNaughton, Timperley, & Hsiao, 2009;McNaughton, Lai, & Hsiao, 2012). In this view, increased student achievement is primarily a product of better teaching. Darling-Hammond & Rustique-Forrester (2005) identified at least four rationales of data use in the current educational accountability and school improvement landscape originating from curriculum, management, pedagogical and organizational, and equity perspectives.

First, from a curriculum perspective, data can substantially influence curriculum and instruction especially when it is used for decision making purposes. There is research evidence showing that data (e.g. assessment and classroom observation data) can influence teachers' instructional planning and classroom practices (e.g. Lai, McNaughton, Timperley, et al., 2009; McNaughton et al., 2012). If data use changes teachers' classroom practices, presumably it could lead to consistent and significant student learning gains.

Second, from a management perspective, the need to establish control over teaching for the purpose of curricular coherence, standardization, accountability for content coverage, and achieving intended results increased the prominence of using data. According to some studies (e.g. Heritage & Yeagley, 2005; Wiliam, 2010), the management of assessment data will facilitate alignment between standards and instruction, and promotes professional development in the school. In addition, school-based performance assessments when evaluated by teachers themselves and used to improve teaching are good management tools for instructional improvement.

The third rationale is both pedagogical and organizational in origin, and focuses on the need for valid and reliable information about student learning to make decisions on what teaching should look like and the school improvement process (Darling-Hammond & Rustique-Forrester, 2005). This perspective aspires to make assessment an integral part of the instruction for teachers, and based on data these teachers will be able to identify what students already know, what and how they need to learn, and determine how best they can help them.

Finally, from an educational equity perspective, data can be a powerful instrument to monitor access and equality of educational opportunities across the different segments of student population explained by student composition including prior achievement, student level background characteristics, and compositional characteristics of student population (Diamond & Spillane, 2004; Schildkamp, Rekers-Mombarg, et al., 2012;Timmermans et al., 2011).

1.2. The research problem

Data use continues to gain more attention in recent years. Schools are increasingly held accountable for the education they provide, to improve student outcomes and produce evidence showing effectiveness of investment aimed to change instruction, assessment and professional development (Huffman & Kalnin, 2003; Timperley & Phillips, 2003). Also, research results implicating data use for sustainable school improvement brought the power of data for the discourse (Carlson, Borman, & Robinson, 2011; McNaughton, Lai, & Hsiao, 2012; Schildkamp, Ehren, & Lai, 2012). Shaped by organizational and policy environment, the trending emphasis on accountability system and the school improvement process (Anderson et al., 2010) redefined as to why data use is gaining center stage in educational discussion and discourse.

For the last few decades the Ethiopian education system witnessed massive structural and curriculum changes aimed to address issues of educational access, equity, quality and relevance (Semela, 2014). Several national and global mandates contributed enormously towards the making of reforms on the structure of the education system, organization of the classroom, teacher education preparation, and assessment and is marked by the introduction of the new Education and Training Policy in 1994 (MoE, 1994). The education policy states that the purpose of primary education is to offer quality education and prepare students for further general education and training (MoE, 1994). To translate the policy statements into practical actions, a series of five year Education Sector Development Programs (ESDPs) were launched with the main thrust of expanding educational access, ensuring equity, and improving its quality and relevance. Moreover, it aimed to achieve the Millennium Development Goals (MDGs) and meet the objectives of a national development plan through a qualified trained work force (MoFED, 2006).Accordingly, the number of student enrolment in primary schooling has grown from three million in 1990s to 17 million (MoE, 2013a). During this period, the rate of enrolment raised from one of the lowest in sub-Saharan Africa to enrolling 85% of children who reached school age. The disparity between the genders, rural-urban classifications, and other disadvantage groups has also improved (MoE, 2013a).

The rapid expansion of the education system however is accompanied by a serious concern of educational quality (Ahmed & Mihiretie, 2015;Serbessa, 2006) as evidenced by low and declining student achievement, low efficiency and input indicators. For example, the Early Grade Reading Assessment (EGRA) on children's reading skills found that while children attend schooling for three years of primary education, a significant percentage of them remained illiterate (Piper, 2010). The National Learning Assessment (NLA) results at grades 4 and 8 (MoE, 2013b) also showed that students scored below 50% across all the four assessment measures, and there was a significant drop in 2013 from the baseline assessment in 2000. Further, high dropout and repetition rates decrease the number of students who continue from the first cycle of primary education (Grades 1 to 4, ages 7 to 10) into the second cycle (Grades 1 to 4, ages 11 to 14) (MoE, 2013a). The gross enrollment and net enrollment rates for grades 5 to 8are 62.9% and 47.3% respectively.

The Ethiopian government pursued policies of decentralization, contextualized planning, school grant, community participation, teachers and principals' professional development and production of textbooks (MoE, 2008b; 2010) to mitigate the declining quality of education. One of such policies is the School Improvement Program (SIP).The SIP is a decentralized approach to school reform nested in the educational policy and accountability structure(Mitchell, 2014), and aims to improve student outcome through "the process of enhancing the way the school organizes, promotes and supports learning" (MacBeath & Mortimore, 2001:p.37, in Mitchell, 2014). As part of the reform, schools are introduced with self-evaluation, development planning and professional development tools (MoE, 2008b)to review their internal conditions, identify priorities areas and set targets most in need of improvement following a structured procedure of analysis, planning, implementation and evaluation (MoE, 2009). Using a self-evaluation framework that covers four major domains – teaching and learning, leadership and management, student environment, and community participation (MoE, 2008b), schools determine focus areas and set standards of performance. Indicators of practice are provided for them to evaluate performances against each standard. Furthermore, in addition to an external inspection, schools are encouraged to produce evidence that supports their assessment of how well they are meeting each performance standard.

Whereas SIP repositions the school as a self-managing unit which continuously build its internal capacities for sustainable improvement (Mitchell, 2014), the Ministry of Education holds schools accountable for student learning and achievement by classifying them into different levels (MoE, 2013c). The classification is based on the School Effectiveness research tradition which makes use of the input-process-output models (UNESCO, 2002), where the rationale is to identify "characteristics of effectiveness" (Sammons, Hillman, & Mortimore, 1995) that can be used by schools for their improvement efforts. Increasing globalization and commitment to fulfill global mandates, such as the Education for All (UNESCO, 2000), and the overall shift from concern with inputs to a concern with outcomes (Greaney & Kellaghan, 2008) are additional impetus to ensure the accountability of schools. Accordingly, schools are classified into four levels, where *Level I* schools are failing or ineffective schools; *Level II* schools are low achieving but struggling schools; *Level III* schools are moderate and improving schools; and *Level IV* schools are good or effective schools (MoE, 2013c).Given the systematic and problem solving nature of school improvement process to support decision making (Cousins, Goh, & Clark, 2006), the classification is presumed to relate to the practice of data use in schools. Hence level I and II schools are low performing schools and might be low data use schools whereas level III and IV are high performing schools, and could represent high data use schools.

On the whole, as schools are struggling to transform themselves into more effective learning environments, data use has become an important tool for changing how they are planning, executing, monitoring and evaluating activities with the purpose to improve teaching and learning (Brunner et al., 2005;Darling-Hammond & Rustique-Forrester, 2005; Datnow, Park, & Kennedy-Lewis, 2012;Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006). Data use can lead to improvement when schools find a balance between their competing responsibilities of complying with accountability measures and improvement efforts, particularly in educational systems struck by massive educational change and restructuring with a lot of accountability and global mandates. Moreover, as the vast majority of available studies on data use are in the developed world (Europe, North America, New Zealand, and Australia), and data use can be distinct in different educational systems due to the data, user, and school organizational characteristics as well as the moderating role of policy context, it is imperative to investigate the practice of data use and how it contributes to the primary purpose of schools, improve student outcome, in a developing country context, in this case Ethiopia. Against the background of the contextual realities and the problem statement discussed above, the present study aims to answer the following key research questions:

1. What kinds of data are commonly used in primary schools in Ethiopia?
2. What is the purpose of data use in primary schools in Ethiopia?
3. To what extent do data, user, and school organizational characteristics influence data use in primary schools in Ethiopia?

CHAPTER TWO

2. The theoretical framework

2.1. The concept of data and data use in education

In the last few decades, data and data use in education has been the focus of considerable research largely because of the accountability system placed on schools. The accountability system mandated schools to collect, aggregate, and upwardly reporting of data pertaining to student learning (Wayman, 2005). The assumption is that accountability policies that produce a lot of data at the school level would initiate data use to change teaching practice. However, several studies have documented compelling evidence that mere availability of data in any form does not guarantee its usage and system improvement (Ingram et al., 2004; Schildkamp & Kuiper, 2010). Schools make decisions based on a range of sources such as data on student assessment scores, limited classroom observations (Carlson et al., 2011) or based on intuitions and 'teacher experiences' (Schildkamp & Kuiper, 2010;Timperley & Phillips, 2003). It is no longer acceptable to use untested taken-for-granted assumptions as a basis for decision making.

The use of data as a means for school improvement was documented in various studies that use causal designs to examine the effectiveness of data use interventions (e.g., Lai, McNaughton, Timperley, & Hsiao, 2009; McNaughton, Lai, & Hsiao, 2012), case studies of schools that have made data-use a priority (e.g., Little, 2012), and even observations from experts in the field (Hamilton, Halverson, Jackson, Mandinach, & Wayman, 2009). These studies found that effective data use can impact teachers' classroom practice as well as principals' quality of support, and as a consequence increase student learning and achievement (Kerr et al., 2006). However, in order to comprehend what data and data use in educational context counts, it is important to clarify the series of questions associated with data use. These questions include: "What are data in the school context?", "Why should schools use data?", and "How do schools use data?" (Schildkamp, Lai, & Earl, 2013). The answer to these questions basically lies in our examination of how teachers and school leaders conceptualize data and data use (Jimerson, 2014) because data use varies with regard to the type of data and the way it is analyzed and interpreted (Ikemoto & Marsh, 2007). In other words, conceptualizing data and data use presupposes an exploration of how teachers and school leaders conceive (develop mental models for data use) what it means to use data in their ongoing work.

In the literature, there are divergent conceptions on what data and data use means. The meaning varies when data are used for accountability, instructional, and school development purposes (Schildkamp et al., 2013) moderated by contextual factors. Even in the same organizational and policy context, the meaning may vary among different stakeholders (e.g. researchers, policymakers, and practitioners) who have different interests and organizational responsibilities. For example, while researchers conceive data as referring to quantitative and qualitative evidence that they collect to answer research questions, policy makers consider data as information they use to evaluate the effectiveness of educational programs. Another example is that some tend to consider "data", "information", and "evidence" one and the same thing while others link "data" with numbers and "data use" with the use of standardized test data for accountability purposes (Jimerson, 2014). The narrow conception that data are information generated from standardized tests and a continued confinement of stakeholders within a domain area in conceptualizing data does not correspond to what counts as data in the educational context in general (Schildkamp et al., 2013); and hence, impact data use as it affects teachers' expectation of students and their own teaching practice.

However, the definition given by Schildkamp et al. (2013) appears to be more relevant to comprehend what counts as data in an educational context. According to them, data are any "information that is collected and organized to represent some aspect of the school" (p.10). This definition is comprehensive in that it encompasses multiple sources and types of data where teachers and

principals need for making decisions to improve student learning. These multiple sources of data include input data (e.g. student characteristics), process data (e.g. the quality of instruction), outcome data (e.g. student test scores, and student well-being), and context data (e.g. policy and resources) (Ikemoto & Marsh, 2007). Data represent the raw state without judgment, interpretation or meaning. As such, it cannot be used for making decisions. For data to be useful, an interpretive data use process that involve noticing of the data itself, making meaning out of it, and construction of implications for action should be put in place (Coburn & Turner, 2011). In view of this meaning of data, data use or data-based decision making can be defined as a process of "systematically analyzing existing data sources within the school, applying outcomes of analyses to innovate teaching, curricula, and school performance, and implementing (e.g. genuine improvement actions) and evaluating these innovations" (Schildkamp & Kuiper, 2010; p.482). Data use therefore represents an iterative process in which teachers and school leaders transform the data into actionable knowledge in a systematic process of data collection, analysis and interpretation.

Several studies have proposed different models and theoretical frameworks regarding the nature and characteristics of data-based decision making in education (e.g., Anderson, Leithwood, & Strauss, 2010; Coburn & Turner, 2011; Hamilton et al., 2009; Ikemoto & Marsh, 2007; Schildkamp & Kuiper, 2010). All of these frameworks have components that assume data use as an interpretive iterative process where a number of conditions, contexts and processes (Coburn & Turner, 2011) determine its course. However, the data use framework developed by Schildkamp & Kuiper (2010) has an advantage of comprehensiveness into the type of data, promoting and hindering factors, and outcomes of data use, and which are hypothesized to be components of data-based decision making.

A data use Theoretical framework for the study

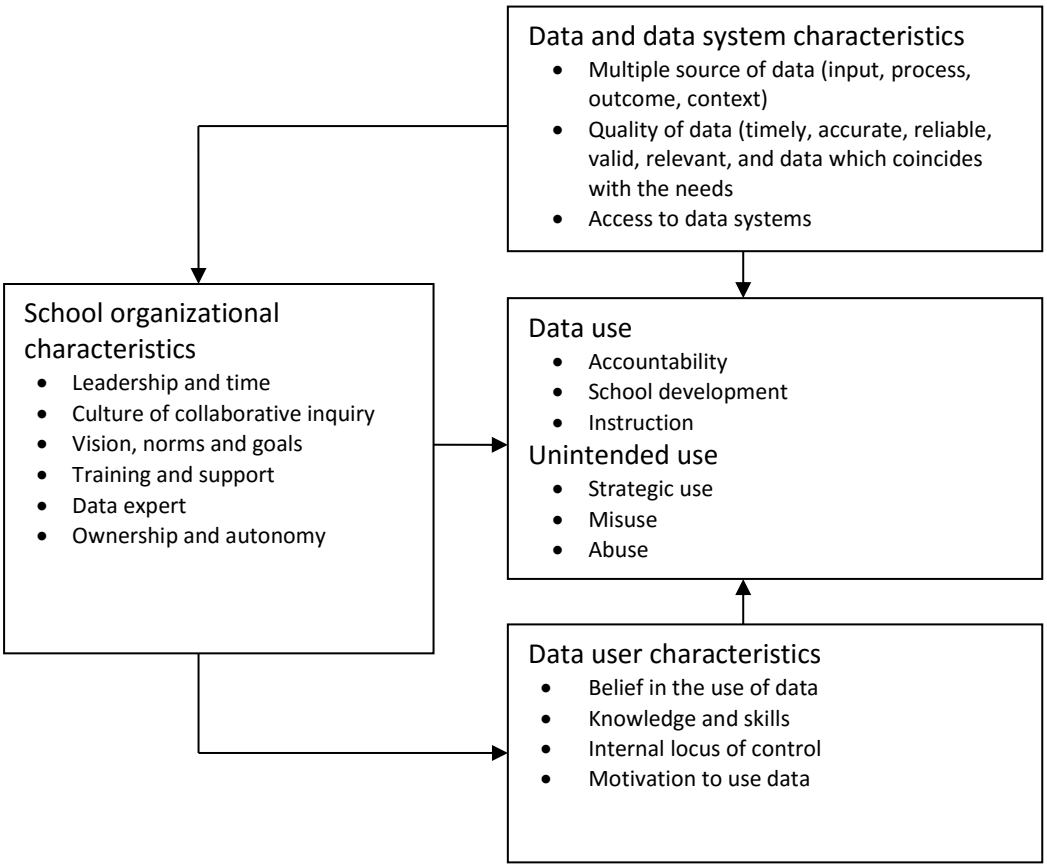

Figure 1. Data use in primary schools: data use, purpose, and promoting and hindering factors, based on Schildkamp& Kuiper (2010)

The figure above displays the policy context surrounding the other components of the theoretical framework. The policy context is proposed to refer to the complex dynamics of curriculum expectations, teaching practice and assessment at all levels in the education system including individual teachers' understanding of their constantly changing school environment (perceptual context) (Schildkamp, Ehren, et al., 2012). The policy context influences the enablers and barriers to data use and how data are used in schools. The enablers and barriers (data and data system characteristics, school organizational characteristics, and data user characteristics) in turn influence data use. The relationship between these variables, however, is two-way in that data use can also influence the enablers and barriers to the use of data (Schildkamp & Kuiper, 2010). In general, the policy context can shape the nature and characteristics of the variables involved by way of limiting possibilities or creating opportunities for data use.

For example, the value given to data at different levels of the education system (e.g. school level, district level, classroom level) would influence how data are used differently at each level (Lee, Seashore Louis, & Anderson, 2012; Levin & Datnow, 2012;Wayman, Jimerson, & Cho, 2012) and the choice of the data type to be used depends on different factors. If student achievement data is highly valued by policy makers because of the accountability system (data and data systems characteristics), schools might select easy-to-use numeric data and ignore other forms of data such as student behavior data, student progress data, classroom observation data which can better explain the teaching and learning process (data use) (Schildkamp, Ehren, et al., 2012). Similarly, when teachers and school leaders use data effectively – using data for long term improvement such as developing instructional strategies for specific groups of students (data use), this may lead to foster sense of ownership and autonomy in data use within school staff (school organizational characteristics). Below, a detailed description of the theoretical framework is presented.

2.2. Data use in schools

The major purpose of using data in schools is to achieve continuous school improvement in terms of increased student achievement. Hence, given the available data in schools, there could be three possible scenarios of data use: *no data use, unintended data use,* and *desired data use*(Schildkamp & Kuiper, 2010). Whether or not schools have little or *no data use* may depend on several factors. Too often lack of availability and sufficiency of data could be the reason (Kerr et al., 2006). As highlighted elsewhere in this paper, however, the mere availability of data does not suffice for effective data use.

Even when data are available it may suffer from undesired data use or *misuse of data*. Misuse of data would be a problem when teachers and school leaders lack the necessary knowledge, skills and disposition of working with data (Schildkamp et al., 2013) that increase the risk of diagnosing wrong problems and then prescribing wrong solutions based on false premises. The other form of undesired data use is *strategic use or abuse* of data. For example, strategic use or abuse of data may be the case when schools have to respond to a high-stake accountability regime with expected liabilities for noncompliance, and when the support provided to them is not sufficient (Ehren & Swanborn, 2012), both of which might push schools to fabricate data, and narrowing dawn the curriculum by teaching to the test (Schildkamp et al., 2013).

The desired data use is described to happen when teachers and school leaders have a direct experience of data collection, analysis, interpretation, and application on issues that are at stake (Schildkamp et al., 2013) to change how the school is functioning, and how teachers practice teaching in the classroom, with the ultimate goal of improving student outcome. This kind of data use is anticipated to have positive impact on student learning as well as achievement, because of the fact that data use is basically aligned with intervention strategies in altering the practice of a school. Illustrated in the theoretical framework (Figure 1), the desired data use in schools can lead to three major purposes: data use for accountability (e.g. communicating to inspectorates, and parents), data use for school development (e.g. policy planning and development), and data use for instructional improvement (e.g. changing instructional approach such as differential instruction for specific groups of students).

2.2.1. Data use for accountability

Data use for accountability purposes refers to schools' use of data to produce evidence for teaching and learning effectiveness (Ingram et al., 2004). Schools can use data, such as assessment and final examination results, classroom observation, and teachers' performance evaluation results, towards students, teachers, parents and educational inspectorates. They use data to evaluate teachers' performance and motivate them by celebrating achievements and improvements. Moreover, schools can use data in their performance review to monitor the extent of goal achievement (Diamond & Spillane, 2004; Schildkamp & Kuiper, 2010; Schildkamp et al., 2013; Wohlstetter, Datnow, & Park, 2008; Young, 2006). Schools use data for accountability purposes also because educational inspectorates provide supervision and in return schools should comply with regulation by periodically reporting their performances and implementing advices given to them. Through the use of regular inspection, monitoring of progress, assessment and testing (Harris, 2002), the educational inspectorates and school governing bodies ascertain the effective functioning of schools.

On the whole, data use plays an important role to produce proof whether actions taken by teachers and school leaders have added value for changing teachers classroom practices and improve student learning and achievement (Coburn & Talbert, 2006). All of which requires schools to use data to prove for students and parents that the education they provide is up to the standard. More importantly, data use can secure accountability of schools in the context of decentralized educational reform, such as school improvement, because accountability is seen as a mechanism to empower schools to collect data from their contexts, analyze and interpret data, and take the necessary actions based on the data.

2.2.2. Data use for school development

The purpose of school development can be achieved when teachers and school leaders use data to determine how the school and stakeholders should function in light of the current emphasis for educational quality. Student achievement data for example can be used for different purposes such as monitoring how well the school is functioning, making curricular decisions (Young, 2006), initiating conversation and discussion with students, teachers, parents, and administrators (Breiter & Light, 2006), shaping professional development through differential strategies (Breiter & Light, 2006; Timperley & Phillips, 2003), reflecting on one's own functioning such as evaluating teachers' performances (Breiter & Light, 2006; Young, 2006), developing and planning of school policy (Breiter & Light, 2006), and so on.

Assessment data can provide important insight on the learning of different groups of students and provide a basis to make changes on policies regarding student learning and achievement as well as testing, teaching timetables, and student grouping (Breiter & Light, 2006; Schildkamp, Rekers-Mombarg, & Harms, 2012). Furthermore, data use also enhances teachers' performance when they use multiple type and source of data for planning, executing, and evaluation in professional development (Schildkamp et al., 2013). Besides, data can enable schools to know their capacities and identify areas where they need to make changes by specifying their goals and priorities.

2.2.3. Data use for instructional improvement

The nature of effective teaching provides the most compelling argument that using data can lead to instructional improvement (Schildkamp et al., 2013). Effective teaching is proposed to be reflective in nature and should be based on data, rather than unscientific assumptions (Timperley & Phillips, 2003). Using assessment and other forms of data enable teachers to achieve a range of activities related to instructional improvement. For example, a teacher may need to focus on reading comprehension skills of students in order to improve their achievement patterns. Decisions on which content area need more attention for examination or which groups of students need special attention for additional academic support (Young, 2006), and what kind of instructional arrangement best suits the needs of specific groups of students can be best addressed when teachers use data.

Furthermore, data play an important role to monitor the effectiveness of interventions and rationalize whether actions taken by teachers and school leaders (e.g. developing new teaching strategies for specific groups of students, effectiveness of a professional development arrangement) positively contributed to school improvement in terms of change in student outcome. However, teachers' decision to change the structure and components of the instruction should be preceded by adequate knowledge of what and how students need to learn as well as what teachers exactly need to do differently in the classroom (Ingram et al., 2004; Schildkamp et al., 2013).

In general, within the domain of instructional improvement, using data is vital to determine how well students are learning in the education system (with reference to general expectations, aims of the curriculum, and preparation for further learning and for life); whether there is evidence of particular strengths and weaknesses in students' knowledge and skills; whether particular subgroups in the population perform poorly; which factors are associated with student achievement; and whether the achievements of students change over time (Greaney & Kellaghan, 2008). Whether the outcomes of using data for instructional purposes are positive or negative however depends on the characteristics of the data, how it is used and whether sufficient support is available for schools to improve (Darling-Hammond & Rustique-Forrester, 2005).

2.3. Factors that enable or hinder data use in schools

A critical point in the ongoing debate on data use seems to be around how data are used and what influences data use in the context of rigorous assessment, standards and accountability regimes. Previous research in data use (e.g. Datnow, Park, & Kennedy-Lewis, 2013; Schildkamp & Kuiper, 2010; Schildkamp et al., 2013; Lachat & Smith, 2005) points to a number of dimensions (or factors) influencing how data are used, ranging from data and data systems characteristics such as type and accessibility of data to user and school organizational characteristics.

2.3.1. Data and data systems characteristics

The characteristics of the data itself and the information system for data management can influence data use. With regard to data itself, there are various types of data collected from *multiple data sources* that can determine the type of decisions made by teachers and school leaders (Lachat & Smith, 2005). These different data types provide essential information about how students' are performing, how teachers practice teaching in the classroom, and in general, how the school is functioning in light of the current emphasis to educational quality. For example, a teacher who wants to improve the achievement of students in reading comprehension could make use of data on student characteristics, such as attendance data (input data), analysis of previous achievement scores on reading comprehension (outcome data), data on critical discussion with students regarding their reading habits (process data) and examination of whether the curriculum and text books are engaging for reading (context data) for designing instruction that best suits their learning needs (Ikemoto & Marsh, 2007; Schildkamp et al., 2013).

Another characteristic of data that can influence its usage is *quality of data*, that is likely to happen because of factors such as accessibility and timeliness of data, the accuracy of available data (Lachat & Smith, 2005), reliability and validity of data, and relevance of data to the schools' primary purpose (e.g. alignment of data strategies with instructional initiatives). More importantly, schools should be able to collect, analyze and interpret data that is useful/or pertinent for making decisions, rather than data that is just available.

Access to an information management system also influence data use in schools. School systems should "develop and maintain district wide data systems" (Hamilton et al., 2009; p.39) where technology is a key component in data management. The proliferation of a large amount of data in schools makes data management less possible in the traditional manner and requires the use of modern data management systems to easily interact with data (Breiter & Light, 2006). Several studies have documented evidence that schools tend to use data to inform classroom instruction when they

have access to data systems, which store data in forms that are easy to access, manipulate, interpret (e.g., Breiter & Light, 2006; Kerr et al., 2006; Wayman & Stringfield, 2006; Wayman, 2005a) and coincides with the growing needs of the user (Wayman & Stringfield, 2006). Hence, using of information management systems create leverage for schools to analyze and report student data regularly, compare their standing with other schools across the accountability indicators and identify specific groups of students in a timely manner that may need special attention (Kerr et al., 2006). On the other hand, the lack, inefficiency or incompatibility of (various) data management systems would delay decision making and could hamper the school improvement process (Schildkamp et al., 2013).

2.3.2. School organizational characteristics

The organizational context of the school shapes how data can be used. The school organizational characteristics manifest itself in several factors including leadership and time for data use (Young, 2006), teacher collaboration and a culture of collaborative inquiry (Wayman & Stringfield, 2005), vision, norms and goals for data use, training, support and partnership programs (Cramer, Little, & McHatton, 2014; Lee et al., 2012), data expert (Schildkamp et al., 2013), ownership and autonomy (Schildkamp & Kuiper, 2010).

Leadership and time for data use: leadership has a critical role in school improvement process. School leaders can effectively formulate and execute plans when they make decisions about students, teachers, and the school on the basis of data (Earl & Fullan, 2003), rather than on untested taken-for-granted basic assumptions. Furthermore, school leaders play an essential role in leading, guiding, and organizing data use in schools; for example, by way of providing time for teacher collaboration around data use, providing support in how to use data and modeling data use and data discussions (Datnow, Park, & Wohlstetter, 2007), demonstrating how to use data effectively, and work collaboratively with teachers in data collection, analysis and interpretation (Levin & Datnow, 2012; Schildkamp, Handelzalts, & Poortman, 2012; Wayman, Midgley, & Stringfield, 2006; Young, 2006).

A culture of collaborative inquiry: a culture of collaborative inquiry is found to have substantive influence on data use in schools. For example, a study by Huffman & Kalnin (2003) indicate that schools engaged in collaborative inquiry in data use have shown improvement in teaching and learning, also increased participation of teachers by allowing them to have more ownership over the data, and expanded their role in decision making process. The process of collaborative inquiry combines a deeper collaboration with inquiry and reflection on data use (Coburn & Talbert, 2006; Katz & Dack, 2014) to create the internal conditions that represent the key management arrangements for improving teaching and learning (Andrews & Andrews, 2002), which are associated with the schools' capacity for sustained development. School leaders can "provide supports that foster a data driven culture within the school" (Hamilton et al., 2009; p.33) such as assigning facilitators to support teacher teams on how to work with data (Datnow et al., 2012), structuring time for teachers to collaborate around data use (Young, 2006) and providing targeted professional development regularly (Timperley & Phillips, 2003). These changes in leadership, time for collaboration and supports for professional growth can generate the internal conditions that are necessary for improvement. In general, collaborative inquiry that challenges teachers' thinking and practice can make meaningful impact on teaching and learning because it addresses both their collective and individual learning needs (Katz & Dack, 2014).

Vision, norms and goals for data use: building a culture of data-based decision making for continuous improvement happens to be one of the major characteristics of schools that set clear visions, norms and goals for data use. Unlike schools that lack clarity on norms and expectations, these schools focus on collaboration, inquiry and reflection with a clear purpose of improving teaching and learning through the use of data (Schildkamp et al., 2013). Schools can create a clear vision and norms around data use when they are able to set specific and measureable student achievement goals at the system, school, and classroom level (Datnow et al., 2007). They should "establish a clear vision for school-wide data use" (Hamilton et al., 2009; p.27) so as to influence the extent to which teachers and students are willing to collaborate and take actions in response to data to identify weaknesses and

strengths, and setting goals for their own learning (Coburn & Turner, 2011). A school-wide data use plan is essential to define teaching and learning concepts, identify the activities, roles and responsibilities of stakeholders, and provide ongoing leadership around data-driven practices (Ikemoto & Marsh, 2007).

Training and support: building school wide capacity through training and support programs is often associated with improvement efforts in teaching and learning. Teachers' collaborative use of data through professional learning communities may lead to continuous school improvement (Farley-Ripple & Buttram, 2014). To use data effectively, teachers and school leaders may have to go through a structured training program using for example the data team procedure (Schildkamp et al., 2013) to acquire skills about the use of statistical terms, concepts, and forms of representing data for better visualization (e.g. graphs, diagrams, etc.). Training and support programs mostly given in the form of professional development should focus on changing the status quo and achieve real improvement by deliberately challenging existing teachers' thinking and practice in data use (Katz & Dack, 2014). Moreover, *data use routines* impact the effectiveness of training and support, and defined as "the modal ways that people interact with data and each other in the course of their ongoing work" (Coburn & Turner, 2011: p.181).Although often taken for granted and overlooked, data use routines can have subtle but substantial influence in shaping the practice of data use in schools. Data use routines may be informal such as when a school leader demands report and agendas from different departments and then examines the data with members of the school management team. Or, they can be highly designed and structured such as developing data use manuals describing the content and procedures of data use, schedules and protocols of data discussions, role positions describing the functions of a data expert to facilitate data use, and guiding worksheets for data use exercises (Coburn & Turner, 2011; Schildkamp et al., 2013).

Data expert: data collection, analysis and interpretation are obviously a challenging task, partly because there is lack of clarity on data-related responsibilities upon teachers and school leaders. Further, because of lack of the necessary knowledge and skills, dispositions towards data use, and sufficient time to work with data (Schildkamp & Kuiper, 2010), it may be necessary to designate a school-based data facilitator with an expertise in data analysis and ability to train and encourage others in data use processes (Hamilton et al., 2009; Kerr et al., 2006; Young, 2006). The nature and quality of support provided by a data expert has the potential to foster effective data use in schools (Lachat & Smith, 2005).

Ownership and autonomy: under the current accountability environment where data use processes are unfolding at multiple levels of the education system that shape school practices, data can be a source of power; and data use involves power relations between actors within the system (Coburn & Turner, 2011). Schools' ownership with regarding to data use can be enhanced when teachers and school leaders are encouraged to collect data from their school contexts, analyze, interpret and take actions based on data accordingly. These collaborative inquiry processes around data use not only influence teachers and school leaders positively but also encourage them to engage in continuous improvement processes that allowed them to take ownership on data use and expand their role in decision making (Huffman & Kalnin, 2003). Hence, for schools can establish effective data use practices, it is important to maintain the balance between accountability and autonomy.

2.3.3. Data user characteristics

Using data certainly predisposes the user to have knowledge and skills, belief on the use of data, internal locus of control, and motivation to use data (Schildkamp & Kuiper, 2010). The data have to be processed into information and then to knowledge in order to be used for decision making. However, this process of transforming data into actionable knowledge requires teachers and school leaders to develop competence in data inquiry – data literacy. Hence, teachers and school leaders need to have the *knowledge and skills* to collect, analyze, and interpret different forms of student-, school-, and system-level data, and understand concepts such as reliability and validity in data use (Little, 2012; Young, 2006).

The users' *belief in data use* is another condition influencing data use in schools. According to Kelly & Downey (2011) teachers' perception, understanding and use of student assessment data is associated with school-level performance as moderated by a range of factors like teachers' positions of responsibilities. Furthermore, teachers' views of the assessment results as valid measures of students' knowledge and ability (Kerr et al., 2006), and the degree to which school staff value data as usable and quality (Cousins et al., 2006) can also facilitate or hinder data use. For example, teachers may perceive that standardized tests scores only measures cognitive outcomes and lack usefulness in making decisions about altering of teaching practice or student achievement. These beliefs then shape what type of data they prefer to use for making decisions; for example, they may prefer to use behavior data as indicator of student learning (Ingram et al., 2004; Kerr et al., 2006). If teachers and school leaders believe that using data will improve teaching practice, and take actions towards improvement of student learning and achievement, there would be high chance for them to participate in data use activities, and use data for planning instruction.

A related factor is teachers' *internal locus of control* (Schildkamp & Kuiper, 2010) – the belief that they have the capacity to make changes using data or sometimes referred to as self-efficacy beliefs. One's self-efficacy beliefs with regard to data use represents the degree to which a person will have more control over his or her behavior and the more consistent the behavior will be with the attitude to data use (Bandura, 1997, in Vanhoof, Vanlommel, Thijs, & Vanderlocht, 2014). When teachers have internal locus of control, they will attribute success or failure in data use primarily to themselves, rather than externalizing to somebody else. In fact, this will motivate them to examine their weakness and strengths, develop solutions for future actions.

Lastly, *motivation* of teachers and school leaders can influence how they engage with and interpret data use (Schildkamp et al., 2013). Whether or not school staff has the propensity to collaborative inquiry and reflection on prevailing perceptions and practices and making the necessary changes based on data may depend on their strong motivation to maintain a positive self-image (Coburn & Turner, 2011). Schools with a culture of collaborative inquiry and reflection have the potential to engage staff in challenging the status quo based on data and keep them motivated to take action in order to make changes in their ongoing work.

CHAPTER THREE

3. Methodology

3.1. Research design

This study employed a mixed-method research design where it blends quantitative and qualitative data collection methods to investigate data use in primary schools in Ethiopia. Using a qualitative research, the study investigated what kinds of data are available in schools, for what purpose data are often used in schools, and the factors influencing data use. Whereas using quantitative research, the study mainly investigated the purposes of data use and factors influencing data use in primary schools.

3.2. Research context

Since 1991, Ethiopia has become a federal country. The notable consequence of the federal arrangement is the decentralization of educational organization and management with authority devolved to regions (MoE, 1994). Whereas setting national standards and curricula remains the mandates of the Ministry of Education, adapting and administering education to local needs is the authority given to Regional Education Bureaus (REBs). The devolution of authority finally reaches to the *Woreda* (district) Education Office (WEO) which is in charge of allocating school grant and supervising the quality of education in schools(MoE, 2002).

As a manifestation of the federal arrangement, schools are accountable to different bodies. For example, the *Woreda* (district) Education Office (WEO) provides routine supervision and in return schools should demonstrate their performances with evidence and implement the advices given to them(MoE, 2002). Regional education bureaus (REBs) adapt and distribute curricular materials, such as textbooks, allocate educational finance, and monitor whether schools comply with using the language of instruction. Concerning competence standards, however, schools are accountable either to the Ministry of Education directly or specialized agencies like the General Education Quality Assurance and Examination Agency (GEQAEA), and the National Educational Assessment and Examinations Agency (NEAEA), which supervise and monitor learning using national examination, accreditation and assessment. The GEQAEA for example prepare and administer national exams, and placement of students for different educational levels. The NEAEA on the other hand focuses on conducting national learning assessment of the relevant age cohort at pre-determined levels of education (currently at grades 4, 8, 10, and 12) every four years and provide information about the status of students' learning outcome and the extent to which students attain pre-defined standards or proficiencies on core subjects of language, mathematics, and the sciences (MoE, 2000; 2004; 2008a; 2013b). The country's education system consists of three levels: primary, secondary, and high education. Primary schooling, which is the focus of this study, covers the first eight years of general education, divided into two cycles. The first cycle is lower primary (Grades 1 to 4, ages 7 to 10) and the second cycle is upper primary (Grades 5-8, ages 11 to 14).

3.3. Sampling and sampling techniques

The selection of respondents followed two stages. In the first stage, schools' annual ranking was considered. The Amhara Regional Education Bureau publishes annual schools' ranking based on the schools' performance in terms of input, process and output, and labeled from Level I to Level IV. Further, schools are also encouraged to evaluate themselves using the same criteria and rate their performance levels. Therefore, this study includes schools whose ranking in both of the evaluations (regional inspection report and school self-assessment report) coincided. When the rankings differ, the regional inspection ranking was considered. Accordingly, survey and interview data were collected from a cluster random sample of eight schools (2 schools from each level, total4 high performing and 4 low performing schools) nested in two administrative districts within the study area. For the interview, four schools were included (1 school from each level).

In the second stage, evidence for this study comes from teachers survey (N=235), interview with principals (N=4 including assistant principals), professional development facilitators (N=4), and teachers (N=4) collected from February 16 to March 5, 2015. Moreover, school documents such as school improvement plans, and teacher professional development plans were also used as an additional source of information mainly as a means to triangulate evidence collected through survey and interviews. The selection of teachers and principals considered their positions of responsibilities within the school and the length of time they spent in their present schools, and all of them have spent at least one year in their present schools.

3.4. Instruments

3.4.1. Inventory check-list

Three instruments pertaining to the research questions were used in this study. The first instrument was a data inventory check-list aimed to assess the extent of availability of different kinds of data on a three-point scale, *fully available* when data were available, disaggregated, registered often in a single registration book or computerized (3); *partially available* when data were not sufficiently disaggregated, may be dispersed in different registration books, and not complete (2); and *not available* when data were not registered at all, and hence not available (1). For each school, the check-list was filled in to determine the extent of availability of data.

3.4.2. Survey questionnaire

The second instrument was a 60-item Likert scale survey questionnaire developed by Schildkamp & Kuiper (2010) aimed to assess the purpose of data use and identify the factors influencing data use in schools. The items pertaining to the purpose of data use were organized into three subscales: data use for accountability (3 items); data use for school development (9 items); data use for instructional improvement (11 items). The items for accountability and school development were measured on a four-point scale: strongly disagree (1), disagree (2), agree (3) and strongly agree (4), indicating the level of data use in schools. Similarly, items pertaining to the factors affecting data use also organized into three subscales: data and data systems characteristics (11 items); data user characteristics (8 items), and school organizational characteristics (18 items).Whereas the items for instructional improvement were measured on a six-point scale: almost never (1), yearly (2), twice a year (3), monthly (4), weekly (5) and twice a week (6), indicating the frequency of data use for specific instructional activities. The English version of survey was first translated into the working language of this study area (*Amharic*) before it was administered.

3.4.3. Interviews and documents

The third instrument was a semi-structured interview protocol developed by Schildkamp& Kuiper (2010). The interviews were based on five open-ended questions about the current practice of school improvement, what kind of data schools often use and how they use data for accountability, school development and instructional improvement purposes. The respondents were also asked to identify factors that promote and hinder data use in schools, and explain how these factors influence data use. Furthermore, school documents, such as the school development plans were used to generate additional information mainly for triangulation purposes.

3.5. Procedures

After explaining the objectives of the study, the instruments pertaining to respondents were administered. For assessing the availability of data in schools, the researcher, with the help of the principals, filled in the data inventory check-list for each of the sample schools to determine the extent of availability of data. Also, the survey questionnaires were distributed to teachers and the researcher was available in schools to clarify questions that might be asked by the respondents. Among 345 questionnaires initially distributed in eight schools, 287 were returned and checked for completeness and accuracy. Of these, 52 questionnaires could not be used for they were either partially filled or incomplete, or paternally responded. Hence, 235 questionnaires were entered into the analysis, indicating a 68% response rate.

Semi-structured interviews were conducted with teachers, principals and professional development facilitators (drawn from four schools). On average, 1 hour had been spent with each respondent. The interviews were conducted in *Amharic*, the regional working language in the study area, and their responses were tape recorded.

3.6. Reliability and validity

The quality of the survey instrument was determined through confirmatory factor and reliability analysis. Confirmatory factor analysis showed a 6 factor structure consistent with the theoretical framework: data characteristics, user characteristics, school organizational characteristics, data use for accountability, school development, and instructional improvement. All items sufficiently loaded to the factors well above 0.51 (see Appendix C). Reliability analyses results as measured by Cronbach's coefficient alpha were: data characteristics (0.80), user characteristics (0.83), school organizational characteristics (0.91), data use for accountability (0.80), school development (0.86), and instructional improvement (0.86).

For the semi-structured interview protocol, the inter-rater reliability check of transcribed interview responses was conducted. Two experts (including the researcher) match the full excerpts of the interview data from one of the four schools with the categories or themes using a coding rubric developed based on the literature. The inter-reliability coefficient was calculated from three of the twelve transcribed interview responses (25%) with 20 codes and 44 responses, where the inter-rater agreement was 76.7%, or Cohen's kappa of .767. After translation into *Amharic*, the survey and interview instruments were checked for validity by two language experts independently.

3.7. Data analysis

Concerning the first research question about what kind of data were commonly available and used in schools, a check-list was used to determine the availability of a specific type of data, such as continuous assessment and final examination results, on a scale describing the extent of availability of that data. Also, the actual use of data was captured through respondents' mention of the different kinds of data during the interview. For the second research question about the extent of use data for accountability, school development and instructional improvement purposes, descriptive statistics was calculated based on the survey data. Moreover, a one-way analysis of variance (ANOVA) was calculated in order to determine whether there was significant mean score difference between high and low performing schools. Regarding the third research question about the factors influencing data use, multiple regression analysis was used to determine the extent to which data use for accountability, school development, and instructional improvement purposes were influenced by data, user, and school organizational characteristics. Further, the interview data were transcribed and organized according to the guiding questions; then, scrutinized to identify conceptual or semantic relationship between them as related the purposes of and factors influencing data use to get a deeper understanding.

3.8. Ethical considerations

The University of Twente Research Ethical Committee has approved the application for ethical clearance of the study before data collection. Moreover, permission from the *Woreda* (district) Education Office (WEO) was obtained for collecting data from sample schools. Participation in the study was entirely on voluntary basis, where the respondents were informed about the objective of the study including the anonymity of their responses. Their informed consent was obtained before distributing the survey and tape-recording interview responses.

CHAPTER FOUR

4. Results

This study aimed to investigate data use for school improvement in primary schools in Ethiopia. The study aimed to assess the kinds of data commonly available and used in schools, examine the purpose for which schools use data, and identify factors influencing data use. The data were collected using the check-list, survey questionnaire, interviews and documents. In this section the results are presented in three parts pertaining to the research questions, where the first part presents data collected mainly through the check-list on the kind of data available and used in primary schools. The second part presents survey data regarding the purpose of data use. The third part also presents survey data on the factors influencing data use in schools. Besides, data obtained through semi-structured interviews (teachers, principals, PD facilitators) and documents are presented for a deeper level understanding of the purpose of data use and influencing factors.

4.1. Type of data available in primary schools

Table 1 summarizes *input data* available in high and low performing schools according to the data inventory check-list. The input data available in high and low performing schools are mostly similar, where most of the available data are fairly disaggregated and recorded in data registration book. Whereas quite some data are available but are incomplete, insufficiently disaggregated, and dispersed in different registration books which may be creating barriers of accessibility. The similarity also goes in the absence of certain data types, such as distance a student has to walk to school and data on school feeding. On the other hand, there are also some differences in that some data types are only found in high data use schools, such as data on students with learning difficulties and data on student socio-economic status. Interestingly, however, most of the incomplete and insufficiently disaggregated data are also found in high performing schools.

Table 2 shows *process data* available in high and low performing schools. The kinds of process data available in high and low performing schools are mostly similar except for some which are only available in high performing schools. For example, data on the amount of time school leaders spent dealing with instructional and administrative issues are available only in high performing school (two schools). The table also shows difference in the extent of availability of certain kinds of process data that is slightly more visible in high performing schools than in low performing schools. For example, there is much difference within high performing schools on the availability of data on student survey and interviews, parent survey and interviews, student group plan and reports than low performing schools.

Table 3 presents *context data* available in high and low performing schools. Although most of the context data are available in all schools, the extent of availability shows more variability in high performing schools than low performing schools. For example, data regarding government annual reports and study results, and school infrastructure are found at different degree of availability from not available at all to fully available in high performing schools. Whereas in low performing schools, the extent of availability of context data is generally similar in that there is less variation among them. While school policy and professional development plans are fully available, government policies and guidelines, school infrastructure and school facilities data are partially available across the low performing schools. Context data are more registered, organized and fully available in high performing schools than low performing schools.

Table 4 summarizes *output data* available in high and low performing schools. The high and low performing schools resemble in terms of the extent to which output data are available, where almost all output data except for parents' inspection report are fully available. Data on parents' inspection report and student report cards are partially available in most schools. The result shows more similarities than differences among schools in terms of the availability of context data.

On the whole, the result shows that there are some differences among schools in terms of the availability of certain kinds of data. The differences are mostly because of the organization and accessibility of the data. However, certain kinds of data, such as data on students' socio-economic status data, preprimary school experience, and amount of time school leaders allocate for instructional and administrative purposes were only available in few schools.

While schools had a wide range of input, process, context, and output data in their possession according to the data inventory check-list, the actual use of data as captured in recurrently mentioned interview responses of respondents seem to be limited to around a few data types. Table 5 illustrates the list of data that were frequently mentioned by the respondents in their interview responses. Accordingly, the respondents in all schools mentioned the use of input data, such as student enrolment data, process data (e.g. continuous assessment, classroom observation, and teacher performance evaluation and PD portfolio), context data (e.g. school improvement plan) and output data (e.g. final examination result, analysis of student results, promoted and dropout students). However, the types of data that were reported to be used vary between and within high and low performing schools. For example, socio-economic data, teacher qualification, performance review data, student hearing, student achievement targets, student and teacher satisfaction survey, student evaluation of teachers' performance and data on exam cheating behavior were mentioned by respondents in high performing schools (School 1). On the other hand, teaching load, school minutes, student attendance, teacher lesson plans, and annual educational statistics were mentioned as mostly used data types by respondents from low performing schools (often in School 5). Both high and low performing schools seemed to be using more process data followed by output data.

Table 1. Kinds of input data available in high and low performing schools

Data types	High performing schools												Low performing schools											
	School 1			School 2			School 3			School 4			School 5			School 6			School 7			School 8		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Student intake/enrolment by demographic data (e.g. age, gender)			X		X			X				X			X			X			X		X	
Enrolment of students with special educational needs		X				X		X				X			X	X			X				X	
Data on students enrolled in alternative basic education, and night program	X					X	X					X			X			X			X			X
Data on at-risk students (students with learning difficulties)			X		X				X		X			X			X			X		X		
Pre-primary school attendance (e.g. students' kindergarten experience)			X	X				X		X			X				X		X				X	
Teachers' level of qualification (including additional trainings and credentials teachers hold)			X		X			X				X			X			X			X			X
Teachers' experience in teaching (e.g. years in teaching)			X		X				X			X			X			X			X			X
Teaching load of teachers (e.g. periods per week)			X			X			X			X			X			X			X			X
Fees and revenue generation (e.g. payments)			X			X			X			X			X			X			X			X
Distance a student has to walk to school (in Km, or in Minutes)	X			X			X			X			X			X			X			X		
Socio-economic data (parental education, income level, etc.)			X	X			X			X			X			X			X			X		
Data on class size/number of students per section			X			X		X				X			X			X			X			X
Student-teacher ratio			X			X			X			X			X			X			X			X
Student-section ratio			X			X			X			X			X			X			X			X
Student-textbook ratio			X			X			X			X			X			X			X			X
Nutrition and feeding data	X			X			X			X			X			X			X			X		

Note: for the availability of data, the possible alternatives were: 1 = *not available* - when data are not registered at all, and not available; 2 = *partially available* - when data are not sufficiently disaggregated, dispersed in different registration books, and incomplete; and 3 = *fully available* - when the data are available, disaggregated, registered in a single registration book or computerized.

Table 2. Kinds of process data available in high and low performing schools

Data types	High performing schools												Low performing schools											
	School 1			School 2			School 3			School 4			School 5			School 6			School 7			School 8		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Classroom lesson observation data			X			X			X			X			X			X			X			X
Lesson plans			X			X			X			X			X			X			X			X
Teachers' daily attendance data		X				X			X			X			X			X			X			X
Teachers' lesson attendance data			X			X			X			X			X			X			X			X
Length of instructional time allocated for different subjects/time tables			X			X			X			X			X			X			X			X
Amount of time school leaders spent to instruction, and administrative issues		X			X		X			X			X			X			X			X		
Students' attendance/ Absentees data			X			X			X			X			X			X			X			X
Frequency of assignments/tests/assessments given in each subject			X			X			X			X			X			X			X			X
Student discipline/behavior data			X		X			X				X		X			X			X				X
Teacher performance appraisal data			X			X			X			X			X			X			X			X
School self-evaluation/internal evaluation			X			X			X			X			X			X			X			X
Co-curricular activities (e.g. school clubs)			X			X			X			X			X			X			X			X
Fiscal and expenditure data (School financial operation)			X			X			X			X			X			X			X			X
Student and staff transfer data			X			X			X			X			X			X			X			X
Staff survey and/or interviews data			X		X			X				X			X			X			X		X	
Student surveys and/or interviews (e.g. time spent in doing homework)			X		X		X				X			X			X			X			X	
Parent surveys and/or interviews (e.g. what kind of parental support)			X	X			X				X			X		X				X			X	
School calendar			X			X			X			X			X			X			X			X
Staff minutes			X			X			X			X			X			X			X			X
Students' council minutes			X		X			X			X				X		X			X			X	
Professional development, and action research portfolios		X			X				X		X				X			X		X				X
Tutorial classes (e.g. when, how much, which subject, for whom)			X			X			X			X			X			X		X			X	
Students' group plan and report (e.g. 1 to 5 ability grouping)	X				X			X				X			X		X				X			X
Student progress data (e.g. continuous assessment results)			X			X			X			X			X			X			X			X
Previous exam questions, and test items			X		X				X		X			X			X			X			X	
Students' target (setting achievement goals)			X		X				X			X			X		X			X			X	

Note: for the availability of data, the possible alternatives were: 1 = *not available* - when data are not registered at all, and not available; 2 = *partially available* - when data are not sufficiently disaggregated, dispersed in different registration books, and incomplete; and 3 = *fully available* - when the data are available, disaggregated, registered in a single registration book or computerized

Table 3. Kinds of context data available in high and low performing schools

Data types	High performing schools												Low performing schools											
	School 1			School 2			School 3			School 4			School 5			School 6			School 7			School 8		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Government policies and guidelines (Education and training policy, ESDPs, School Improvement Framework, etc.)			X			X			X		X			X			X			X			X	
Government annual reports and study results (Education statistics annual abstracts, National Learning Assessment, Early Grade Reading Assessment, etc.)			X		X		X				X			X			X			X		X		
School policy plans and information (e.g. school improvement plans)			X			X			X			X			X			X			X			X
School infrastructure data (type, quantity, quality of equipment, buildings, instruments, etc.)			X	X					X		X			X			X			X			X	
School facilities data (water, latrines, playground, library, clinics, pedagogical center, computers, cafeteria, electricity, etc.)			X			X			X		X			X			X			X			X	
Professional development plan (group/department level)		X			X				X			X			X			X			X			X
Parent-teacher-student association plan (classroom/school level)			X			X		X				X			X			X		X			X	

Note: for the availability of data, the possible alternatives were: 1 = *not available* - when data are not registered at all, and not available; 2 = *partially available* - when data are not sufficiently disaggregated, dispersed in different registration books, and incomplete; and 3 = *fully available* - when the data are available, disaggregated, registered in a single registration book or computerized

Table 4. Kinds of output data available in high and low performing schools

Data types	High performing schools												Low performing schools											
	School 1			School 2			School 3			School 4			School 5			School 6			School 7			School 8		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Parents' inspection reports		X		X			X				X			X			X			X			X	
Student achievement data (e.g. Final exam results and analysis)			X			X			X			X			X			X			X			X
Student report cards (e.g. with competencies in each subject)			X		X			X			X			X			X			X			X	
School inspection reports/external evaluations			X			X			X			X			X			X			X			X
Dropout data			X			X			X			X			X			X			X			X
Repetition data			X			X			X			X			X			X			X			X
Promotion data			X			X			X			X			X			X			X			X
Survival rate to Grade 5			X			X			X			X			X			X			X			X
Primary completion rate			X			X			X			X			X			X			X			X

Note: for the availability of data, the possible alternatives were: 1 = *not available* - when data are not registered at all, and not available; 2 = *partially available* - when data are not sufficiently disaggregated, dispersed in different registration books, and incomplete; and 3 = *fully available* - when the data are available, disaggregated, registered in a single registration book or computerized

Table 5. Kinds of data (input, process, context and output) mentioned by respondents from high and low performing schools during the interview.

	High performing schools		Low performing schools	
	School 1	School 2	School 5	School 8
Input data				
Enrolment	X	X	X	X
Teaching load			X	X
Teacher qualification	X			
Socio-economic data	X			
Process data				
Continuous assessment	X	X	X	X
Classroom observation data	X	X	X	X
Teacher performance evaluation	X	X	X	X
Performance reviews	X			
Student hearing (monthly FGD)	X			
Missed & tutorial classes	X	X	X	X
Student achievement target	X			
Teacher and student satisfaction (survey)	X			
School minutes	X		X	X
Peer-led team learning		X	X	X
PD portfolio	X	X	X	X
Student attendance			X	
Teacher lesson plans			X	
Context data				
School improvement plan	X	X	X	X
Education and training policy		X		
Output data				
Final examination results	X	X	X	X
Analysis of student results	X	X	X	X
Promotion and dropout	X	X	X	X
Annual educational statistics			X	
Student evaluation of teacher performance	X			
Exam cheating behavior (survey)	X			
Discussion with parents (minutes)	X	X	X	X

4.2. The purpose of using data in primary schools

The study aimed to find out the extent to which teachers in high performing and low performing schools use data for accountability, school development, and instructional improvement purposes. With respect to this, the teachers responded to a sixty-item survey instrument and their scores across the three data use purposes were analyzed using descriptive statistics. Teachers were asked to rate the strength of their agreement with the statements describing their extent of use of data for accountability, school development and instruction. Table 6 summarizes the means, std. deviations, minimum, and maximum values on the three scales. The results show that teachers in most of the schools scored high on data use for accountability purposes, generally because they rate most statements moderately positive. They also scored high in data use for school development and instructional improvement purposes, indicating that teachers generally agree with most of the statements in the three scales. Despite higher score in the scales, the mean scores also highlight some degree of disparity among schools in using data for accountability, school development and instructional improvement.

Table 6. Data use for accountability, school development and instructional improvement in each sample schools.

Data use purposes	Schools	School label	Mean	Std. dev.	Min.	Max.
Accountability (3 items)	1	High (n=29)	3.0805	.70517	1.00	4.00
	2	High (n=24)	2.9444	.55313	2.00	4.00
	3	High (n=33)	3.2525	.44120	2.33	4.00
	4	High (n=22)	3.4697	.44435	2.67	4.00
	5	Low (n=35)	3.1810	.64343	1.00	4.00
	6	Low (n=30)	2.9111	.27589	2.33	3.33
	7	Low (n=17)	2.5294	.45733	1.67	3.33
	8	Low (n=45)	3.2296	.49145	2.33	4.00
School development (9 items)	1	High (n=29)	3.0421	.68003	1.11	4.00
	2	High (n=24)	2.7778	.39454	2.00	3.67
	3	High (n=33)	3.1010	.39904	2.11	4.00
	4	High (n=22)	3.2071	.48286	2.44	4.00
	5	Low (n=35)	3.0508	.58568	1.00	4.00
	6	Low (n=30)	2.9074	.40651	2.11	3.67
	7	Low (n=17)	2.6536	.56640	1.44	3.78
	8	Low (n=45)	3.1037	.44026	2.33	4.00
Instructional improvement (11 items)	1	High (n=29)	4.2508	.83449	2.00	5.64
	2	High (n=24)	4.5833	.84770	2.27	5.64
	3	High (n=33)	4.7824	.49216	3.00	5.82
	4	High (n=22)	4.5041	1.0795	1.55	5.91
	5	Low (n=35)	4.4104	.72740	2.64	5.64
	6	Low (n=30)	4.4424	.78230	2.36	5.36
	7	Low (n=17)	4.4706	.67054	3.00	5.45
	8	Low (n=45)	4.6626	.60849	2.91	5.55

Note: For accountability and school development, the possible alternatives were: 1 = strongly disagree; 2 = disagree; 3 = agree; and 4 = strongly disagree. Whereas for instructional improvement, possible alternatives were 1 = almost never; 2 = yearly; 3 = twice a year; 4 = monthly; 5 = weekly; and 6 = twice a week. Further, Schools 1, 2, 3, and 4 are high performing schools whereas Schools 5, 6, 7, and 8 are low performing schools.

For the analysis with regard to high performing and low performing schools, and to determine whether there was a significant mean score difference between them, a one way analysis of variance (ANOVA) was calculated. Descriptive statistics on data use for accountability, school development, and instructional improvement are presented in Table 7. The results (see Table 7) show that teachers in both high and low performing schools generally did not differ, suggesting that they agreed to most of the statements in data use for accountability (M=3.1821, SD=.57172; M=3.0472, SD=.54550) and school development (M=3.0350, SD=.51975; M=2.9825, SD=.51137), and use data at least moderately for instructional improvement (M=4.5387, SD=.82422; M=4.5154, SD=.69452). Although teachers in high performing schools scored slightly higher than teachers in low performing schools across the three scales, the difference was not statistically significant ($F_{(1, 233)} =$, $p<.05$), suggesting that there was no real difference on data use for accountability, school development and instructional improvement purposes between high and low performing schools (see Table 8).

Table 7. Descriptive statistics for teachers' data use for accountability, school development and instructional improvement for high and low performing schools.

Data use purpose	High performing schools (n=108)	Low performing schools (n=127)	Total (N=235)
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Accountability	3.1821(.57172)	3.0472(.54550)	3.1092 (.56056)
School development	3.0350 (.51975)	2.9825 (.51137)	3.0066 (.51480)
Instructional improvement	4.5387 (.82422)	4.5154 (.69452)	4.5261 (.75532)

Note: For accountability and school development, the possible alternatives were: 1 = strongly disagree; 2 = disagree; 3 = agree; and 4 = strongly disagree. Whereas for instructional improvement, possible alternatives were 1 = almost never; 2 = yearly; 3 = twice a year; 4 = monthly; 5 = weekly; and 6 = twice a week.

Table 8. One-way Analysis of variance (ANOVA) of data use for accountability, school development, and instructional improvement for high and low performing schools.

	Source	SS	df	MS	F	Sig.
Accountability	Between	1.061	1	1.061	3.413	.066
	Within	72.469	233	.311		
School development	Between	.161	1	.161	.605	.437
	Within	61.854	233	.265		
Instructional improvement	Between	.032	1	.032	.055	.814
	Within	133.467	233	.573		

Using a semi-structured interviews, teachers, school leaders and professional development facilitators were asked to explain what kind of data they use for accountability, school development and instruction, and how. Below, the description of data from interview responses are presented in three sub-sections corresponding with data use purposes.

4.2.1. Data use for accountability in high and low performing schools

On data use for accountability purposes, the respondents were asked to explain how they use data for evaluating performance, monitoring the achievement of goals, motivating students and the staff, and meeting accountability demands by regularly reporting to parents and school administration. Below is the within-case analysis of data use for accountability purposes in high and low performing schools followed by a cross-case examination between them.

4.2.1.1. Within-case analysis: data use for accountability in high performing schools

One consistent finding that has surfaced from the interview of teachers, principals and professional development (PD) facilitators was their understanding of data use in terms of meeting the accountability demands. With regard to *evaluating teachers' performance*, interview responses indicate differences among the high performing schools in the sense that School 1 stands out more explicit in using student assessment, data on teacher utilization of instructional time, and the provision of additional learning opportunities especially for low achieving students to evaluate teachers' performance. Whereas in School 2, data use was mentioned only slightly as teachers' participation in professional development activities is one component of teachers' evaluation and a criteria for nominating teachers for other training programs provided mainly by external stakeholders. A principal from School 1 reported that:

> Decisions on career promotion and other benefit packages are based on data. For example, teacher quality and effectiveness of teaching is evaluated based on three categories of indicators: teachers' pedagogical content knowledge and skills, teachers' behavior, and students result.

Data use for *monitoring progress* in goal achievement was also mentioned though the responses indicate some degree of difference among schools in the extent of use. While there was no mention of using data to monitor goal achievement in School 2, the responses in School 1 appears to be more explicit and explanatory. Periodic review of performance was conducted to evaluate the extent of achievement of planned activities and make adjustments when the review has shown otherwise. As indicated in the school's development plan "four performance review meetings will be held with stakeholders per year", where performance was planned to be checked using school records, such as school minutes and school self-assessment reports. When asked about how schools were using data for monitoring goal achievement, a PD facilitator from School 1 reported that:

> The analysis of student results is given to departments for reviewing achievement levels. The analysis shows the status of each department in improving student achievement, and on which subject students are not doing well. It also shows what, how, and to what extent teachers needs to do in the future to reach to the planned target.

The responses also indicate that schools have different experiences in using data to *motivate students and the staff*. The responses from School 2 didn't show any kind of experience attributable for using data to celebrate achievements and improvement of practice. Whereas in School 1, the responses indicated that there are experiences of using data to celebrate achievements and improvements of the teachers. A principal from School 1 states that:

> "…students evaluate the performance of their teachers. Based on the evaluation result, teachers are ranked and the school recognizes those who perform well for their good performances".

The information from documents also provides evidence that School 1 uses interview and survey data to motivate students and the staff, where the school set target to increase "the percentage of teachers and students who feel they participate in the school decision-making to 95%".

Moreover, the responses indicated that data were used for *meeting accountability demands and complying with regulation* by periodically reporting (or communicating) activities for which they are responsible. In some schools however reporting data seemed to be a routine practice that should be performed periodically, which could be reducing its significance. For example in School 2, data (e.g. student achievement data) were reported because it is a standard requirement. As the PD facilitator stated "teachers need to record their PD activities in a portfolio….once checked and stamped by the principal, it will be filed with their profile as an evidence of their participation". Whereas in other schools like School 1 communicating student achievement data were reported to be helping teachers to identify problems and actions that would be taken by the school and other stakeholders for the purpose of improving student learning. A PD facilitator from School 1 reported that:

> The school uses the analysis result to communicate with parents especially when a child shows a decrease in learning and achievement. Teachers and school leaders make consultation with parents on the status of the student, the problems on achievement levels, and actions taken in the future by the school and the parent.

The interview and document analysis indicated that schools use data for accountability purposes, but there is noticeable difference within the high performing schools, where School 1 generally stands out better than School 2. While School 1 uses data to evaluate teacher performance, monitoring goal achievement, motivating students and the staff, and meeting accountability demands through periodic reporting, School 2 was restricted to use data for evaluating performance and meeting accountability demands.

4.2.1.2. Within-case analysis: data use for accountability in low performing schools

The responses from low performing schools also indicated data use for meeting accountability demands. That is, using data to evaluate performance, monitor progress towards goal achievement and regularly reporting performances as a standard procedure. Concerning the *evaluation of teachers' performance*, student achievement data were given more emphasis, where teachers were required to meet the student achievement targets set by the schools. A principal from School 8 stated that student achievement is the key component of teacher performance evaluation, where "teachers should meet the proportion of students who score below 50%, 50 to 74%, 75 to 84%, and above 85% as determined in the school target". Besides, classroom observation and supervision data, continuous assessment results, and lesson plans were reported to be checked in order to determine whether teachers have fulfilled (complying with) the performance evaluation requirements. A principal from School 5 reported that:

> We inspect teacher lesson plans to check to what extent teachers incorporated different domains of learning, active learning strategies and appropriate instructional materials. Continuous assessment documents are checked whether teachers comply with the school mandates. There are periodic classroom observations to see how teachers' create effective teaching environment.

Teachers however argued that principals and educational officials unrealistically assume teachers can improve the quality of education and demand improved student achievement scores in the absence of appropriate school setup and the presence of socio-economic differences between students. The criterion used in teachers performance evaluation and the direction coming from the *Woreda* (district) Education Office (WEO) often contradict with the school and classroom context. Explaining how teachers comply with the performance evaluation standards of the school, a teacher from School 5 raised concern on the risk that excessive demands has led some teacher to compromise on their professional ethics. He reported that:

> The target that says all students should score above 50% is tough to achieve given the large class size, workload, student absenteeism and low student motivation. This often pushed teachers to inflate student scores and compromise the authenticity of reported achievement scores in teacher made tests.

The interview responses also indicated that schools use data for evaluating teachers' performance in a more formative evaluation manner, where teachers at department level discuss the extent of content coverage and number of missed periods, student attendance, provision of tutorial classes, and the functioning of peer-led student learning groups. Indicating that formative performance evaluation is helpful to know about teachers' current performance levels, identify weaknesses and strengths, and anticipate possible actions, a PD facilitator from School 5 reported that:

> Teachers in their department evaluate their performances weekly and report to the school. They evaluate students' participation in learning groups, attendance, content coverage, missed classes, and tutorial support, and so on. They also compare their performances with others in the department. The evaluation result is used to rank departments and teachers.

The schools consider teachers as key players in their improvement processes and assign several roles for which teachers are accountable. The documents include targets, strategies of implementation, expected result, required resources including time, role owners and indicators of practice. However, there are targets written in a generic way that might preclude the chances to use data for evaluating performance. Similarly the performance indicators were also written in a way that simply describes the expected result. For example, School 5 intends to "use action research to develop teachers' capacity" and sets "training and discussions among teachers" as a means for implementation. While the expected result was described as "teachers' capacity is improved, and students' achievement reached to sufficient level", the indicators of performance simply say "evaluation against the plan".

For using data to *monitor progress* in goal achievement, reflections of respondents indicated that there is some degree of resemblance among low performing schools. The respondents mentioned student

assessment, attendance, repetition, and dropout data as frequently used data types to check whether teachers are achieving the targets set at the school level. Besides, data were reported to be used for determining the level of the school as expected by the Ministry of Education inspection manual. A PD facilitator from School 5 stated that:

> The school set goals to increase student achievement with a target of all students achieve above 50%. This target should also be translated into every subject and grade level. Student assessment results, attendance and demographic data are used to check achievement of the target and the school's rank in terms of input, process, and output.

Periodically reporting performance data for *meeting accountability demands* and complying with the regulation was mentioned by principals and professional development facilitators. The responses indicated that recording student achievement, behavior and discipline data and reporting to the school administration is one of teachers' responsibilities. A principal from School 5 stated that:

> Registration books are distributed to teachers to record student assessment results, classroom participation, and discipline and behavior. The recorded information is reported to the vice principal every month; and including final examination results at the end of the semester.

This point of view was also echoed by a principal from School 8. He stated that:

> Student data are reported in three ways to the *Woreda* (district) education office. First, at the beginning of the academic year, the number of students who get registered is reported. Second, there is monthly report of dropout students. Third, at the end of the semester, the proportion of students who achieve below 50%, 50 to 74 %, 75 to 84%, and above 85% is reported.

The responses overall indicate that low performing schools use data for accountability purposes more or less in the same manner. Data were used for evaluating performance in a more formative way that allows teachers to periodically evaluate their performance and compare with others in the school. Moreover, schools resemble in using data to monitor goal achievement at the school level and meeting accountability demands by regularly reporting to the administration. However, the results also indicated the risk of using data inappropriately when teachers are pushed by the 'unrealistic' expectations to manipulate student achievement scores.

4.2.1.3. Cross-case analysis: data use for accountability in high and low performing schools

Analyses of responses suggest that high performing schools displayed both similarity and differences in using data for accountability purposes. School 1 and School 2 exhibit some degree of resemblance in using data for evaluating teachers' performance and periodically reporting performance as a routine practice. However, the type of data and the ways it was used differ. For example, School 1 more often uses student achievement data, data on utilization of instructional time and additional learning support for low achieving students than School 2. Besides, data were used to motivate students and the staff by celebrating achievements and improvements. Hence, high performing schools were more different than similar when using data for accountability purposes.

Low performing schools however used data for accountability purposes more or less in the same manner. Different types of data, such classroom observation, continuous assessment, lesson plans and provision of tutorial classes were used to evaluate teachers' performance in formative manner, where teachers review performances and compare achievements with others to scale up best practices. Moreover, schools also used drop out and repetition data to monitor the achievement of goals by regularly evaluating planned activities, and reporting to the administrators. As a whole, high performing schools (particularly School 1) used different kinds of data for accountability purposes slightly better than low performing schools whose practice seems to be threatened by unrealistic expectations that might push schools to manipulate data.

4.2.2. Data use for school development in high and low performing schools

Regarding data use for school development, the respondents were asked to explain how they use data for school development planning process, setting priorities, goals and targets, shaping professional

development, supporting conversation with parents, teachers and administrators as well as reflecting on their own teaching practices. A separate within-case analysis of data use for school development purposes in high and low performing schools is presented below followed by a cross-case examination.

4.2.2.1. Within-case analysis: data use for school development in high performing schools

The respondents were first asked to explain how the school improvement and teachers' professional development plans were developed. The respondents unanimously expressed that school *development planning process* was participatory, where the school improvement committee mainly organizes the participation of teachers, students, and parents. For example, a principal from School 1 explains that "all teachers participate to express their views, about 60% of the students participate in filling the questionnaires, and some selected parents (about 40-50%) also participate" in the planning process. Although the planning process was described as participatory, the nature and extent of participation seemed to vary between stakeholders. For example, the participation of parents was described mostly in relation to fundraising, and monitoring student behavior and discipline. The principal continues to say the following:

> Parents participate in raising fund to fulfill school resources. They also help the school in shaping student behavior and discipline, where tripartite target setting is a good example. The school, the parent and the student set time bound goals to improve achievement; and parents agree to follow up the child's behavior and discipline, make regular school visit to consult teachers.

The nature of stakeholders' participation in school development planning, however, remains different within high performing schools. While some schools often used analysis of student achievement scores, classroom observation and supervision reports, and student satisfaction survey results to prepare teacher professional development plans (School 1), others base their decisions on discussions made during teachers' general meetings. Explaining how the contents for *professional development* were determined, a PD facilitator from School 2 stated that teachers made discussions on the challenges of teaching and learning. Following the discussion, "teachers forward the list of challenges [as professional development topics], of which they select the top three that are most commonly faced by them". Evidences from the schools' documents also appear to support what was obtained through interview responses, where schools follow almost similar PD format and structure, but differ on how they determine the content. Analysis of student achievement scores was the basis for determining the needs of professional development in School 1, but that was not the case in School 2. Rather, the school "identified twenty two" potential 'problems' during discussions with the teachers, from which ten of them were selected as topics for professional development.

The responses also suggest that there are distinctions in identifying areas of need for policy development and planning, and *setting priorities, goals and targets for improvement*. For example, School 1 appears to have used multiple sources of data, including assessment and classroom observation data disaggregated by different student characteristics, such as socio-economic status, to identify strengths and weaknesses that make comparison of baseline, actual and target achievement easier. Whereas in School 2 often used data were continuous assessment and final examination results disaggregated only in terms of the genders. When asked to explain what and how data are used for school development planning, a principal from School 1 reported that:

> …often a five year trend analysis of student results is conducted. For example, the analysis mostly indicated achievement gaps between students from the community and students from orphanage supported by our school where the former achieve better. So, one of the targets of this year's plan is reducing the achievement gaps between community and orphanage students by 20%. Data are used to monitor and evaluate the school improvement plan, compare baseline achievement with the target achievement and compare current actual achievement with a similar period in the previous year on the basis of student characteristics.

Using data for *shaping teacher professional development* was also reflected in the responses of teachers, principals and PD facilitators. However, these perspectives were not widely shared by respondents from all of the high performing schools, rather confined to some schools which seemed to have better data use practices. Only the responses of principals and PD facilitators from School 1 indicated that analysis of teachers' instructional planning, classroom observation, student satisfaction survey data, and student assessment results is often followed by identification of knowledge and skills gap of the teachers for intervention planning. A principal from School 1 stated that:

> The analysis of achievement scores may show some groups of students achieve below the target, as a result, we may need to design special support programs like tutorials. Based on student satisfaction survey, classroom observation and supervision reports as well as teacher satisfaction survey, we may organize training programs for teachers on specific skill development programs often in the form of professional development activities.

Setting priorities, goals and targets for professional development and shaping its nature and characteristics ongoing is partly related with how its content was determined initially. The PD and school improvement documents of School 1 indicated that the school set a goal to increase the "percentage of teachers, in the lessons observed, who adjusted their teaching strategies according to the interests of individual students and groups to 92.3%" based on teachers' interview and survey data. On the contrary, School 2 bases its decision on teachers' discussions. The responses also indicate that schools used data for *supporting conversations with parents, students, and teachers* and with the school administration. For example, teachers use assessment results to reflect on their own teaching practice often in department level evaluative meetings and professional development sessions, including how they developed differential instruction for students, student achievement, attendance and participation in classroom activities and the functioning of peer-led team learning approach. A PD facilitator in School 1 states that:

> For example, when student achievement score shows problems, we discuss with the student, parents, and teachers; then we identify whether the problems are related to the exam, the student, or the teacher. We collect parents' views, teachers' records and views about the student, and then propose interventions to change the achievement problem.

This point of view was also echoed by another PD facilitator from School 2 who says that "teachers reflect on their own teaching practices in PD sessions, and often followed by questions and propositions from other teachers". Evidence from the schools' documents also indicate that high performing schools exhibit noticeable difference within themselves in using data for meeting accountability demands by complying with regulations. While School 1 sets performance target to conduct "four meetings per year with parents to present and discuss student assessment methods, learning achievements and annual learning targets" and intends to use school records and self-assessment data for verification, School 2 often focuses on phony targets that appears to be difficult for measurement. For example, School 2 sets targets to "establish partnership with external stakeholders and improve teaching and learning". However, there was no mention of what data can be used to measure performance level and how.

The evidences suggest that schools created different mechanisms to participate stakeholders in school development planning though the nature and extent of participation differ. While some schools participate the staff to some extent in data collection and analysis (School 1), others define participation in terms of discussion to set out areas of professional development needs (School 2). They also differ in the amount of data collected and used to identify areas of need and set priorities, goals and targets. School 1 collected multiple types of data that were fairly disaggregated by different student characteristics than School 2 and used to set baseline, actual and target achievement goals. Moreover, differences were observed when using data to shape professional development. Several kinds of data (e.g. instructional plans, achievement and classroom observation data) were analyzed to base decisions for intervention planning to bridge teachers' knowledge and skills gap. High performing schools however displayed similarities in using data for supporting conversation. Also supported with data from school development documents, the differences within high performing schools override the similarities in using data for school development purposes.

4.2.2.2. Within-case analysis: data use for school development in low performing schools

Developing the *school improvement plan* in low performing schools follows almost the same process as in the high performing schools. The process starts with the formation of a school improvement committee charged with collecting data through questionnaires, interviews and documents (e.g. student achievement records and school minutes). Explaining the process of formulating the school development plan and what kinds of data were used to identify the areas of need for improvement and set priorities, goals and targets, a principal from School 5 stated that:

> The school improvement committee distributes questionnaires to teachers, conduct focus group discussion with students and parents, collects information from different documents, such as student achievement rosters, and school minutes. The committee then rates the extent of student achievement in different subjects as very high, high, low and very low, and decides target areas.

Although schools collected different kinds of data to determine areas of need for school development planning, they lack the necessary autonomy for *setting priorities, goals and targets*. The schools' effort to contextualize their school improvement planning seemed to be challenged as they were supposed to directly adopt targets set at national level. As such, student achievement data were mainly used to determine school level and classroom level goals. A principal from School 5 reported that:

> The school set targets in line with the government's national goals in the education sector which says that all students should score above 50%, 50% of students score 50-74%, 35% of students score 75-84%, and 15% of students score above 85%.

A teacher and PD facilitator from School 8 also explains how schools and individual teachers determine improvement goals. He stated that:

> The *Woreda* (district) Education Office expects schools to improve student achievement levels by 10% annually. The school then set its targets based on the direction coming from the education office. Similarly, teachers are supposed to improve student achievement by 10% from the previous year.

The evidence from the schools' development plans also indicate that low performing schools determine areas of need for teacher professional development through discussions with teachers on the overall problems influencing student learning and achievement. For example, in School 5 "twenty nine" potential areas or 'problems' were suggested, of which the school selected nine of them with a simple criteria whether the issue is related with professional development or not. Concerning the use of data for shaping *teacher professional development*, none of the respondents explicitly mentioned how data were used to identify the knowledge and skills gap of teachers, and plan for intervention. Hence, the possibility of schools to address the special professional learning needs of teachers on the basis of data and tackle emerging and trending issues in teaching and learning process would be greatly reduced.

Regarding data use for *supporting conversation with students, teachers, parents and school leaders*, continuous assessment and final examination results were commonly often used to initiate discussion during professional development, department and school level meetings. However, the discussions with parents were often dominated by issues of raising funds, student attendance and discipline (School 5 development plan and financial report). Explaining the benefits of data for initiating discussions among teachers, a principal from School 5 states that:

> In department meeting teachers discuss the practice of continuous assessment, peer-led learning, usage of instructional materials, etc. They compare their own performance with others, and share experiences to scale up best experiences.

Also, a teacher from School 8 mentioned how student assessment data were used for reflecting on teachers' own teaching practice in department level meetings. A teacher reported that:

> I administer tests to measure students' performance and report the result every month to department coordinator. At department we discuss on analyzes of average student

performance and on the strengths and weaknesses, and possible solutions for improvement. The analysis also compares performance of students' in terms of gender.

The responses indicated that schools collect different data (e.g. student achievement score) to prepare their school development. The participation of stakeholders (mainly teachers and students) was described in terms of providing information and filling out questionnaires to generate data for school development planning – setting priorities, goals and targets. Even though a lot of data were collected and made available, schools' autonomy to identify development needs and set goals and targets on the basis of the data was reduced as they were required to adopt nationally set student achievement targets. Also, the possibility of schools to contextualize school development planning in a way that explains their internal capacity will be affected. Low performing schools were also experience more similarity in using data for supporting conversation with students, teachers, parents, and the school administration. While the discussion with teachers and school administration often centers on achievement results, their conversation with parents were mainly focus on student attendance and disciplinary issues.

4.2.2.3. Cross-case analysis: data use for school development in high and low performing schools

The respondents in high performing schools almost unanimously indicated that school development planning was participatory in nature. However, the way participation was described differs across schools. While in some schools teachers participate in data collection and analysis (School 1), others explain participation in terms of discussions to determine professional development needs (School 2). The nature and characteristics of data collected and used to identify priorities, goals and targets also vary, where School 1 used more data to set baseline, actual and target achievement goals than School 2. Moreover, high performing schools displayed difference when using data for shaping teacher professional development. Data on student achievement, classroom observation and instructional planning were used to identify professional development needs and for intervention planning. A slight resemblance however was shown on data use for supporting conversation often in the form of department level evaluative meetings and professional development sessions. High performing schools were exhibit more differences than similarities in using data for school development purposes, where School 1 appeared to use data more constructively than School 2.

Low performing schools also participate stakeholders in development planning process. Stakeholders provide information during discussions and survey questionnaires for the schools to determine priority areas and set goals and targets. However, the data were not sufficiently used as schools were required to adopt targets set by the *Woreda* (district) Education Office which determines the goals based on nationally set standards. Lastly, low performing schools used data (e.g. student achievement, attendance, and discipline) for supporting conversation with stakeholders during department based weekly evaluative meetings and professional development sessions, where teachers often reflect on their own teaching practice and share experiences.

Several instances of data use for school development purposes have been raised both in high and low performing schools. Respondents reported data use for identifying professional development needs, setting goals and targets, shaping professional development and initiating conversation with stakeholders. However, these aspects of data use were less distributed among schools; high performing schools appeared to be more diverse than low performing schools which displayed more similarity between themselves. When comparing high and low performing schools, the high performing schools (particularly School 1) were generally better in using data for school development purposes.

4.2.3. Data use for instructional improvement in high and low performing schools

On data use for instructional improvement the respondents were asked to explain how and what data they use to monitor student progress, make instructional changes (e.g. differential instruction) and provide feedback for students to encourage self-directed learning. Below, within-case analysis of data

use for instruction in high and low performing schools was conducted followed by a cross-case examination between them.

4.2.3.1. Within-case analysis: data use for instructional improvement in high performing schools

Interview responses of teachers, principals and PD facilitators from high performing schools indicated that a wide range of academic, socio-economic, behavioral and psychological data were used to monitor student progress, make instructional changes for certain groups of students who need special learning support, and encourage students to regulate their own learning. Data were also used to provide additional academic and psychological support for low achieving students. For example, teachers train students on study techniques and strategies. A principal from School 1 reported that:

> Achievement scores disaggregated by subject, grade, gender, national exam, school based exam, socioeconomic background like students from the community and scholarship were used to differentiate students into achievement levels and to provide support for low achievers. Analyses students' exam cheating behavior, teachers' satisfaction on students' progress and achievement also used to inform additional academic and psychological support.

Regardless of the amount of data available, teachers in some high performing schools mainly rely on aggregated student achievement scores – continuous assessment and final examination results – to make instructional decisions. When asked about which data the school uses for making instructional changes and monitor students' progress in learning, a teacher from School 2 stated that:

> …..continuous assessment results makes at least 60% of student assessment results, and the rest will be final examination. Using the continuous assessment result, I also monitor the functioning of peer-led team learning groups and categorize students into three groups: high achievers, average achievers and low achievers. Then, I often provide additional tutorial classes for low achieving students.

Although the responses show considerable degree of variations in type and characteristics of data available, there seems to be a general pattern across the high performing schools that continuous assessment data provide teachers timely information about students' progress that they can use to plan additional learning support for low achieving students. Explaining how teachers should use data to monitor student progress in learning, a PD facilitator from School 2 stated that:

> Teachers should have a portfolio that contains student continuous assessment scores, participation in classroom activities, and behavior. Then, teachers can easily monitor student learning and identify their problems as early as possible.

The responses indicated the use of data for making instructional changes to address special learning needs of certain groups of students (e.g. low achievers) through differential instruction. However, it was not clear what differential instruction means, because the tendency to equate differential instruction with after school tutorial classes seemed to be dominant inmost responses. High performing schools show differences in the type and ways of using data for monitoring student learning to make instructional changes. For example, as an indicative of using multiple types of data to address the learning needs of students through differential instruction, School 1 in its development plan include goals related to assessment methods, nature of feedback, additional learning time devoted to low achieving students. These include: "the number of assessment methods per subject to assess student learning will be at least 12 by the end of the year", "percentage of consistency, frequency and quality of feedback given by teachers per subject will be 100%", "percentage of students who get extra teaching support…will be 9.3%", and "average number of hours per semester each teacher spends providing extra teaching support….will be 32 hours". However, in School 2, the indicators of practice were not explicit enough to show which kinds of data can be used for planning additional learning support for students.

Data were also reported be used for *encouraging students to monitor their own learning* and develop self-directed learning competence. This was mentioned only by respondents from School 1, the principal states that:

> Recently, we have organized student meta-cognitive skill training based on the data collected during student hearing session that show some level of stress going on among students as they were preparing for the national exam.

The PD facilitator also explains how data can be used to make students accountable for their own learning when they participate in setting goals. Setting goals make students responsible to monitor their own learning and motivates them towards higher achievement. He stated that:

> Students are encouraged to set achievement goals every semester based on their previous achievement as a bench mark. For example, a student who achieved 85% in math might plan to reach 90% in the current academic year. They also state what they can do by themselves and what they expect from teachers and parents.

The responses indicated that there are distinctions within high performing schools regarding data use for instructional improvement purposes. For example, both School 1 and School 2 reported that they use data to group students into different achievement levels and provide additional learning support for low achieving students. But, the types of data and the way they use these data differ. School 1 collects and analyzes a lot of academic, socio-economic, and psychological data disaggregated with different student characteristics while School 2 uses mostly aggregated continuous assessment and final examination results. School 1 had also advantage over School 2 in using data to encourage students' self-directed learning competence by monitoring their own learning.

4.2.3.2. Within-case analysis: data use for instructional improvement in low performing schools

Various kinds of data are also available in low performing schools which they can use for instructional improvement purposes. For example, a principal from School 8 reported that student achievement data, teachers' and the school management minutes are used to monitor student progress, identify their learning problems and take corrective measures, such as tutorial support. Indicating multiple ways that schools can use assessment data for making instructional decisions, the principal stated that:

> Achievement data are mainly used to improve student learning. For example, semester based analysis of student achievement score is used to identify strengths and weaknesses and make corrective measures on planning, monthly analysis of continuous assessment scores is used to monitor how well students are learning, and provide additional support.

However, there seems to be more reliance on assessment results as the basis to "identify strengths and weaknesses in student learning" and create additional learning opportunity for low achieving students. Continuous assessment was mentioned as a basis for implementing peer-assisted learning in the classroom, where students with better academic performance lead groups of five other students with different achievement levels. As a result strong leverage is placed on continuous assessment of student achievement as it allows teachers to identify students based on their achievement and organize them into teams. A teacher from School 8 explains this as follows:

> I administer continuous assessment tests to identify students as low, average, and high achievers; provide tutorials for the low achievers; and organize them into peer-led learning groups. A student with good achievement coordinates five other students who have different achievement levels.

Data use for instructional improvement in low performing schools mainly centers around the use of continuous assessment results to classify students into different achievement levels to provide additional tutorial support for low achieving ones. Moreover, the continuous assessment data were used to assign students into different peer-led team learning groups. There was no mention of using data to encourage students monitor their own learning so that they develop self-directed competence. On the whole, low performing schools appears to resemble in their use of data for instructional improvement purposes.

4.2.3.3. Cross-case analysis: data use for instructional improvement in high and low performing schools

A cross-case examination of data use for instructional improvement between high and low performing schools indicated both similarities and differences. In both cases, schools used data to group students into different achievement levels as low, average and high achievers based on continuous assessment and final examination results. The continuous assessment data were also used to form peer-assisted learning groups which are considered in most schools as a pedagogical response to improve the achievement levels of low achieving students. However, there are aspects of data use on which high performing schools (School 1) had advantage over low performing schools. For example, while continuous assessment data remain to be an important source of information for making instructional change, the nature and characteristics of data and the way it was used differ. The data in School 1 were relatively better disaggregated and encompass a wider range of data types. Using data to improve students' self-directed learning competence was also an addition.

4.3. Factors affecting data use in primary schools

Regarding the factors influencing data use, multiple regression analysis was calculated to determine the extent to which data characteristics, user characteristics and school organizational characteristics influence data use for accountability, school development and instructional improvement purposes. Preliminary analysis were performed to ensure the fulfillment of the assumptions of multicolinearity, homoscedasticity, independent errors (Field, 2009). Table 9 shows the results of the regression analysis regarding the variables influencing data use for accountability, school development and instructional improvement.

The regression model was run three times to determine the influence of the predictor variables. The first was the analysis with data use for accountability as dependent variable and data characteristics, user characteristics, and school organizational characteristics as independent variables, where overall model was found significant to predict the outcome variable (R^2 = .60, F=115.318, p<.001). The results also show that although all the factors positively influence data use for accountability, only school organizational characteristics were found to have a significant and strong influence (b=.707, SE=.070, p<.001).

Second, the regression analysis with data use for school development purpose as a dependent variable and data characteristics, user characteristics, and school organizational characteristics as independent variables was conducted, where overall model was found significant to predict the outcome variable (R2 = .582, F = 107.202, p<.001). The regression result also reveal that data use for school development was significantly and strongly influenced by data characteristics (b = .119, SE = .070, p<.05), user characteristics (b = .246, SE = .066, p<.001), and school organizational characteristics (b = .508, SE = .066, p<.001).

Lastly, the regression model with data use for instructional improvement as a dependent variable and data, user, and school organizational characteristics as predictor variables was run, where overall model was found significant to predict the outcome variable (R2 = .144, F = 12.988, p<.001). The result shows that although the predictor variables positively influence data use for instructional development, only data characteristics (b = .191, SE = .147, p<.05) and school organizational characteristics (b = .179, SE = .138, p<.05) displayed significant influence. The predictor variables (factors) accounted for 60% of the variance in data use for accountability, 58.2% in data use for school development, and 14.4% in data use for instructional improvement.

Table 9. Results of multiple regression analysis, factors influencing data use.

Variables	Accountability B(SE)	Development B(SE)	Instruction B(SE)
Data characteristics	.053 (.075)	.119 (.070)*	.191 (.147)*
User characteristics	.055 (.070)	.246 (.066)**	.067 (.138)
School organization	.707 (.070)**	.508 (.066)**	.179 (.138)*
R	.774	.763	.380
R Square	.600	.582	.144
Adjusted R Square	.594	.577	.133
df	3, 231	3, 231	3, 231
F	115.318	107.202	12.988

** Regression is significant at the 0.01 level (2-tailed).
* Regression is significant at the 0.05 level (2-tailed).

In a qualitative interview, teachers, principals and professional development facilitators were asked to identify factors that enable and hinder data use and describe how they affect data use in schools. They mentioned a range of school organizational, user and data related factors influencing data use, and their responses are presented below.

4.3.1. School organizational factors that enable and hinder data use in high and low performing schools

On school organizational factors that can enable and hinder data use, the respondents mentioned the culture of data use (including the norms and values), workload and shortage of time, availability of resources such as computers, and leadership and support system.

4.3.1.1. Within-case analysis: school organizational factors in high performing schools

The respondents dominantly mentioned school organizational factors to influence data use. The factors include the culture of data use, workload and availability of time to work with data, and availability of resources and a support system. Although these factors were mentioned by most of the respondents the way they were reported to affect data use was generally different. For example, a PD facilitator from School 1 indicated that *absence of designated time* to work with data is because of lack of professional development opportunities on data use, rather than workload. Attempts to share experiences obtained from previous training opportunities on data use were limited, and makes it less widespread in schools. However, workload and availability of time affect data use differently in School 2 where the respondents mentioned lack of time to work with data was mainly caused by high workload. A teacher from School 2 stated that:

> It is hard because teachers are required to teach up to 24 periods per week [1 period is 50 minutes], perform continuous assessment of students, coordinate co-curricular activities, participate in professional development, and report all these…

A principal from School 2 also reported how lack of time and unplanned seasonal activities hinders him and the staff in general to work on innovative ways of teaching, such as data based decision making. He reported that:

> Sometimes we are occupied with seasonal activities coming from the education office. For example, we have to be able to make grade 1 students master reading, writing, basic arithmetic until December 30. It is difficult to stick to the schedule of the school.

Availability of resources such as computers and the *support* provided by the school 'data gathering team' was also reported to affect data use positively. However, schools vary in the extent to which they provide sufficient number of computers for teachers to record and manage student data. Insufficient access to computers prevents teachers from improving their knowledge and skills to summarize and interpret student data. In addition, the lack of designated time for support and the

temporary nature of the data gathering team (mostly organized annually and has adhoc character) reduce the chance of getting a structured and sustainable support system. A principal from School 1 stated that:

> The data gathering team that includes ICT and mathematics teachers distributes questionnaires to teachers and students to gather information on the teaching, learning, assessment and other issues. Also, collects continuous assessment and final examination results from teachers at the end of the semester. Registered and organized in a computer file, the data will be available for teachers to use.

Schools have a record office charged with collecting, organizing, analyzing and interpreting various kinds of educational data related to students and teachers. Current activities however are very limited and are not more than collecting and storing student assessment, examination, and attendance rosters, and teachers and staff profiles. A principal from School 1 reported that:

> Actually the record personnel are supposed to carry out data management and analysis. But that is not the case. They do not have training in statistics, or data management. So, what the record office does is not more than keeping manually recoded data, [such as teachers' profiles].

The *culture of using data* in general and in teachers' day to day practice particularly was mentioned as an important factor that hinders data use in schools. The respondents indicated that the value given to data may be contributing to its use. Although some degree of variation in the extent to attribute culture of data use was observed where School 1 stands out better than School 2, the response of a principal from School 1 seems to capture the situation in most of the schools. He reported that:

> The first, and probably a difficult problem is the culture of using data. Often teachers assess students, score exams, aggregate overall achievement scores, announce grades and submit the scores to the school. The same thing happens year after year [almost as a ritual]. So, breaking this culture was really difficult. Initially teachers were required to analyze student achievement scores for the subject they teach but now staffs trained in SPSS are in charge of the analysis. In general, the value for analyzing data is quite low.

Several school organizational factors were identified to influence data use, including culture of data use, workload and availability of time to work with data, resources and support system. These factors however influence data use differently. For example, in School 1 absence of designated time to work with data was mainly because of lack of professional development opportunities on data use, rather than workload. But in School 2 the main reason for limited amount of data use was lack of time due to high work load and unplanned seasonal activities. The other factor was availability of resources (e.g. computers) and support given by the school data gathering team which influence data use in School 1 positively though the support was not structured and systematic. In School 2 however these factors influenced data use negatively as teachers were not able to get sufficient computers to summarize and register student data. Lastly, the culture of data use also mentioned as a factor to influence data use mostly in a negative way because data and data use were not understood beyond a ritual of assessing, scoring, and aggregating of student results.

4.3.1.2. Within-case analysis: school organizational factors in low performing schools

School organizational factors were mentioned to influence data use often in a negative way. For example, a teacher from School 8 explains the reason why she was not using data other than student assessment results for grouping students into different achievement levels and assigning them into different peer-led team learning groups. High teaching load and other school activities were reported as reasons for the *lack of time* to work on data. The opportunity of working with data often in the form of professional development activities was also not available in schools. She stated that:

> There is high teaching load. For example, in this semester I teach 27 periods per week. Moreover, there are other school activities, such as professional development, coordinating co-curricular activities, and scoring of exam papers.

Concerning the *availability of resources*, all of the respondents mentioned mainly the lack of computers as a reason for not using data to the required level. As such, the schools data management system was based on manual registration of assessment results, attendance, dropout and repetition on data recording books which makes the process very tiresome and less easy for use.

The respondents were also asked to explain about the *availability and extent of support* in data use within their schools. All of them mentioned that there is a record office in schools however most of the time what this section does is collecting summarized attendance records, assessment rosters at the end of the semester or year, and documenting in and out going letters. The response of a principal from School 5 when asked to explain the role of the school record officer may capture the situation. He reported that:

> The school record office collects and keeps student achievement cards and rosters, attendance sheets, and teachers and other staff personal profiles, and letters. Also prepare profiles for newly registered or transferred students and staffs.

Multiple school organizational factors influence data use in low performing schools, mostly in a negative way. High teaching load, lack of professional development opportunities on data use and other school based activities (e.g. co-curricular activities) were the reasons for the lack of time to work with data. Moreover, the extent of availability of resources and support systems were also influencing data use in a way teachers were not able to use computers sufficiently due to lack of these resources. There were no professional development opportunities and support for the staff concerning data use. More importantly, the way these factors affect data use in low performing schools (Schools 5 and 8) seemed to be more or less similar.

4.3.1.3. Cross-case analysis: school organizational factors in high and low performing schools

Several school organizational factors influence data use within high performing schools, but differently in different schools. For example, in School 1, lack of designated time on data use was mentioned due to lack of professional development opportunities. Whereas in School 2, the main reason for limited amount of data use was related to lack of time due to workload and unplanned seasonal activities. The relative availability of resources (e.g. computers) and support provided by data gathering team (making data available for users) positively influence data use in school 1 though the support was not structured and systematic. However, these factors influenced data use in School 2 negatively as teachers were not able to sufficiently get computers to register and summarize student data. Lastly, the culture of data use influence schools' use of data mostly in a negative way because data and data use seemed to be understood little beyond a ritual of assessing, scoring, and aggregating of student results.

Similarly, multiple school organizational factors influence data use in low performing schools, but mostly in a negative way. High teaching load and other school based activities, such as co-curricular activities were the reasons for the lack of time to work with data. Moreover, lack of resources and support systems influence data use negatively. There were no professional development opportunities and designated time to support the staff on data use. More importantly, the way these factors affect data use in low performing schools (Schools 5 and 8) seemed to be more or less similar.

4.3.2. Data user related factors that enable and hinder data use in high and low performing schools

Data user related factors had surfaced in the interview responses of respondents, both in high and low performing schools. These include attitude and awareness about data use and knowledge and skills on how to work with data, including the skill of data collection, analysis and interpretation. A separate within-case analysis of the user related factors is followed by a cross-case comparison between high and low performing schools.

4.3.2.1. Within-case analysis: data user related factors in high performing schools

The respondents identified factors related to the characteristics of the user that influence data use in high performing schools. They mentioned knowledge and skills, and attitude and awareness to influence data use differently, where respondents from School1 generally perceive them positively. For example, a principal from School 1 says that "the school management has got training on educational management information system and some statistical software packages, such as SPSS". Moreover, "trend analysis of student achievement in subject, grade level, gender, national exam, school based exam, socio-economic status, such as students from the community and orphanage" also reported to change the quality of the school's development planning.

However, sharing knowledge and skills through professional development seem to be more important as some respondents were calling for refresher training. For example, a PD facilitator from School 1 says although ICT experts assist teachers whenever they want to do with computers, "refresher courses are necessary to activate teachers' knowledge about using data in a systematic manner, and refine their skills of using computer applications" because "there are also skill gaps. The skill to effectively and efficiently use computer applications like MS-Word, MS-Excel is low". Hence, knowledge and skills on data influence its use mostly in a negative way.

Attitude and awareness towards data use, that teachers should base their decisions to improve student learning on data and complying with the requirements by reporting to the school, was also mentioned by respondents. Schools however seemed to vary in their assessment of attitude and awareness as a factor influencing data use. While the respondents from School 1 mentioned attitude as an enabling factor by referring to the generally favorable attitude among the school staff, the respondents in School 2 consider attitude as a hindering factor for data use. For example, in School 2 a PD facilitator says that teachers often complain about workload and are "less willing to record and report data" because they consider it as an extra job.

4.3.2.2. Within-case analysis: data user related factors in low performing schools

The respondents from low performing schools also label the factors in the same way where knowledge and skills was reported to facilitate data use whereas attitude hinders data use. Teachers and PD facilitators indicated that many teachers have received training on basic computer applications. Also, some teachers mentioned their participation in a one-day orientation and experience sharing program about the benefits of recording data. However, the lack of resources and support system and workload decreases their practical engagement in working with data.

The other user characteristic to affect data use is attitude and awareness towards data and data use. All of the respondents mentioned attitude as a factor that hinders data use in schools. Principals and PD facilitators recognized teachers' workload for less engagement on data use, but according to a principal from School 5 "what matters most is teachers' willingness and commitment" to the expectation of the school. Teachers' attitude towards data use was also shaped by the organization and management of the classroom where (self-contained) teachers rarely refer to previous achievement of students who had been taught by other teachers. A teacher from School 8 stated that:

> I didn't get much difficulty to know my students as I taught them from grade 1 to grade 3. However, at grade 4, I get additional students who have been taught by other teachers; and I couldn't get them sometimes comparable with mine. It takes me quite some time to decide how much they can progress.

Teachers' hesitation to use data was also shaped by their attitude towards the quality of data available in schools. Asked to explain the reasons why he was not using previous student achievement data, a teacher and PD facilitator from School 8 reported that:

> I prefer to base decisions on my own current test results, because I don't know how they (students) have been taught before. Teachers may vary in handling peer-led learning groups and continuous assessment tests; some use assessment criteria strictly while others do not.

4.3.2.3. Cross-case analysis: data user related factors in high and low performing schools

User related factors mentioned by respondents include knowledge and skills, attitude and awareness towards data use. These factors however influence data use differently in high and low performing schools. The responses indicated that knowledge and skills was perceived as an enabling factor because the school make computers available and provide basic computer training for the staff (School 1). High performing schools assess the influence of user related factors differently in that attitude and awareness towards data influence its usage negatively (School 2). The intermittent character of support program and inadequate professional development opportunity on data use appear to reduce its widespread impact. Low performing schools show similarity in their perception of user related factors for data use. They (mostly teachers) reported knowledge and skills facilitate data use, but the lack of resources and support system limit them from using it. On the other hand, attitude and awareness towards data use were mentioned as factors negatively influence data use. Hence, the responses suggest more uniformity among low performing schools than high performing schools.

4.3.3. Data related factors that enable and hinder data use in high and low performing schools

Factors related to the characteristics of data were mentioned by respondents from high and low performing schools. These include availability of data, accessibility of data, and accuracy and quality of data. Below, a separate within-case analysis of how these factors influence data use in high and low performing schools is presented followed by a cross-case examination.

4.3.3.1. Within-case analysis: data related factors in high performing schools

The characteristics of data as a factor to affect data use has surfaced in the interview responses of respondents, but mentioned less frequently compared to others. For example in the high performing schools, mostly in School 1, the principals, teachers and PD facilitator mentioned availability, accessibility and quality of data as factors facilitating data use while there was no mention of such factors in School 2. A PD facilitator says that "the school data gathering team collects student assessment and examination data, record in EXCEL, and made it available for teachers to use". With regard to maintaining the quality of data, the principal mentioned the school's decision to use 'standardized exam' prepared by teachers who teach different sections. He also mentioned 'item bank' that the school collects all exam questions in order to maintain a balanced representation of different lesson topics and avoid repetition.

4.3.3.2. Within-case analysis: data related factors in low performing schools

Quality and availability of data were mentioned to influence data use in low performing schools. For example, according to a PD facilitator from School 5, data use may be influenced by lack of the required data often because teachers fail to record and report the data in a timely manner. She reported that:

> When we need a certain type of data, the data may not be found in time. There are delays in reporting about student learning, assessment, and attendance regularly. Though they (teachers) should report every quarter, but that is not always the case.

As to the quality of data, respondents differ in their characterization of the factor. When asked to explain how previous student achievement data was used for planning instruction, a teacher from School 8 imply that the lack of standardization in student assessment produced less reliable student achievement data. Accessibility of previous student achievement data was also constrained by lack of digital recording and data management system. She reported that:

> These students have been taught by different teachers, and were assessed differently from grade 1 to 3. When they come together at grade 4 you may not find them at different level. Even when you decide to trace their previous performance, it is not easy to get assessment results [due to manual data management system].

The characteristics of data influence data use in low performing schools mostly in a negative way. Availability of data hinders its use because of the delay of reporting data in time. The quality of data

also influence data use negatively as the current practice of student assessment produced less reliable achievement score.

4.3.3.3. Cross-case analysis: data related factors in high and low performing schools

The characteristics of data as a factor to affect data use has surfaced in the interview responses of respondents, but mentioned less frequently compared to others. Availability, accessibility, and a relative quality of data were reported to influence data use positively (School 1), where data gathering team played an important role. To improve the quality of available data, school level 'standardized exams' and collection of exam questions in an 'item bank' were implemented. There was no mention of data related factors in School 2. On the other hand, data related factors influence data use negatively in low performing schools. The required data may not be available (Schools 5 and 8) due to delay of recording and reporting data. Lack of standardization in student assessment and examination was also another reason for the low quality of data. In sum, data related factors were perceived differently, where they are recognized as facilitators in high performing schools and hindrances in low performing schools.

CHAPTER FIVE

5. Discussion and conclusions

The major purpose of this study was to investigate how primary schools in Ethiopia use data for school improvement. Particularly the study aimed to assess commonly available and used data in schools and examine for what purpose data were used. Further, the study sought to identify enabling and hindering factors and describe how they affect data use in schools. As an exploratory study to understand the problem more comprehensively, diverse sources of data and methods were employed. Accordingly, teachers, principals, PD facilitators provided information for the study. Data were collected using questionnaires, interviews, and school documents, such as school development plan, and analyzed using both quantitative and qualitative approaches. In this section, the results presented in the previous chapter are discussed in light of the literature to draw conclusions and implications for research and practice.

5.1. Kinds of educational data in Ethiopian primary schools

The results indicate that both high and low performing schools had a wide range of input, process, context, and output data available. The kind of data available in most schools were more or less similar except for slight variation in terms of the extent of data availability or pattern of disaggregation, where high performing schools appear to have a bit more disaggregated process and context data than low performing schools. With regard to input and output data, they seemed to have more or less a balanced representation. However, certain types of data were only found in some schools (e.g. data on socio-economic status found only in School 1). The high stake accountability system constituted within decentralized educational reform (Coburn & Talbert, 2006), such as the school improvement program, could explain why there is high availability of data in schools. Most importantly, the data inventory has shown wider range of process data both in high and low performing schools which is consistent with previous studies (e.g. Hawa, 2014). Other studies however reported that output data were the most commonly available data in schools (Bernhardt , 2009). Wider availability of data however does not seem to necessarily ensure its utilization as very few type of data were recurrently reflected in the interview responses and highlighted in the schools' development documents. A similar finding was reported by Schildkamp, Karbautzki, & Vanhoof (2014) about data use in five European countries; there are country wise variations, where schools generally possess wide range of data though most of them narrowly focus on achievement data that might lead to narrow form of data use predominantly focusing on cognitive outcomes. When explaining how they use data in the school improvement process, the respondents mentioned a low amount (or few types) of data during the interview, suggesting the limited scope of data use. Of the different types of data, however, process data were reported to be the most available and used data followed by output data. Further, analysis of schools' development plan indicated that schools generally did not seem to be making more use of data except School 1 whose school development plan included some considerations for school self-assessment data and decisions from deliberations involving community members and parent-student-teachers associations. Although schools collect a lot of data evidence-based decision making in setting school priorities

5.2. The purpose of using data in primary schools

The results of this study also seemed to indicate that schools used data for accountability, school development and instructional improvement purposes. High performing schools scored slightly higher mean in all the three scales of the survey questionnaire than low performing schools, but it was not statistically significant. This means that although these schools are categorized differently in relation to their performance on school improvement by the Ministry's standards, there is no relation with their extent of data use according to this study.

The qualitative analysis of interview responses however showed mixed results. While the high and low performing schools displayed similarity on certain aspect of data use, they also differ on other aspects. The differences were even more pronounced within high performing schools than low performing schools often because of the kind of data available and the way it was reported to be used. For example, for accountability purpose, continuous assessment results, classroom observation data, provision of additional support for low achieving students were used to evaluate teachers' performance and communicate periodically with the school administration (School 1 and 5). Data were also used to motivate students and the staff by celebrating achievements and improvements which sustain best performance. Other schools (School 2 and 8) often based decisions on student achievement data, data on the provision of tutorial support, attendance, dropout and repetition data to evaluate teachers' performance. Further, data were also used to monitor progress in goal achievement and reporting to the school administration.

As the results suggest, schools' data use seemed to be dominated by accountability purposes. The main reason why data use focuses on accountability purposes could be the current policies of decentralized school reform nested within nationally set policy and accountability structure (Mitchell, 2014). For meeting accountability demands and complying with the regulation, schools have to periodically report their performances with data to the [*Woreda* (district) Education Office], parents and the school governing body (Schildkamp, Ehren, et al., 2012). The interview response of teachers for example indicated that teachers have to register students' continuous assessment and examination results, attendance and participation in classroom activities and peer-led learning groups and report to departments where they together with other teachers formatively evaluate their extent of performance against the expected level. Yet, schools still differ on certain aspects of data use for accountability, where the differences could be explained among other things with differential supervisory support provided by the *Woreda* (district) Education Office.

With regard to data use for school development purposes, the survey result indicated both high and low performing schools scored above average, and the differences between them were not significant to impact their data use practices. However, due to the kind of available data and the way data were reported to be utilized, some differences were observed within and between high and low performing schools. For example, in high performing schools teachers participate in data collection and analysis and used student achievement, classroom observation data and instructional plans to identify professional development needs and set priorities, goals and targets for planning interventions which to some extent corresponds to the findings of previous studies, such as Breiter& Light (2006) and Coburn & Talbert (2006). Often a five year retrospective trend analysis of student achievement data was performed to set baseline, actual, and target achievement goals disaggregated on different student characteristics (School 1). Nevertheless, there is no clear evidence that schools' use of data for school development purposes has followed an eight-step data team procedure (Schildkamp et al., 2013) that is a systematic and structured framework consisting of problem definition, formulating hypothesis, data collection, data quality check, data analysis, interpretation and conclusion. Interestingly, however, the reported data use practices missed several important steps of effective data use.

Another interesting finding related to data use for school development is the participation of stakeholders mainly teachers in identifying professional development needs. Participation was defined in its narrow sense that teachers discuss on overall challenges of teaching and learning process influencing student learning and achievement, and decide the contents of professional development (Schools 2, 5 and 8). However, the possibility of using data from 'critical' teacher discussions would be low given schools are required to adopt targets determined at the Education Office, which is difficult to align with the schools internal capacity for development (Hopkins, 2001). Moreover, while the extent of using schools' self-assessment and inspection data in identifying priorities along with critical teacher discussions was not clear, most of the priorities identified through teachers' discussions could risk "intuitiveness" (Schildkamp et al., 2013), and are most likely to be felt needs. To improve, a school should set its own targets and goals representing its potential for development, rather than dealing with externally imposed accountability driven goals. The current condition of data use might be linked to the fact that schools are so stretched to accomplish ambitious goals which

resulted in distributing their capacity into too many fronts where they will end up with unsatisfactory performance in their school improvement efforts.

Schools also show differing characteristics when using lesson plans, classroom observation data, student satisfaction and assessment results as well as teachers' performance evaluation to shape professional development. In some schools (e.g. School 1), the school leaders and PD facilitators fairly used disaggregated continuous assessment results, final examination results and teachers' performance evaluations to identify student learning problems and supporting teachers to implement differential instructional activities (Breiter & Light, 2006;Brunner et al., 2005). Whereas in most of the schools (Schools 2, 5, and 8) there was low level of data use probably because of the fact that data often used to determine the contents of professional development were collected in short lived teacher discussions which more often to be teachers' judgments and recent experiences that shape their thinking rather than evidence.

Concerning data use to support conversation, responses from high and low performing schools indicated more or less similar experiences. Schools predominantly used data on continuous assessment and final examination results and student attendance to start discussions with teachers, students, parents and school leaders (Breiter & Light, 2006;Brunner et al., 2005). However, the type of data and relative focus of the discussion differs with the type of stakeholder involved in the discussions. For example, teachers use achievement data, attendance and participation data and data on the functioning of peer-led team learning approach to reflect on their own teaching practice in department based evaluative meetings and professional development sessions, where they evaluate features that went well and that didn't go so well (Breiter & Light, 2006; Brunner et al., 2005; Young, 2006). The discussions with parents were often dominated by issues of raising funds, student attendance and discipline, where schools' financial reports, dropout and repetition data were mainly used.

Regarding data use for instruction, the survey result was not big enough between high and low performing schools. However, the case study findings indicated that there are some similarities as well as differences within and between them. In both cases, schools seemed to focus on continuous assessment and examination data to group students into different achievement levels as low, average and high achievers. The continuous assessment data were also used to assign students into peer-led team learning groups which are considered in most schools as a pedagogical response to improve the achievement levels of especially low achieving students. This narrow focus of data as assessment and examination results (Schildkamp et al., 2014) may be accounted for the level of data literacy in schools where data were not adequately and systematically collected, analyzed, interpreted and used to change teaching practice and improve student outcomes (Schildkamp et al., 2013). Or otherwise known as that the schools' data use experience can be described as conceptual data use in that teachers reported data use experiences could impact often indirectly via changing teachers' attitude about data and data use. Schools also differ on other aspects of data use for instruction, where high performing schools (particularly School 1) had advantage over low performing ones (Schools 5 and 8). For example, while continuous assessment and final examination data remain to be an important source of information for making instructional change, such as identifying students as low, average and high achievers, and assigning them into peer-led learning teams, the nature and characteristics of data and the way it was used differ. The data in School 1 were relatively better disaggregated and encompass a wider range of data types. Using data to improve students' self-directed learning competence was also an addition.

The results of this study in general seemed to indicate that schools' use of data for accountability and school development purposes override data use for instructional improvement. The focus seemed to be more on accountability as schools had to adopt district level targets set by the Education Office. As (Schildkamp et al., 2014) argued, while holding schools accountable for the education they provide is important, the main focus of data use should be on improvement of the school and student learning. According to them, data use can lead to sustainable improvement when data are used for

accountability, school development, and instructional improvement purposes simultaneously and with a balanced emphasis to each of the purposes of data use.

5.3. Factors affecting data use in primary schools

The results of this study further show that data use for accountability purpose is influenced by school organizational factors. The use of data for school development is influenced by data characteristics, user characteristics and school organizational characteristics. Also, the use of data for instructional improvement is influenced by data characteristics and school organizational characteristics. These factors however influence data use differently in high and low performing schools. *School organizational characteristics* influence all the three types of data use significantly, indicating the importance of this factor. In some high performing schools (School 2) and low performing schools (Schools 5 and 8) teachers perceive school organizational factors as barriers for data use. As the results suggest several accountability mandates placed on schools created enormous pressure and seemed to dilute the schools capacity for real improvement based on data. For example, schools are required to adopt externally set achievement targets in order to reach the global mandate of achieving universal access to primary education while maintaining its quality (MoE, 2010). The challenge therefore is that schools are required to improve student achievement in the absence of appropriate setup and opportunities for data use in one hand and continued demand to achieve national and international commitments. This seems to trap schools to deal with competing goals which are often contradictory to each other – complying with accountability demands of increasing access to education and improving its quality.

Other factors also include lack of leadership and support system for example in the form of professional development on data use, unplanned seasonal activities, high work load, and the culture of using data beyond the usual practice of assessing, scoring, aggregating and reporting of student achievement data. Previous studies (e.g. Schildkamp et al., 2014) however reported the positive influence of organizational factors such as teacher collaboration on data use, support by a data expert, and school leaders' encouragement and facilitation of data use. This could be explained by the focus on accountability system may vary in different educational systems with varying conceptions, speed and impact (Greaney & Kellaghan, 2008) which may create possibilities or barriers for data use. For example, the degree of centralization and decentralization across educational systems varies enormously, so does the meaning of accountability among stakeholders within an educational system itself (Harris, 2002). In developing countries, where this study is based, it is assumed that using disaggregated data related to the mandates of teachers and educational leaders can secure accountability in a decentralized educational system (Davison, Soboka, & Berkie, 2010) as accountability is seen as a mechanism to empower schools to collect data from their contexts, analyze and interpret data, and take the necessary actions based on data.

With regard to *user characteristics*, teachers' skills and knowledge (data literacy), and attitude and awareness towards data were recognized to influence data use in high and low performing schools. Teachers' reported skills and knowledge of using computers influenced data use positively (e.g. School 1) where the relative availability of resources and support provided (by a data gathering team) help high performing schools to show signs of improved data use. However, data literacy is something more than working with computers to record and summarize student achievement data. Rather, it requires the schools' decision on the appropriateness and usefulness of data for the purpose, the quality of data, and the correctness of data analysis and appropriateness of the interpretation (Schildkamp et al., 2013) also the pedagogical content knowledge to know what to change and improve based on the data (Young, 2006). The lack of resources and support system, workload and insufficient professional development opportunity on data use appear to reduce its widespread impact (Schools 1, 5 and 8).

Concerning attitude towards data use, the respondents reflected diverse views. The respondents generally tend to have positive attitude that data use can lead to improvement (Datnow et al., 2007; Schildkamp & Kuiper, 2010), but their practical engagement in some kind of data use practices was

limited. For example, teachers, mostly in low performing schools, hesitate about the reliability of previous student achievement data and this negatively influenced their use of data (Schools 2, 5, and 8). Several factors were mentioned for this, including inconsistent application of continuous assessment, lack of 'standardization of exams', and organization of the classroom where a self-contained classroom management at lower primary level obviously resulted in differences in maintaining standards. Furthermore, although schools possess a lot of self-assessment and inspection data, awareness on how these data can be used for school improvement planning process appear to be low. Whereas in high performing schools (School 1), attitude towards data was reported to influence data use positively, where for example, school staff participated in training programs on data analysis techniques. This difference could be related with other factors mainly with school organizational factors.

Data and data system characteristics significantly influenced data use for school development and instructional improvement purposes. However, it has surfaced in interview responses less frequent than others, and influence data use differently in high and low performing schools. Data and system characteristics includes a functioning data management system and access to reliable and timely data which is a precondition for effective data use (Breiter & Light, 2006; Schildkamp & Kuiper, 2010; Wayman & Stringfield, 2006), where schools with these data systems are more likely to show better data use practices than those that do not have. As such, in some high performing schools (School 1) the relative availability, accessibility, and quality of data influence data use positively, but there was no mention of these factors in School 2. Moreover, experiences such as administering school based 'standardized exams' and collecting exam questions in an 'item bank' as well as the role of data gathering team seemed to be contributing positively to get relatively reliable student achievement data to base decisions for improvement. On the contrary, low performing schools perceive data related factors to have influence in a negative way (Schools 5 and 8). Delay in recording and reporting student assessment and examination data and lack of standardization in student assessment were implicated from teachers and school leaders' responses.

On the whole, data use was influenced by data, user, and school organizational factors, where the later was influencing data use for accountability, school development, and instructional improvement purposes. The interview responses also show that most of the factors influencing data use were within the category of school organizational characteristics. However, these factors do not seem to be operating independently, rather the issues mentioned in one of the factors were either the cause or consequence for the other factor. Hence, these influencing factors are interrelated.

5.4. Unintended uses of data in primary schools

Instances of unintended data use were reflected during the interview, but very few. The first is abuse of student achievement data, which happens when teachers inflate student scores and compromise the authenticity of reported achievement scores in teacher made tests in order to meet the proportion of students who should score above 50% – the minimum proficiency benchmark set by the Ministry of Education. Schools are required to reduce dropout and repetition rates to open up space for newly enrolled students to achieve universal access to primary education. This large amount of accountability pressure and lack of support creates undesirable use of data (Schildkamp et al., 2013) which undermines the schools' opportunity for improvement and the data generated through this process does not reflect the actual performance of students and the schools (Ehren & Swanborn, 2012). Another example is copying school development plans from another school. For example School 2 and 5 had school development plans which in most of its parts include exactly the same contents and wording.

5.5. Conclusion

Data has received increasingly wider attention; and insight into how it is used in schools, its enablers and barriers becomes crucial. Despite efforts made to improve schools through a decentralized school development planning process, results remain largely unsatisfactory. As school improvement is a

research based and problem solving process, it is necessary to investigate how schools use data for improving student learning, which factors explain data use and how. Literature from the existing knowledge base was reviewed to understand the relationship between the variables involved in using data for school improvement. Data were collected from a sample of schools using questionnaires, interviews and documents, systematically organized and used for analysis. Descriptive statistics and one-way ANOVA was calculated to compare schools categorized by the Ministry of Education as high and low performing schools in their use of data for accountability, school development and instructional improvement purposes. Finally, multiple regression analysis was computed to identify the factors influencing data use. Consistent with findings of the study, the following conclusions could be drawn from the results of this study:

- With regard to availability and use of educational data, the results indicated that both high and low performing schools have a wide range of input, process, context, and output data available. High performing schools are less similar than low performing schools in terms of the extent of availability and disaggregation of certain kinds of data. Process data were the most widely available data type in schools followed by input data. However, the availability of a large amount of data does not guarantee or seem to support actual use of data in schools. The respondents mentioned fewer types of data during interviews, most of which were process and output data, suggesting the limited scope of data use to impact school improvement efforts.
- Concerning the purpose of data use, respondents from high and low performing schools indicated their use of data for accountability, school development and instructional improvement purposes. The high performing schools stand out a little higher than low performing schools, but that was not significant to cause any meaningful difference. The case study however showed some form of data use (e.g. monitoring and evaluation, supporting conversation) in some high performing schools but generally lacks systematic and structured features, and missed several important steps of effective data use procedure.
- Several factors influence data use, but differently in high and low performing schools. For example, data use for accountability purpose is influenced by school organizational factors. Data use for school development is influenced by data, user and school organizational characteristics. Data use for instructional improvement is influenced by data, and school organizational characteristics. On the whole, school organizational characteristics predominantly influence data use moderated by data and user characteristics. However, the factors are interrelated to influence data use. Lastly, instances of unintended data use, such as abuse of data was observed due excessive and often contradictory accountability pressure on schools which mandates them to comply with competing goals of achieving universal educational access and maintaining its quality.

5.6. Recommendations and implications

The quantitative analysis indicates there are slight differences between high and low performing schools, but not significant enough to meaningfully influence data use. In the qualitative case study and document analysis however the perceptions in high performing schools were more varied than in low performing schools. Most schools appear to perceive a great need to improve schools using data, but a multitude of interconnected factors bar them from taking actions. The following recommendations and implications for policy and practice are, therefore, offered:

- Schools could be assisted to strengthen existing professional development program, and make it more structured and systematic (Schildkamp & Poortman, 2015; Schildkamp, Handelzalts, & Poortman, 2012). The results can be widespread through introducing instructional materials designed to promote effective data use (manuals, rubrics, etc.), alter culture of data use (challenging teachers' assumptions about data and data use), and application of innovative teaching methods that need to be verified with data. The professional development can be tailored to address contextual factors. Moreover, teachers' professional growth as a result of the intervention should be monitored, recorded and be subject to modification or rejection accordingly. To this end, leadership always remains to be important through presentations, demonstrations, modeling, and peer-coaching may be integrated with (Schildkamp &

Poortman, 2015). It can be extended to familiarize schools with educational data management practices that include systematic collection and storing of data, organizing data, analyze and interpret data.

- Effective school based leadership in terms of the role played by a school principal in the context of the school improvement process can motivate teachers to actively engage in effective data use for improved learning. Moreover, the result also implicate as to how pre-service teacher education prepare teachers and school leaders with the knowledge and skills necessary for effective data use that can lead to school improvement (Mandinach, Friedman, & Gummer, 2015).
- Educational inspection processes could be made more responsive to the demands of the school improvement process by including aspects of the school improvement tradition, such as data-based decision making. Examining the discrimination validity and reliability of the instruments used to label schools as high and low performing schools is also implicated.

Moreover, the study aimed to scientifically contribute through understanding nature, characteristics and processes of data use in a developing country context where competing accountability mandates largely shape the policy context. Future research on the basis of the findings of the study can be implicated mainly from the limitations of the study. The first is methodological limitation related to using teachers' self-perception as a source of data which can risk favoritism when teachers tend to choose socially desirable responses. Therefore, intervention studies that involve observational methods could capture more valid and reliable data. The second could be related with the theoretical framework that is used in this study. As data use is a complex and iterative process that involves interpretive social processes, the influence of stakeholders in terms of the role they played in the school improvement process could give a more comprehensive understanding. Therefore, future research could focus on the role of these stakeholders in the schools' use of data in the context of increased accountability system where schools are operating within an environment of meeting competing goals.

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APPENDICES

Appendix 1: Survey questionnaire

ባህርዳርዩኒቨርሲቲ
የትምህርትናስነ-ባህሪሳይንስፋኩልቲ
የትምህርትናዕቅድናስራአመራርትምህርትክፍል

በአንደኛደረጃመምህራንናር/መምህራንየሚሞላመጠይቅ

የጥናቱርዕስ፡በመረጃየታገዘውሳኔአሰጣጥለትምህርትቤትማሻሻል፤የመረጃአጠቃቀምዳሰሳበአንደኛደረጃትምህርትቤቶች

የጥናቱዓላማ፡የዚህመጠይቅዓላማየአንደኛደረጃመምህራንናር/መምህራንበመረጃየታገዘየትምህርትቤትማሻሻያአተገባበርየመረጃአጠቃቀምለመዳሰስየተዘጋጀነው፡፡በዚህመጠይቅውስጥበአስራአራትንዑስክፍሎችየቀረቡ 60 ጥያቄዎችተቀምጠዋል፡፡በእያንዳንዱንዑስክፍልለተዘረዘሩትጥያቄዎችከፊትለፈታቸውከተዘረዘሩትአማራጮችመካከልየእርስዎንሃሳብ የሚወክለውንይምረጡ፡፡

በዚህጥናትመሠረትመረጃ (Data) ማለትተማሪዎችን፣መምህራንንእንዲሁምትምህርትቤቱንየሚመለከቱናየተለያዩውሳኔዎችንለመወሰንጠቀሜታያለውማንኛውምኢንፎርሜሽንሊሆንይችላል፡፡ለምሳሌየተማሪዎችየምዘናውጤቶች፣የማጠቃለያፈተናውጤቶች፣ተማሪዎችንየሚመለከቱግላዊመረጃዎች(ዕድሜወዘተ)፣የትምህርትቤትሱፐርቪዥንመረጃ፣የተማሪቅበላዝውውርየለቀቁየደገሙተማሪዎችመረጃ፣የመምህራንሠራተኞችናተማሪዎችየስብሰባቃለ-ጉናኢዎች፣የተማሪወላጆችማህበራዊእናኢኮኖሚያዊሆኔታ፣የትምህርትቁሳቁሶችናግብአቶችወዘተሊሆንይችላል፡፡

Data in this Survey refers to "all the relevant information on students, schools, and teachers that the school's staffs use for decision making (Schildkamp, Ehren& Lai, 2012).

Examples of data: assessment results; final examination results; students demographic data; school inspection data; data on intake, transfer and school leavers; minutes of staff and students meetings; parents socio-economic status; data on available school resources etc.

A. School name:_____
B. Number of years you spent in this school:_____

		በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
1	**መረጃየማግኘትሁኔታ** (*Accessibility* of data)				
1.1	የተማሪዎችንመረጃበወረቀትም (ጽሁፍ) ሆነበሶፍትኮፒየማግኘትእድሉአለኝ፡፡				
1.2	የተማሪዎችንመረጃበአንድፋይልውስጥተደራጅቶማግኘትእችላለሁ፡፡				
1.3	አስፈላጊየሆኑየተማሪዎችንመረጃከት/ቤቱየተለያዩየስራክፍሎችበቀላሉማግኘትእችላለሁ፡፡				
1.4	አሁንየማስተምራቸውንተማሪዎችመረጃየትምህርትዓመቱእንደተጀመረ (ቢያንስበ3ሳምንት ጊዜውስጥ) ከተለያዩየትምህርትቤቱየስራክፍሎችአገኛለሁ፡፡				
1.5	በትምህርትዓመቱአጋማሽየሚመጡተማሪዎች (በዝውውርወይምበመልሶቅበላ) መረጃከተለያዩክፍሎችበፍጥነትማግኘትእችላለሁ፡፡				
2	**የመረጃውጠቃሚነት** (*Usability of data*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
2.1	ተማሪዎችንበተመለከተየማገኘውመረጃየማስተምረውንትምህርትበአግባቡለማቀድናለመዘጋጀትይረዳኛል፡፡				
2.2	ተማሪዎችንበተመለከተበማገኘውመረጃተማሪዎችበየዓመቱበትምህርታቸውየሚያሳዩትንመሻሻል(determine academic growth) እንድለካያስችላል፡፡				
2.3	የማስተምራቸውንተማሪዎችበትምህርታቸውስለሚያሳዩትመሻሻልመረጃአለኝ፡፡				
2.4	ስለማስተምራቸውተማሪዎችያለኝመረጃበጣምጥቂት(ውስን)ነው፡፡				

3	**የመረጃጥራት** (*Quality of Data*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
3.1	ስለማስተምራቸውተማሪዎችያለኝመረጃየቅርብጊዜ (ወቅታዊ) ነው፡፡				
3.2	ከተለያዩምንጮች (ት/ቤቱ፣ ት/ጽ/ቤት፣ ት/ቢሮ፣ ት/ሚ ወዘተ) የማገኘውየተማሪዎችመረጃተመሳሳይናትክክለኛነው፡፡				
4	**የመረጃአጠቃቀምዕውቀት** (*Data literacy*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
4.1	የማስተምረውትምህርትስለተማሪዎችከማገኘውመረጃአንፃርአስተካክላለሁ (እቃኛለሁ)፡፡				
4.2	መረጃንበመጠቀምተማሪዎችያላቸውንየመማርፍላጐትእንድለይ(diagnosing learning needs) አግዘኛል፡፡				
4.3	የመረጃአጠቃቀምንበተመለከተየሚያስፈልጉየጥራትመለኪያዎችንናጽንሰሃሳቦችን(correlation, Validity, reliability)እረዳለሁ፡፡				
4.4	የጥራትመለኪያዎችንመሠረትበማድረግየማኅኛቸውንመረጃዎች(ለምሳሌየተማሪዎች ንየፈተናውጤቶችናሪፖርቶች)እንዴትመተንተንናመረዳትእንዳለብኝአውቃለሁ፡፡				
4.5	በግራፍየሚቀርብመረጃንበቀላሉመተንተንናመረዳትእችላለሁ፡፡				
5	**አመለካከት** (*Attitude*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
5.1	መረጃንመጠቀምየእያንዳንዱንተማሪየመማርፍላጐትለማወቅአስፈላጊነው፡፡				
5.2	መረጃየማስተማርስራየንለማሻሻልአስፈላጊነው፡፡				
5.3	የማስተማርስራበመረጃየታገዘሲሆን(የማስተማርስነ-ዘዴዎች፣ የትምህርትይዘትወዘተ) ተማሪዎችተጠቃሚይሆናሉ፡፡				
6	**የትምህርትአመራር** (*Leadership*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
6.1	መረጃንመጠቀምየውጤታማየመማርማስተማርተግባርለማካናወንዋነኛመሳሪያእንዲሆንየትምህርትቤታችንርዕሰመምህርያበረታታል፡፡				
6.2	የት/ቤታችን ር/መምህርመረጃንበአግባቡናበውጤታማነትጥቅምላይበማዋልበኩልጥሩምሳሌነው፡ :				
6.3	የት/ቤታችን ር/መምህርመምህራንናሰራተኞችመረጃንበአግባቡእንዲጠቀሙበትምቹሁኔታዎችንፈ ጥሯል (ለምሳሌበቂጊዜእንዲኖርማድረግ)፡፡				
6.4	የት/ቤታችን ር/መምህር፣ ም/ር/መምህርየት/ከፍልተጠሪዎችየደረሱበትንየመረጃትንተናውጤትከመምህራንና ሌሎችሰራተኞች,ጋርይወያዩበታል፡፡				
6.5	ከት/ከፍልተጠሪዬጋርበተማሪዎችመረጃና፣ ትንተናእንዲሁምውጤትላይውይይትእናደርጋለን፡፡				
6.6	ት/ቤታችንእያንዳንዱመምህርየመረጃትንተናከህሎቶችምማሳደግእንዳለበትያውቃል፡፡				
7	**የጋራትብብር** (*Collaboration*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
7.1	ተማሪዎችየትምህርትውጤታቸውንእንዲያውቁከማድረግበተጨማሪውጤታቸውን በተመለከተአወያያቸዋለሁ፡፡				
7.2	የተማሪዎችንየትምህርትውጤትወላጆችእንዲያውቁትከማድረግበተጨማሪበውጤቱ ላይውይይትአደርጋለሁ፡፡				
7.3	የተማሪዎችንየትምህርትውጤትበተመለከተከሌሎችመምህራንጋርመረጃእለዋወጣለ ሁ፤ ውይይትምአደርጋለሁ፡፡				
8	**ራዕይ** (*Vision*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
8.1	በውጤታማማስተማርምንነትላይበትምህርትቤታችንመምህራንዘንድየጋራስምምነት (መግባባት) አለ፡፡				
8.2	በውጤታማየተማሪዎችመማርምንነትላይበትምህርትቤታችንመምህራንዘንድየጋራስ ምምነት(መግባባት) አለ፡፡				
8.3	በውጤታማየተማሪዎችየመማርሂደትየመገምገምዘዴምንነትላይበትምህርትቤታችን መምህራንዘንድየጋራስምምነት(መግባባት) አለ፡፡				
9	**የመረጃአጠቃቀምልማዶችናአሰራሮች** (*Norms of data use*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
9.1	መረጃንመጠቀምበትምህርትቤታችንቅድሚያየሚሰጠውተግባርበመሆኑከሞላጐደል ሁሉምውሳኔዎችበመረጃላይየተመረኮዘናቸው፡፡				
9.2	በትምህርትቤታችንማንኛውምተግባርከመፈፀሙበፊትቅደምተከተልንየጠበቀ				

	(structured method) መረጃየመሰብሰብ፣ የመተንተንናየመተርጐምሂደትበተግባርእናውላለን፡፡				
10	**እየተሰጠያለድጋፍ** (*Support*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
10.1	መረጃንበውጤታማነትእንድጠቀምበት ት/ቤቱበቂየሆነድጋፍያደርግልኛል፡፡				
10.2	መረጃንበውጤታማነትእንድጠቀምበትእገዛሲያስፈልገኝድጋፍየሚያደርግልኝሰው (የመረጃባለሙያ፣ መምህር፣ ር/መምህርወዘተ) በትምህርትቤታችንይገኛል፡፡				
10.3	የማስተማርስራዎንበመረጃላይተመርኩዝእንዳሻሽልድጋፍናእገዛየሚያደርግልኝሰው (የመረጃባለሙያ፣ የስራባልደረባ፣ መምህር፣ ር/መምህር) በት/ቤታችንይገኛል፡፡				
10.4	መረጃንበአግባቡእንድጠቀምበት ት/ቤቱበቂጊዜመድቦልኛል፡፡				
11	**ተጠያቂነትንለማረጋገጥመረጃንመጠቀም** (*Data use for accountability*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
11.1	ት/ቤታችንኃላፊነቱንበአግባቡመወጣቱንለማረጋገጥየሚጠቀመውመረጃ ት/ቤቱአሁንያለበትንነባራዊሁኔታበትክክልየሚያሳይነው፡፡ (ለምሳሌለወላጆች፣ ለትምህርትሱፐርቫይዘሮችየሚያቀርበውሪፖርት)				
11.2	ትምህርትቤታችንተግባራዊስለሚያደርገውየትምህርትቤትማሻሻያፕሮግራምለትምህርትሱፐርቫይዘሮችናኢንስቴክተሮችመረጃእንሰጣችዋለን፡፡				
11.3	በት/ቤታችንየምንሰበስበውመረጃአስፈላጊለሆኑተግባራትእንዲውልበተደራጀሁኔታእንዲቀመጥይደርጋል፡፡				
12	**መረጃንለትምህርትቤትማሻሻያተግባርመጠቀም** (*Data use for School Development*)	በጣም አልስማማም	አልስማማም	እስማማለሁ	በጣምእስማማለሁ
		1	**2**	**3**	**4**
12.1	ከትምህርትቤቱውጭያሉአካላት (የወረዳትምህርት ጽ/ቤት) የሚያዘጋጃቸውንየግምገማውውጤቶች (የኢንስፔክሽንሪፖርት) ት/ቤታችንንለማሻሻልእንጠቀምበታለን፡፡				
12.2	የተማሪዎችየትምህርትውጤትየመምህራንንየማስተማርተግባርለመገምገምእንጠቀም በታለን፡፡				
12.3	ር/መምህራንትምህርትቤቱያስቀመጣቸውንግቦችእያሳካመሆኑንለመምህራንለማሳየት መረጃንበዋነኝነትይጠቀማሉ፡፡				
12.4	ጥልቅየሆነየመረጃትንተናዋነኛየትምህርትቤትማሻሻያተግባርአድርገንእንጠቀምበታለን፡፡				
12.5	በትምህርትቤታችንያለውየትምህርት ክ/ጊዜድልድልየተማሪዎችንየመማርፍላጐት(learning needs) መሠረትያደረገነው (ለምሳሌተማሪዎችዝቅተኛውጤትላገኙባቸውየትምህርትዓይነቶችከፍያለጊዜይመደባል)፡፡				
12.6	የተማሪዎችንየፈተናውጤትየትምህርትቤትማሻሻያዕቅድንዓላማናየትኩረትነጥቦችንለመለየትእንጠቀምበታለን፡፡				
12.7	የተማሪዎችየፈተናውጤትየመምህራንተከታይየሙያማሻሻያንበተመለከተውሳኔለመስጠትይረዳል፡፡				
12.8	የተማሪዎችየፈተናውጤትየስርዓተትምህርቱንክፍተቶችለመለየትእንጠቀምበታለን፡፡				
12.9	በትምህርትቤታችንውጤታማየማስተማርዘዴንለመለየትመረጃንእንደዋነኛመሳሪያ (ዘዴ) እንጠቀምበታለን፡፡				

13	**መረጃንለመማርማስተማርተግባርመጠቀም**(*Data use for instruction*) **ከዚህበታችየተዘረዘሩትንተግባራትለማከናወንመረጃንምንያህልጊዜትጠቀምበታለህ/ሺ/**	ምንምአልጠቀምበትም	በዓመት1 ጊዜእጠቀምበታለሁ	በዓመት2 ጊዜእጠቀምበታለሁ	በወር1ጊዜእጠቀምበታለሁ	በሳምንት1 ጊዜእጠቀምበታለሁ	በሳምንት 2ጊዜእጠቀምበታለሁ
		1	**2**	**3**	**4**	**5**	**6**
13.1	እያንዳንዱንተማሪመሠረትያደረገየትምህርትዓላማለማስቀመጥ						
13.2	ተማሪዎችበየትኞቹየትምህርትይዘቶችላይዕውቀትናክህሎትእንዳዳበሩወይምእንዳላዳበሩለመወሰን፡						
13.3	ተማሪዎችበአግባቡእየተማሩናየትምህርቱንዓላማእያሳኩመሆናቸውንናአለመሆናቸውንለማረጋገጥ፡						
13.4	የማስተምረውንትምህርትከእያንደንዱተማሪየመማርፍላጐትጋርለማጣጣም፡						
13.5	በከፍልውስጥየመማርማስተማርፍጥነቴንለመወሰን፡						
13.6	ለተማሪዎችስለትምህርትሂደታቸውማብረ - መልስለመስጠት፡						
13.7	ተማሪዎችንእንደየችሎታቸውበቡድንለማደራጀትናትምህርቱንለመስጠት (for targeted instruction)፡						
13.8	በከፍልውስጥየማስተምረውንይዘትለመለየት (ለመወሰን)፡						
13.9	ተማሪዎችለምንየተወሰኑስህተቶችንእንደሚፈፅሙለመለየት						
13.10	የማስተምረውንትምህርትልዩችሎታያላቸውንተማሪዎችመሠረትባደረገመልኩለማሻሻል፡						
13.11	የማስተምረውንትምህርትየመማርፍጥነታቸውዝቅተኛየሆኑተማሪዎችንመሠረትባደረገመልኩለማሻሻል፡						

Appendix B: Interview

Interview guideline for Teachers and School Leaders

I am working on a master thesis concerning the use of data, such as assessment results and self-evaluation results, for school improvement. I would like to ask you several questions concerning school improvement initiatives in your school and the use of data. When I talk about data, I mean all the information that is available on the functioning of the school, including assessment data, self-evaluation results and inspection report. The goal of my study is to find out various ways in which the school uses data. This interview will take approximately one hour. Before we start this interview, do you have any questions? Do you mind if I audiotape this interview? The results will be treated anonymously.

1. A) Could you tell me something about recent curriculum or school improvement initiatives in your school?
   Let the respondent speak freely, but probe if the questions below are not addressed, and ask for examples and illustrations. Also, ask about the use of data to improve student outcomes.
   B) What is your role in these initiatives?
   C) Does the school use data in these initiatives? If yes, which data?
   D) By whom are these data being used?
   E) How are these data being used?
   F) For which purposes are these data being used?

2. A) Which data do you use in your job?
   Let the respondent speak freely, but probe if the questions below are not addressed for each data source mentioned by the respondents. Ask for examples and illustrations.
   B) How are these data being used?
   C) How often do you use this type of data?
   D) For which purposes are these data being used?

3. A) I brought a list of different types of data (note: this list will be different for each of the countries), which might be available in your school. Can you tell me if these data are indeed available, if you have access, and if you use these data sources? Some of the data sources may have already been addressed in question.
   You can skip these data sources. For the other data sources, ask if the respondents uses these. If the respondent uses the data, ask how, how often and for which purposes, if the respondent does not use the data, ask why not. Also, ask for examples and illustrations of use.
   - ☐ School Inspection reports
   - ☐ Student progress reports
   - ☐ Information in the annual school programme of events
   - ☐ Information on the annual policy plan of the school
   - ☐ School self-evaluation result, including teacher and school leader questionnaires
   - ☐ Data on intake, student transfer / turn over / school leavers
   - ☐ Final examination results
   - ☐ Assessment result
   - ☐ Student demographic data
   - ☐ Student questionnaires data
   - ☐ Fee payment data
   - ☐ Lesson plans
   - ☐ Student and teacher daily attendance data

B) Did I miss certain data sources either you or your colleagues use? If yes, which ones? How do you use these data, how often, and for what purposes?

4. A) For what purpose do you use the data?
   Let the respondent speak freely. If the respondent is not able to answer this question, you can give some hints by asking if he or she uses data for improving his teachings, group students, evaluate efforts, etc.
   B) For what purpose do other teachers use data?

5. A) Do you receive any support in the collection, analysis, interpretation and/or use of data? *If the respondent is not able to answer this question, you can give some hints by asking if the school board encourages the use of data, if data is discussed collectively in team meetings, if the respondent received any professional development in the use of data etc.*
   B) If yes, how and is this sufficient?
   C) If no, do you want support? If yes, what type of support?

6. A) Are there any barriers in the school that prevent the use of data? *If the respondent is not able to answer this question, you can give some hints by asking if the respondent thinks he or she has the knowledge and skills needed to analyze data, of he or she has enough time to use data, and if the respondent has sufficient access to data.*
   B) If yes, what barriers and how do these barriers prevent data use?
   C) Can you indicate whether or not you agree with the following statement and why?
   - We have little money to use data effectively.
   - I have little time to use data effectively.
   - I don't have access to the all data I would like to use.
   - We receive a lot of our data too late.
   - A lot of data are not accurate.
   - A lot of data are not relevant to my job.
   - I don't think it is important to use data in my job.
   - I need training in the use of data.
   - We are capable of improving our school without the use of data.
   - I encourage data use in my school.
   - We collectively use data in this school.
   - Our school has a clear vision and clear goals.
   - We use data to check if we are reaching our goals.
   - Our school has a data expert, which helps me in the use of data.
   - I have the skills and knowledge needed to use data.

This was my last question. Thank you very much for your time. I am going to write a short report based on this interview. I will send this report to you for confirmation. Again, I want to stress that these results will be treated anonymously.

Appendix C: Results of Factor Analysis

Component Matrix[a] of data use for Accountability

	Component
	1
Data that we collect in our school are documented (can be easily found/retrieved if needs arise)	.866
We provide data for our school improvement to our Inspectors	.844
The data we use for accountability purposes (eg. to give reports to parents, give to School inspectors) represent the reality at school	.840

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Component Matrix[a] of data use for school development

	Component
	1
We use detailed data analyses as an essential part of improvement processes in my school	.800
School leaders use data to show teachers the extent to which the school is achieving its goals	.799
In my school we use data as a tool to determine effective teaching methods	.754
In my school we use student examination results to plan yearly goals and targets for school improvement	.750
Results of students are used to evaluate teacher's performance	.729
Student examination results are used to identify gaps in our curriculum in my school.	.689
In our school we use external evaluations (eg. from the School inspection) for our own improvement	.678
In my school student examination results lead to decisions with regard to professional development of teachers	.635
The division of teaching time in my school is based on identified learning needs of students	.524

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Component Matrix[a] of data use for instructional improvement

	Component
	1
adapt my teaching based on the needs of slow learners	.755
study why students make certain mistakes	.709
identify teaching and learning content to use in class	.705
make or adapt my teaching to individual students' needs	.703
set the speed of my lessons	.685
determine progress of students	.669
adapt my teaching based on the needs of gifted students	.666
determine which topics and skills students do and do not possess	.651
give students feedback on their learning process	.597
set learning goals for individual students	.558
form small groups of students for targeted teaching and learning	.509

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Data characteristics

Component Matrix[a] for accessibility of data

	Component
	1
I have access to relevant data on my students from various offices in my school	.778
I can find all the data on my students in one file	.768
I have access to student data in either hard copy files or information system	.737
Data on my current students are available from various offices in my school at the beginning of each school year (within 3 weeks)	.709
When students starts in the middle of the school year, their data becomes quickly available from various offices in my school	.682

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Component Matrix[a]forusability of data

	Component
	1
With the data I have on my students I can determine the academic growth of my students from year to year	.877
The student data I have access to, help me plan my lessons	.815
I have data on the progress of my students	.766
I have too little data on my students	.428

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Component Matrix[a] for quality of data

	Component
	1
The student data I have are accurate because they are similar despite the different sources school	.864
The data I have on my students are up-to-date	.864

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Data user characteristics

Component Matrix[a] for data literacy

	Component
	1
I am able to use data to diagnose student learning needs	.808
I am able to adjust my teaching based on data	.775
I understand the quality criteria and concepts for data use (for example, correlation, validity, reliability)	.765
know how to interpret data and reports I receive (exam results, student achievement results of previous years) according to the quality criteria (correlation, validity, reliability etc)	.753
I can comfortably interpret data that are presented in graphs	.542

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Component Matrix[a] for attitude

	Component
	1
Data are important in changing my teaching	.881
It is important to use data in determining individual student needs	.870
Students benefit when teaching is based on data, e.g. teaching techniques, contents, etc.	.836

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

School organizational characteristics

Component Matrix[a] for leadership

	Component
	1
My school principal is a good example of an effective data user	.835
My head of department discusses data with me	.805
Our school principal and heads of departments discuss the results of their data analyses in the school	.799
My school principal encourages data use as a tool to support effective teaching	.758
My school principal creates many opportunities (e.g. time) for the teachers and other staff to use data (e.g. Analyzing data for planning improvement actions)	.746
My school is aware that we need to keep developing the skills of teachers to analyze data	.692

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Component Matrix[a] for collaboration

	Component
	1
I share and discuss my student's results with parents	.849
I share and discuss the results of my students with students	.814
I share and discuss the results of my students with other teachers	.676

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Component Matrix[a] for vision and norms

	Component
	1
Teachers in my school share a common understanding of what student learning is	.838
Teachers in my school share a common understanding about what good teaching is	.821
Teachers in my school share a common understanding about effective ways to evaluate student learning	.811
Data use is a priority in my school (i.e. almost every decision depends on data)	.714
In my school we use a structured method to analyze and interpret data before any action	.677

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Component Matrix[a] for support

	Component
	1
There is someone within the school whom I can contact for help about using data	.887
There is someone within the school who helps me change my practice (e.g. teaching) based on data	.873
I am adequately supported by school in the effective use of data	.836
There is specific time set aside by the school for me to use data	.705

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix D: Results of Reliability Analysis

Scale	Number of items	Coefficient of Cronbach alpha
Accessibility of data	5	.786
Usability of data	4	.700
Quality of data	2	.661
Knowledge and skills (e.g. data literacy)	5	.776
Attitude	3	.828
Leadership	6	.865
Collaboration	3	.674
Vision	3	.849
Norms for data use	2	.703
Support	4	.844
Data use for accountability	3	.805
Data use for school development	9	.869
Data use for instructional improvement	11	.860

Appendix F: Interview coding

Purpose of data use

Variables	School 1			School 2			School 5			School 8		
1. Accountability	PD	T	P	PD	T	P	PD	T	P	PD	T	P
1.1. Evaluation of teacher performance			+	+		+	+		+			+
1.2. Monitoring progress in goal achievement	+	+	+				+	+	+	+	+	+
1.3. Motivating students and staffs	+		+									
1.4. Communicating (or reporting) to parents and local education office	+		+	+	+	+			+	+		+
2. School development												
2.1. Policy development and planning (identify areas of need and target resources, identify strengths and weaknesses)			+			+			+			+
2.2. Shape professional development	+		+									
2.3. Setting priorities, goals and targets	+	+	+			+		+	+	+		
2.4. Supporting conversation with parents, teachers and administrators; as well as reflecting on own teaching practice	+	+		+	+		+		+	+	+	+
3. Instruction												
3.1. Monitoring student progress	+	+	+	+	+			+			+	+
3.2. Instructional changes (e.g. differentiation, peer-assisted instruction)	+	+	+	+	+		+	+	+		+	
3.3. Feedback to encourage students self-directed learning	+		+									

Note: PD= professional development facilitators; T=teachers; and P= principals; and (+) = aspects of data use mentioned by respondents.

Factors influencing data use

Factors	School 1			School 2			School 5			School 8		
	PD	T	P	PD	T	P	PD	T	P	PD	T	P
Training & experience (knowledge and skills)	+	+	-/+		-	+	+			+	+	
Attitude and awareness	+		+	-		-	-		-	-		-
Culture of data use (norms and values)	+		+/-			-	-					
Workload and time	+/-	+/-	+/-	-	-	-		-		-	-	-
Resources for data use (e.g. computers)	+		+			+		-		-	-	
Support & data expert	+	+/-	+/-		-	-		-	-		-	
Availability of data	+		+				-					
Accessibility of data	+	+										
Accuracy and quality of data			+							-	-	+

Note: PD = professional development facilitators; T= teachers; and P = principals; and (+) = factors mentioned as facilitating data use; (-) = factors mentioned as hindering data use; ( ) = no mention of any factors; (+/-) = factors mentioned as both, but more of as facilitators for data use; and (-/+) = factors mentioned as both, but more of hindering for data use.