USING DATA TO INFORM INSTRUCTION: PILOTING A DATA LITERACY PROFESSIONAL LEARNING MODEL

by

Norma St. Croix

B.A. (Ed), Memorial University of Newfoundland and Labrador, 1984

B.A., Memorial University of Newfoundland and Labrador, 1988

CFLS, Université Laval, 1990

M.Ed. Mount Saint Vincent University, 2006

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

in the Graduate Academic Unit of Education

Supervisor: Elizabeth Sloat, Ph.D., Faculty of Education

Examining Board: Jim Croll, EdD, Faculty of Kinesiology
Robert Laurie, Ph.D., HRA, Faculty of Education
Gregory Paterson, Ed. D., HRA, Faculty of Education

External Examiner: Kirk Anderson, Ph.D., Faculty of Education,
Memorial University Newfoundland

This dissertation is accepted by the Dean of Graduate Studies

THE UNIVERSITY OF NEW BRUNSWICK

August, 2019

© Norma St. Croix, 2019
ABSTRACT

As Canadian provinces strive to be more accountable for student achievement, educators are provided with an increasing amount and variety of assessment data at the student, class, school, district, provincial, national, and international level through increased access to information systems, online monitoring systems, and other measurement tools (Hamilton, Stecher, & Yuan, 2012). However, assessment-based monitoring systems designed to generate achievement data and to inform teaching interventions are failing to increase student learning because teachers are unprepared for, and unsupported in, understanding how to use the data reports they receive (Datnow & Hubbard, 2015). This qualitative research study was designed to develop, pilot, refine, and validate a data literacy Professional Learning Model (PLM) by conducting an applied and collaborative investigation with educators in one grade K-5 school. The PLM has four stages: Stage 1—Locate and understand data, Stage 2—Analyze, interpret, and evaluate data and their sources, Stage 3—Respond to data and transfer data to action, and Stage 4—Reflect on and evaluate use of data. The model serves to ensure each educator has the necessary knowledge and skills to use both internal and external sources of data to measure student learning accurately and to use assessment information to target student learning needs. Working through the PLM stages, the researcher implemented an assessment-led, data-based approach to differentiating instruction targeting the early reading skills students need to succeed in school. This study identifies those factors educators believe best support, and those that most inhibit, their use of assessment results. This study also identifies the key components of professional learning that educators need to use data systematically for addressing student learning needs and increasing teaching effectiveness. The PLM contributes to educators’ increased use of assessment data and
confidence using data to target student learning needs. Teachers and educators unanimously accepted the PLM as a strong model to develop their data literacy for teachers and educators.

**Keywords:** Early literacy, data informed decision making, Response to Intervention, assessment, student learning, professional development
DEDICATION

I dedicate this thesis to my mother, Elizabeth, who instilled in me the value of education and the confidence to pursue my dreams; and to my three daughters, Marissa, Alicia, and Chantal whose unwavering love, support, encouragement, patience, and pride inspired me to persevere while living in New Brunswick pursuing my studies.
ACKNOWLEDGEMENTS

This research would not have been possible without the support and guidance of my committee. First, I wish to thank my supervisor Dr. Elizabeth Sloat for her tireless support, feedback, suggestions, and countless hours of reading and rereading my work to ensure my dissertation conveyed clearly and succinctly the research study and its findings. I wish to express a very special thank you to Dr. Robert Laurie, my mentor and friend, who encouraged me to pursue my Ph.D. I am deeply grateful for our numerous discussions, as well as his encouragement, availability, and guidance throughout this research process. Thank you to Dr. Jim Croll whose genuine passion, insightfulness, probing questions and deep understanding of the field of education research made me a more reflective researcher. Liz, Robert and Jim, I will always be grateful for you sharing your knowledge with me and for your friendship and confidence in me. You made learning fun and purposeful.

I acknowledge the support of Anglophone West School District who granted me permission to work closely with their educators and students in a school in their district for the 2017-2018 academic school year. This important research would not have been possible without the ongoing support of the educators and students who welcomed me into their school and classrooms and made me feel like I was a member of their amazing and dedicated school community. Your passion, engagement, knowledge of teaching and learning and contributions were invaluable to conducting my research. I feel fortunate to now count you as friends as well as co-researchers.

To the professional team at The Learning Bar, especially Dr. J. D. Willms, thank you for your flexibility, support, and friendship while I juggled work demands and the pursuit of my Ph.D.
Last but not least, I will forever appreciate the love, encouragement, and patience I received from so many important people in my life including my children Marissa, Alicia, and Chantal; their father Brendan, my siblings Joan, Kevin, and Pam; and my friends both in Newfoundland Labrador and New Brunswick. A special thank you to Gerald for believing in me.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>ABSTRACT</th>
<th>vii</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>iv</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>v</td>
</tr>
</tbody>
</table>

## Chapter One: Introduction ................................................................. 1

- Setting the Context for the Study ........................................... 4
- Purpose of the Research Study .................................................. 8
- Research Questions ............................................................................... 11
  - Research question 1 ........................................................................ 11
  - Research question 2 ........................................................................ 12
  - Research question 3 ........................................................................ 12
  - Research question 4 ........................................................................ 12
- Research Methodology Overview .................................................. 12
  - Research design ................................................................................. 12
  - Research setting and participants .................................................. 13
  - Data collection methods ................................................................... 14
  - Data collection procedures ............................................................. 15
- Phase 1 .................................................................................................. 16
- Data analysis plan ................................................................................. 17
- Study strengths and limitations .......................................................... 17
- Conclusion ............................................................................................ 19

## Chapter Two: Review of the Literature ................................................. 21

- Introduction .......................................................................................... 21
- Effective Teaching .................................................................................. 21
- Assessment-led Teaching and Learning Models .................................. 23
  - Preschool assessment data ................................................................. 23
  - Available student assessment data ................................................. 24
- Response to Intervention (RtI) ............................................................. 28
- What Prevents Teachers from Using Data Effectively ......................... 36
- Overcoming Barriers to Using Student Assessment Data Successfully .... 38
- Five Stages of Data Literacy ................................................................. 40
  - Stage 1 – Read and understand data ................................................... 43
  - Stage 2 – Analyze data ....................................................................... 45
  - Stage 3 – Interpret data ...................................................................... 48
  - Stage 4 – Responding to data and transferring data to action to inform instruction. .................................................................................................................. 51
  - Stage 5 – Reflecting on and evaluating use of data ............................ 56
- Conclusion .............................................................................................. 58

## Chapter Three: Research Design and Methods ....................................... 60

- Introduction .......................................................................................... 60

- }
Chapter Four: Findings and Discussion ..............................................98

Introduction .......................................................................................98
Research Question 1: Using the Professional Learning Model with Assessment Data .......................................................... 101
  Provincial assessments .................................................................... 101
  District assessments ....................................................................... 106
  Teacher-created assessments ............................................................ 109
  Resources to address identified student needs .................................. 112
Research Question 2: Standardized Literacy Assessments .................. 125
  Purpose of the standardized assessments in the study ...................... 125
  Using student assessment data ....................................................... 131
  Addressing student needs ............................................................... 136
  Meeting students’ needs through RtI and the PLM .............................. 138
  Use of collaborative practices to build and use data literacy skills ...... 142
  Alignment of classroom-based and standardized assessment results .. 143
  Discussion of assessment data ........................................................ 146
Research Question 3: Issues, Challenges, and Barriers Educators Face When Using Data ........................................................................................................ 149
  Challenges using assessment data at the beginning of the study ......... 150
    Lack of time ................................................................................... 152
    Insufficient professional learning .................................................. 154
  Other challenges identified and addressed while piloting the PLM .... 156
    Commitment to using the PLM ...................................................... 157
    Fear of admitting not knowing how to work with data .................. 158
    Too much data ............................................................................. 158
    Impact of teacher buy-in .............................................................. 159
Barriers to using data at the end of the study .......................................................... 160
Challenges with standardized assessment data ....................................................... 162
Challenges with provincial and district data ............................................................ 163
Challenges with classroom-based assessments ....................................................... 164
Discussion for overcoming identified challenges ..................................................... 166
  *Engaged leadership in the school. ................................................................. 167*
  *Collaborative practices....................................................................................... 168*
  *Willingness to learn and engage in professional learning. ............................... 170*
  *Teacher intern preparation to use data. ......................................................... 170*
Research Question 4: Data Literacy Professional Learning Model .......................... 172
Revised PLM ........................................................................................................... 174
  Using the professional learning model................................................................. 181
Changes in educators’ assessment and teaching practice ....................................... 185
  Educators’ feedback on the data literacy PLM ............................................... 193
Positive factors for implementing the PLM ............................................................ 197
Conclusion .............................................................................................................. 200

**Chapter Five: Discussion and Conclusion** .......................................................... 202

Introduction ............................................................................................................. 202
Discussion of Key Findings ..................................................................................... 204
  Available assessment data ................................................................................. 204
  Assessment-based monitoring system ............................................................... 205
  Addressing challenges to using assessment data .............................................. 207
  Optimal data literacy professional learning model ........................................... 208
Discussion of the Professional Learning Model ..................................................... 210
Significance of the Research .................................................................................. 214
Study Limitations and Directions for Future Research ......................................... 216
  School size ......................................................................................................... 216
  Single research setting ...................................................................................... 217
  Study duration .................................................................................................. 218
Recommendations from Study Findings ................................................................. 219
  Identify educators’ current level of data-literacy skills .................................... 219
  Ensure current educators are data-literate ......................................................... 219
  Prepare future teachers to be data-literate educators ....................................... 220
  Provide educators with coaches and time to collaborate using data ................. 220
  Develop a school, district, and province-wide data-use policy ....................... 221
  Use universal screeners and benchmark assessments ..................................... 221
Conclusion .............................................................................................................. 222

**References** ......................................................................................................... 225

**Appendix A - Educator Questionnaire** ............................................................... 254

**Appendix B - Semi-Structured Teacher Interview Protocol** .............................. 256

**Appendix C - Semi-Structured Administrator Interview Protocol** .................. 260

**Appendix D - Reflection and Evaluation Interview Protocol** .......................... 264

**Appendix E - Observation Protocol Form** ....................................................... 265
Appendix F - Data Literacy Professional Learning Model .............................................. 266
Appendix G - Introduction to Study ................................................................................. 272
Appendix H - Director Consent Letter .............................................................................. 274
Appendix I - Administrator Consent Letter .................................................................... 278
Appendix J - Teacher Consent Letter ............................................................................... 282
Appendix K - Parent Consent Letter ................................................................................. 286
Appendix L - Materials and resources used for interventions and instruction .............. 288
Curriculum Vitae
List of Figures

Figure 1. *Data Literacy Professional Learning Model* ......................................................... 10
Figure 2. *The data team procedure (Schildkamp & Ehren, 2013)* ........................................ 89
Figure 3. *Tiers of teaching interventions to prevent reading difficulties* ............................ 92
List of Tables

Table 1  Skills for Reading and Understanding Data .................................................44  
Table 2  Skills for Analyzing Data ........................................................................48  
Table 3  Skills for Interpreting Data ....................................................................51  
Table 4  Skills for Responding to Data and Transferring Data into Action to Inform  
        Instruction ......................................................................................................55  
Table 5  Skills for Reflecting on and Evaluating Data Use ....................................57  
Table 6  Provincial and District Assessment Data Available to all Educators and Grades  
        ..................................................................................................................105  
Table 7  Assessment Data Created by Teachers by Grade Level ............................115  
Table 8  Barriers to Using Data at the Beginning of the Study ...............................151  
Table 9  Barriers to Using Data at the End of the Study ........................................161  
Table 10 Skills for Locating and Understanding Data ............................................177  
Table 11 Skills for Analyzing, Interpreting, and Evaluating Data and their Sources ..178  
Table 12 Skills for Making Instructional Decisions Based on Data ..........................180  
Table 13 Skills for Evaluating Data use and Reflecting on Professional Learning .....181  

Chapter One: Introduction

In the past decade, there has been an increasing emphasis on data-informed-decision-making in the teaching and learning process (Neugebauer et al., 2018; Hoover & Abrams, 2013; Little, 2012; Mandinach & Gummer, 2013; Means, Padilla, DeBarger, & Bakia, 2009). Data use means the actions of educators to collect, organize, and analyze data to inform practice (Wayman, Cho, Jimerson, & Spikes, 2012). As Canadian provinces strive to be more accountable for student achievement, teachers are provided with an increasing amount and variety of assessment data at the student, class, school, district, provincial, national, and international level through increased access to information systems, online monitoring systems, and other measurement tools (DeLuca, LaPointe-McEwan, & Luhanga, 2016; Goertz, Oláh, & Riggan, 2009; Hamilton et al., 2012). Teachers can become overwhelmed by data overload (Schildkamp & Kuiper, 2010) since they receive data in multiple forms such as numeric (percentiles, frequency), graphic (line, bar graphs), and colour-coded (Response to Intervention, large-scale assessment reports), along with differing reporting methods. Educators must also consider data from computerized data systems such as student demographics and school attendance along with classroom observation data to make instructional decisions about students. This data overload places heavy demands on educators and their capacity to work with student-level data.

All students deserve access to a high-quality educational experience that now includes teachers using data to adjust instruction to meet the needs of individual students, small groups, and the whole class (Datnow, Park, & Kennedy-Lewis, 2013; Lai & McNaughton, 2016; Lai & Schildkamp, 2013; Masters, 2014). Teachers must make
decisions about which data are useful, and for what purposes, to further student learning. Research into teachers’ data literacy challenges is emerging in North America (Campbell & Levin, 2009; Reeves & Honig, 2015), Europe (Schildkamp, Karbautzki, & Vanhoof, 2014), and New Zealand, the Netherlands, England, South Africa, and Belgium (Lai & McNaughton, 2013). In the small but growing body of research on the application and implementation of data-use, initiatives to inform instruction have been neither consistent nor sustained (Slavin, Cheung, Holmes, Madden, & Chamberlain, 2013). Assessment-based monitoring systems designed to generate achievement data and inform teaching interventions are failing to increase student learning because teachers are unprepared for, and unsupported in, understanding how to use the data reports they receive (Datnow & Hubbard, 2016; Levine, 2006; Long, Rivas, Light, & Mandinach, 2008). Research is needed to identify how teachers can systematically use available data to select and implement interventions and teaching strategies targeting student learning needs to increase student achievement. There is also a need for research to discern the barriers and challenges educators face when attempting to use data to guide instruction, so the challenges can be addressed.

According to Gummer and Mandinach (2015), there is not yet an established framework for data literacy acquisition that schools and districts can use to identify student strengths, diagnose needs, and provide support with data-driven decision-making practices for educators. Educators and school leaders can use data to drive decisions or inform decisions (Knapp et al., 2006; Shen & Cooley, 2008). In this study the focus is enabling educators to use assessment results to inform instructional decisions so the researcher will use the term data-informed decision making (DIDM). Data literacy skills are the skills and knowledge that are needed to effectively use data in schools (Gummer
This study was designed to address this specific need for a clearly articulated and tested data literacy learning model by conducting an applied and collaborative investigation with educators in one school to pilot-test, and refine as necessary, a five-stage professional learning model (PLM) to increase educators’ data literacy knowledge and skill. The model was developed through an extensive and detailed review of the research and applied literatures focused on the three areas of data-driven decision-making (DDDM):

1) Response to Intervention (RtI),
2) emerging research on educators’ issues, obstacles, and challenges in increasing data literacy knowledge, understanding, and skills, and
3) the grounded PD approach to address data use limitations.

The purpose of the research was to implement, refine, and assess the effects of an assessment-led, data-based approach to differentiating instruction targeting the early reading skills students need to succeed in school.

This dissertation has five chapters. To situate the context for the study, the first chapter outlines how data from numerous assessments should facilitate the use of interventions to target student learning needs before presenting the challenges educators experience when attempting to use data. Following this, the purpose of the study and the research questions are presented. Chapter One concludes with a summary of the methodology and study design chosen to explore how teachers used data through piloting the five-stage data literacy professional learning model.

Chapter Two presents a review of the literature related to data-driven decision-making and Response-to-Intervention (RtI) frameworks, both of which are designed to address student needs using varying types of assessment results. The discussion then
turns to considering the skills teachers need to read, analyze, and interpret data, and then use information from that data, to make instructional decisions that address students’ learning needs. Chapter Three describes the research design chosen setting out in detail the study’s research setting and participants, data collection procedures, and plan for analyzing the data. Chapter Four presents the results of the analysis as outlined in the findings and discussion. The dissertation concludes with Chapter Five, which contains a discussion of the findings and limitations and benefits of the study along with recommendations for future research.

**Setting the Context for the Study**

Response to Intervention (RtI) is a challenging and complex process (Turse & Albrecht, 2015) that consists of universal screening of all children related to a particular set of skills, tiered interventions designed to meet differing degrees of learning need, and progress monitoring designed to identify, and address student learning challenges aimed at improving student outcomes (Fuchs, Fuchs, & Compton, 2012). To determine student, class, and school instructional needs, educators must have the knowledge and skills to use data from three types of assessments, which have all been designed for different purposes (Brown & Hattie, 2012; Looney, 2011; Wixson & Valencia, 2011). The first type are diagnostic assessments used to identify areas of student learning need in a number of curricular subjects. Examples of diagnostic assessments are the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2003) measure to assess children’s reading skills, the Phonological Awareness Literacy Screener (PALS; Invernizzi, Sullivan, Meier, & Swank, 2004) early literacy assessment, and the Individual Growth & Development Indicators (IGDI; Greenwood, Carta, & Walker,
2004) to assess children’s early literacy. The second type of assessments are more frequently used common assessments that typically include the range of measures developed or purchased at the district level, teacher-developed literacy profiles, grade and skill-based benchmark assessments used to identify a child’s reading level, and monitor student learning and progress (e.g., Fountas and Pinnell Benchmark Assessments; Fountas & Pinnell, 2012; and Developmental Reading Assessment, Beaver, 2006). The third type of assessments are large scale criterion-referenced standardized assessments such as provincial and international assessments. These are used to identify students’ achievement levels based on established standards, such as the Progress in International Reading Literacy Study (PIRLS; IEA, 2016). The first type, diagnostic assessments, can be a progress monitoring system that generates student-level assessment data at regular intervals throughout the year. These types of progress monitoring systems are foundational to RtI initiatives (National Center on Response to Intervention, 2010). However, assessment-based monitoring systems designed to generate achievement data and to inform teaching interventions are failing to increase student learning, in large measure because teachers are unprepared for and unsupported in how to use the data reports they receive (Datnow & Hubbard, 2015; Levine, 2006; Long et al., 2008).

To respond to demands for accountability and for higher student achievement, school leaders and teachers together must have knowledge, skills, and district support to use the extensive data available to them that can inform student learning needs (Darling-Hammond, Orphanos, LaPointe, & Weeks, 2007; Datnow, Park, & Wohlstetter, 2007; Mandinach & Gummer, 2016). School leaders’ commitment to data use is fundamental to the success of data-driven decision-making in schools (Ontario Principals’ Council,
2009). However, research within the past decade indicates that teachers and school leaders themselves identify significant challenges that must be overcome if data is to be used to its fullest capacity for responding effectively to student needs (Confrey & Makar, 2005; Holcomb, 2004; Jimerson & Wayman, 2012; Marsh, 2012; Oláh, Lawrence, & Riggan, 2010; Schmoker, 1999; Schildkamp & Kuiper, 2010). School systems that promote data use often assume that the necessary knowledge, structures, and resources are already in place to support educators’ interpretation of and response to data (Marsh, 2012). As a result, they fail to provide schools and educators with the skills and resources they need to use data effectively. Teachers report that they do not have the knowledge and skills needed to understand, interpret, and analyze assessment data results, and to create actionable and pedagogically sound solutions based on those results (DeLuca & Bellara, 2013; Dembosky, Pane, Barney, & Christina, 2005; Farley-Ripple & Buttram, 2014; Mandinach & Gummer, 2016). Confrey and Makar (2005) identified a pervasive lack of statistical knowledge among educators for interpreting and analyzing data. Many teachers are afraid that data will be used against them to determine their effectiveness as teachers since assessment data have often been used for teacher accountability purposes rather than to inform or improve instruction. This has led to a mistrust of the type of data collected and the way it is used to make decisions (Datnow & Hubbard, 2016; Holcomb, 2004; Schmoker, 1999). Another major challenge to data use identified by educators is the substantial time required to analyze data critically and the limited time available during school days to turn data into actionable solutions (Jimerson & Wayman, 2012; Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006; Schildkamp & Kuiper, 2010). In a study on data use in schools, Means, Chen, DeBarger, and Padilla (2011) found that educators expressed a higher confidence level when
analyzing data if they worked collaboratively with their colleagues. Hence, school leaders must provide time, a safe environment, ample professional learning opportunities, and all resources necessary so teachers can collaborate to understand, analyze, and interpret data, and then to make decisions that impact student learning positively.

Research has shown that teachers do not receive adequate professional development (PD) in working with and responding appropriately to incremental monitoring assessment data (Kratochwill, Volpiansky, Clements, & Ball, 2007; Mandinach & Gummer, 2013; Marsh & Farrell, 2015; Means et al., 2011), and yet PD on understanding data sources and how to use data is crucial for improving school quality (Desimone, 2009; Van Veen, Zwart, Meirink, & Verloop, 2010). The current research uses the term professional learning (PL) rather than professional development (PD) because in this research teachers contribute to an active learning community in their own schools. The term professional development usually refers to more intermittent and passive learning sessions that have less influence on impacting teaching practice (Smith, 2010; Stewart, 2014; Wei, Darling-Hammond, & Adamson, 2010). Current PD on using data typically does not make the connection between understanding data and making instructional decisions (Love, Stiles, Mundry, & DiRanna, 2008; Mandinach, Gummer, & Muller, 2011; Schildkamp, Poortman, Luyten, & Ebbeler, 2017). Making that connection is essential for changing teaching practice to target student learning needs. To be highly effective, PD needs to occur over a sustained period, be strongly contextualized to the students with whom educators work in a particular school, involve collaboration between teachers and school leaders on how to increase student achievement, and allow room to analyze and reflect on pedagogical
decisions to improve student learning (Desimone 2009; Guskey & Yoon, 2009). It is this need for prolonged, contextualized, and applied PD with educators that this study seeks to address through the applied and collaborative research design chosen for this study.

**Purpose of the Research Study**

New Brunswick, like nearly all Canadian provinces and Territories, has recently begun to implement a Response to Intervention (RtI) model and instructional approach to increase student learning. The New Brunswick government recognizes that teachers’ data literacy is essential to the success of their RtI initiative (Government of New Brunswick, 2016). Given that there is an increased expectation for teachers to access, analyze, interpret, and take action based on the assessment data they receive to increase student learning (Marsh & Farrell, 2015; Piety, 2013), teachers must have opportunities to become highly data literate and instructionally adaptive to individual learning demands (Louis, Leithwood, Wahlstrom, & Anderson, 2010). Ikemoto and Marsh (2007) stated that demands for data-informed decision-making often imply that data use is a straightforward process. As a result, educational stakeholders such as Departments of Education and district leaders who expect teachers to use data to teach more effectively fail to acknowledge the different ways in which educators use data to inform decisions. If teachers are to analyze, interpret, and act based on the numerous and various types of data, they must have opportunities to develop the knowledge, skills, and competencies to do so. To invoke this change, teachers’ data literacy must focus on cycles of continuous inquiry using assessment literacy skills to drive instruction (Ronka, Lachat, Slaughter, & Meltzer, 2009). There needs to be a balance between standardized learning assessments and classroom assessments for learning (Stiggins & DuFour, 2009). Classroom assessments, such as quizzes, exit slips, performance tasks, or writing
assignments, administered on a regular basis in classrooms, provide immediate individual student level results that are crucial for helping students learn (Guskey, 2003). Researchers have demonstrated the powerful effectiveness of teachers’ collaboration in teams to analyze and interpret student data to improve instruction and student achievement (Aylsworth, 2012; Gallagher, Means, & Padilla, 2008; Roberts, 2010).

In light of the above clearly articulated need, what should an effective RtI-driven Professional Learning Model (PLM) for teachers look like? How can we ensure that educators receive the detailed and complex knowledge and skills necessary to use student assessment data to improve academic outcomes for all children? This study addresses the need for a clearly articulated and tested data literacy learning model. Specifically, the purpose was to conduct an applied and collaborative investigation with educators in one school to pilot-test and refine a five-stage professional learning model the researcher developed by conducting a detailed review of the research and applied literatures focused on data-driven decision-making (DDDM).
Professional Learning Model for Data Literacy Skills

The goal of the learning model depicted in Figure 1 is to help educators translate data into instructional practice. The professional learning process has five learning stages.

STAGE 1 Reading and understanding data
STAGE 2 Analyzing data
STAGE 3 Interpreting data
STAGE 4 Responding to data and transferring data to action
STAGE 5 Reflecting on and evaluating data use

Figure 1. Data Literacy Professional Learning Model

Each stage requires different knowledge, skills, and understandings to actualize, and the stages build incrementally toward full competence. This chapter contains brief descriptions of the stages to situate the research questions. Chapter Two presents a more extensive explanation of each stage. Stage 1 leads educators through the knowledge and strategies they need for both reading and understanding assessment data found in various feedback reports. Stage 2 guides educators through the process of analyzing student, class, and school achievement data which then leads to Stage 3, where they acquire skills for interpreting data about student, class, and school achievement and
learning needs. Stage 4 requires educators to use, and refine where necessary, their pedagogical content knowledge for responding to the data by drawing on a range of instructional skills and strategies aimed at targeting learning needs toward increasing student achievement. A crucial stage of any study or new program implementation is contained in Stage 5, which involves reflecting on the processes of reading, analyzing, interpreting, and responding to data and evaluating the effectiveness of the decisions taken based on the student data to enhance learning and educators’ data literacy skills. Each interconnected stage develops specific knowledge and skill and breaks down the complexities of data literacy into manageable learning segments. This allows educators to become data literate at their own pace without becoming overwhelmed. The researcher anticipated that an incremental and evolving five-stage approach, rather than a top-down holistic approach, would help educators become more data literate because this approach systematically guided educators through clear and distinct learning stages.

**Research Questions**

The research questions below provide a lens for collecting and examining the study data purposefully, as well as for investigating educator practices as they worked through the issues, challenges, and successes they encountered while making data-informed decisions about their teaching and students’ learning.

**Research question 1.** What data are available to New Brunswick teachers in the study’s school? Where, when, and how do educators access findings and reports generated by the data? In what ways do teachers use the school’s existing assessment-led instructional strategy and their own created assessments to identify and target children’s individual literacy learning needs at each grade level?
Research question 2. To what extent, and in what ways, do educators’ existing data sources, and the student-level information they provide, align with the standardized assessment-based monitoring system administered by the researcher for study purposes?

Research question 3. What issues, barriers, and challenges do educators and administrators identify when attempting to work with data they generate at the class and school level, receive from the district or provincial levels, or receive based on the standardized monitoring system implemented for study purposes?

Research question 4. In what ways does evolving through a clearly articulated research-based model for addressing individual, class, and whole school learning needs influence the instructional decisions educators make when working with both existing and newly generated student assessment data? Through the iterative implementation process of the model, what changes with and for educators emerge? Based on the data gathered through this study, what does an optimal learning model and approach entail for moving educators, administrators, and support teachers to become strong data-literate educators and RtI professionals?

Research Methodology Overview

Research design. To explore the data-informed instructional decisions educators make using literacy assessment data, a qualitative research design provided information to understand, and not measure, educators’ use of assessment data as they pilot-tested the five-stage professional learning model aimed at increasing their data literacy. Qualitative approaches aim to address the how and why of a problem or situation and tend to use multiple data collection methods to explore the topic fully (Creswell, 2009). This qualitative research study explored the challenges and successes educators
experience using assessment results while at the same time introducing, assessing, and refining a professional learning model to increase the data literacy skills of educators in an applied collaborative study. The qualitative approach provided rich information to develop an understanding of how, when, and why educators use data, the challenges they must overcome to use data effectively, and the supports that benefit educators as they acquire new data-literacy skills to inform their instructional decisions.

This applied collaborative research occurred in a natural setting of the school to address the identified problem of educators not having the skills to use data effectively to increase student achievement (Denscombe, 2014). Applied research usually draws substantially upon the literature to provide a theoretical base for the study (Burns, 2000). The researcher used an intensive literature review to develop the PLM that was pilot tested in this study. Through each of the PLM stages, all the educators were active participants and co-researchers throughout the study; they worked as partners with the researcher to read, analyze, and interpret student assessment results and plan interventions that targeted student needs. The researcher used the ongoing discussions with the participants to answer the research questions.

**Research setting and participants.** This study was situated in Anthony Primary 1, a small K-to-5 Anglophone public school in New Brunswick during one academic school year. The school had been promoting the use of data to inform instruction, and its educators sought, through this applied and collaborative research effort, to increase all students’ literacy achievement levels. The study participants were five teachers, three educational support teachers, the school’s administrator, and 60

---

1 The school name and participant names have been changed to ensure anonymity.
students ranging from kindergarten to Grade 5. The educators in the study school had varied teaching experiences, educational levels, and years of teaching experience. They had received some PD on implementing RtI initiatives. The smaller school and number of participants facilitated an initial pilot-testing of a school-wide implementation of the PLM.

**Data collection methods.** This qualitative research design used multiple methods of collecting data to provide descriptive information to answer the research questions. This data triangulation (Patton, 2002) supplied comprehensive relevant information that provided thorough and in-depth responses to each of the research questions. The researcher collected six types of data during the school year starting in November, working collaboratively with the educators and the administrator to institute the RtI five-stage professional learning model to support their regular curriculum implementation.

These are the six types of data:

1) **Questionnaire:** Before the start of the applied collaborative study, educators completed a questionnaire (see Appendix A) to provide information on their teaching background, demographics, and perceptions about the use of assessment data to inform teaching.

2) **Interviews:** Throughout the school year, the researcher conducted ongoing individual and group semi-structured interviews (see Appendices B, C, and D) to identify any concerns or problems participants experienced as they implemented each stage. This allowed the researcher to address concerns immediately to maximize participation and learning during the study.
3) Observations: The researcher made detailed observations of educator practices during class visits and small-group and whole school meetings (see Appendix E) to discuss data. These observations guided the conversations during follow-up meetings and in addressing identified student learning needs.

4) Field notes: The researcher made field notes of observed classroom practice, meetings, and discussions with individuals and groups (see Appendix E), documenting such things as questions asked, levels of engagement, successes, and challenges.

5) Materials: The researcher continually collected a range of curricula, information sources, and assessment materials the educators used to inform curriculum content and pedagogical decisions. These materials helped link collected data to student instruction.

6) DIBELS assessment: The researcher used the data from the DIBELS NEXT assessment given to all school children three times during the year to track individual student performance on the emergent literacy, early reading, and conventional reading skills of children across the K-to-5 levels. The individualized student-level assessment data combined with the data collected through several other methods to ensure the purpose of the research was met as collaborators piloted the five stages of the professional learning model.

**Data collection procedures.** This study consisted of five sequential yet overlapping phases of data collection as the participating educators grew in their RtI and assessment knowledge, understandings, and skills. Before piloting the professional learning model, the educators identified the data literacy skills they chose to focus on throughout the study. These skills, discussed in detail in the literature review, are
summarized in Appendix F. The reflection helped teachers monitor their learning and their perceptions about using data throughout the study.

Phase 1 began when the researcher visited the school to meet with the administrator and teachers to discuss mutual and respective goals for partnering to conduct the study. During these first two-to-three weeks of the study, the educators completed the self-directed questionnaires and participated in one-on-one interviews to share their teaching experiences and how they used assessment data in their teaching. In Phase 2 the researcher gathered student data during the first month of the study by administering both standardized and teacher-created assessments to ascertain teacher competence in using the results from student assessments to inform instruction. In Phase 3 the researcher implemented the five-stage data-literacy learning process depicted in Figure 1; this continued throughout the school year. The researcher held meetings and visited classrooms on a regular basis following the initial student data collection and analysis. During this phase, the educators worked collaboratively to use assessment data to inform instruction and use interventions to target identified student learning needs. As the educators worked through each stage of the PLM, the researcher documented the educators’ and students’ successes, challenges, questions, and evidence of learning. Phase 4 extended throughout the study as the researcher monitored students’ achievement levels and used instructional interventions as needed to address learning gaps. Phase 5 was the final data collection phase. The researcher conducted one-on-one interviews with all the educators to collect participants’ feedback about their own learning and that of their students. Throughout all five data collection phases procedures, the researcher took field notes to document what happened in classrooms and meetings. These notes provided rich descriptions that guided the study and the data analysis.
Data analysis plan. The first step of the analysis involved reading through the data gathered through questionnaires, interviews, classroom observations, field notes, supporting documents, and student performance data to help answer the research questions (Denscombe, 2014). Next, the researcher organized the collected data by coding it with labels such as assessments, barriers, or interventions, to events, actions, and information gathered throughout all five phases of the data collection (Petty, Thomson, & Stew, 2012). The interviews were professionally transcribed and then the researcher verified them to ensure accuracy. The researcher used data from interviews to understand participants’ challenges and identified needs as they worked with student assessment results.

The researcher analyzed individual student, class, and school data on an ongoing basis to identify how the educators increasingly used data to provide targeted interventions that met student learning needs. Data from interviews, observations, and document analysis helped identify the supports the educators needed to use data to target student learning. A clearer picture of how participants used data and their data literacy skills emerged as the researcher continually analyzed assessment results in tandem with data from observations, field notes, and document analysis. The collected data revealed any changes in educator practice and instructional decisions that happened during the study. An important component of the analysis was that the researcher refined the PLM throughout the study based on observations, reflections, and input from the participants.

Study strengths and limitations. This applied collaborative study has several benefits for the study participants and other educators as well as some possible limitations. This study piloted a PLM based on assessment data to help identify the supports and resources needed to increase educators’ understanding and use of data to
inform instructional decisions. Students participating in the study received tiered and research-based interventions that targeted a wide range of reading challenges children encounter from Kindergarten-to- Grade 5. This pilot study will add to the growing body of research on using student assessment data based on a tested model that began with an extensive literature review designed to help future educators understand the complexities of effectively using data to increase student learning. The findings will aid school leaders, jurisdictions, and teacher preparation programs at universities with courses and other supports that enable new and practicing teachers to use assessment data to plan, teach, and evaluate learning so student achievement is increased.

The limitations of any study are the restrictions associated with the particular methods the researcher used to gather and analyze data (Creswell, 2003). This research study may be seen to have three design limitations, all of which are discussed more fully in Chapter Five. The first possible limitation was the small number of teachers and students who participated in the research pilot study. This could potentially limit applying study results to other schools. A second limitation may be that all study participants were from the same school and had received the same PD on using data. This might have either limited or enhanced the range of data literacy skills these educators possessed before the study began. Nevertheless, it seemed reasonable to expect that the educators would increase their RtI knowledge, skills, and capabilities because the study was school-based and year-long. A third limitation may be that the one-year study timeframe was too short to ensure adequate educator learning and substantive change in professional practice. A one-year timeframe for an initial piloting has been deemed appropriate so that educators can choose to continue to work with a more enhanced and enriched model design during the following school year.
**Conclusion.** With more and more data being readily available to educators, there are expectations from education departments, school districts, and parents that teachers use data to identify and meet students’ needs so students experience success. But having more data does not automatically lead to increased student learning unless educators use that data to inform ongoing, targeted, and individualized instructional decisions. Using data is a complex process. Limited research has been done to identify in detail how educators can move to an assessment-led teaching and learning approach. This applied and collaborative study design piloting the five-stage PLM was the best approach to determine the support educators need for reading and using data to target and improve students’ learning. The researcher worked collaboratively with the educators to develop a comprehensive set of research-based teaching strategies that targeted a wide range of emergent, early, beginning, and conventional reading challenges children encounter across the K-to-5 spectrum. Working together with teachers in their classrooms to provide ongoing professional learning experiences about integrating assessment results into day-to-day instructional practice, the researcher helped the educators increase their assessment knowledge. They also worked together to identify what worked and what needed to be revised in the PLM.

The primary data collection methods were frequent and varied semi-structured interviews combined with observations, field notes, and document analysis. These data covered all aspects of educators’ obstacles, challenges, and learning needs using multiple forms of student assessment data. This variety of data allowed the researcher to capture the complex, multifaceted, and contextual process of data literacy acquisition. The outcome of the data analysis was to identify the supports and resources needed to increase educators’ understanding and use of data to inform instructional decisions.
The next chapter of this dissertation contains a comprehensive review of the relevant research explicating the RtI assessment-led teaching and learning model now being implemented widely in schools across Canada. This discussion is equally informed by the rich literature on data-driven and data-informed decision-making as it applies to RtI efforts. The review also includes a detailed discussion of the challenges educators face when using assessment data, along with an analysis of the PL approach that works best to impact teacher practice. Chapter Three presents an outline of the research design and methodology, including the data collection methods and procedures selected to pilot test the five-stage professional learning model and to answer the four research questions guiding the study. The final chapters set out a concluding discussion.

The next chapter turns to a detailed review of the literature the researcher examined to contextualize the study’s purpose, design, and research questions.
Chapter Two: Review of the Literature

Introduction

The review of literature is divided into six parts. The researcher used the d ERIC-EBSCO, Academic Search Premier, Google Scholar, and ProQuest databases to retrieve online journals and research studies using the key words and phrases effective teaching, data-driven decision-making, educational assessment, barriers to using data, data-informed decision-making, teacher use of assessments to inform instruction, Response to Intervention (RtI), and data literacy. The first part is an overview of quality teaching and what makes a teacher effective in increasing student learning. The second part presents various student assessments that teachers can use to assess and monitor to target individual student, small group, and whole class instructional needs. Educators are expected to target student needs through RtI, which is the focus of the third part of the literature review. Although data-informed decision-making has been emphasized in education in recent years, educators are still struggling to use data effectively. The researcher discusses these challenges in the fourth part. The fifth part presents research on the essential elements of quality professional learning for educators. The literature review concludes with an overview of the five stages of skills educators require to use data effectively to impact student learning.

Effective Teaching

Teaching students is a complex process that is constantly evolving. After thirty years of conducting educational research, Shulman (2004) concluded that classroom teaching is perhaps the most complex, most challenging, most demanding, and most frightening activity that our species has ever invented. Despite Shulman’s conclusions about the demands of teaching students, high-quality and effective teachers do increase
student learning (Coe, Aloisi, Higgins, & Major, 2014) and their impact is recognized
globally (Hanushek & Rivkin, 2006; Hattie, 2012; Slater, Davies, & Burgess, 2012). To
promote student learning, teachers draw on a unique set of curricular content and
pedagogical knowledge (Gitomer & Zisk, 2015).

Muijs and Reynolds (2011, 2017) found that what teachers do in the classroom
explains a large proportion of classroom-level variance of student achievement. Since
the effects of teachers on student learning are cumulative and long lasting (McCaffrey,
Lockwood, Koretz, & Hamilton, 2003), identifying what makes a teacher effective and
developing professional learning opportunities for teachers to develop new skills is
critical to increasing student achievement. According to Hattie (2012), who conducted a
meta-analysis of over 500,000 research studies, many teacher behaviours positively
influence student achievement. These include

- creating strong relations with students,
- communicating goals,
- using evidence-based teaching strategies such as explicit teaching,
- using ongoing assessment with clear and timely feedback, and
- being responsive to student needs.

Teachers cannot teach effectively unless they identify criteria to measure how
well students are learning the content and plan ways to increase learning based on
individual student needs. Effective teachers use diagnostic, formative, and summative
assessments in their teaching practices. Diagnostic assessments such as screeners and
pretests identify each student’s strengths, needs, knowledge, and skills prior to
instruction. Formative assessments, sometimes referred to as assessment for learning,
provide feedback and information during instruction to increase student learning. One of the most powerful, high-yield strategies for impacting student achievement is creating frequent, high-quality formative assessments (Hargreaves & Fink, 2006; Stiggins, 2005). Educators must have the skills to create valid and reliable classroom-based assessments to measure student achievement of curriculum outcomes at the right level of difficulty and then use the information from the assessments to plan interventions and instruction. Formative assessments can provide teachers with information to understand what their students specifically need so they can personalize their instructional practices (Frey & Fischer, 2013; Noskin, 2013). Summative assessments, known as assessment of learning, are used to make judgments about students’ levels of mastery of a topic after instruction (McTighe & O’Connor, 2009). Effective assessment and use of assessment data are key to student learning (Cooper, 2010). Teachers face continuously changing challenges and to face them teachers need to acquire new skills, strategies, and new knowledge.

Assessment-led Teaching and Learning Models

Preschool assessment data. Before four-year-old children start kindergarten, several Canadian jurisdictions (e.g., Alberta, Manitoba, and New Brunswick) as well as many other countries (e.g., Australia) use a diagnostic assessment measure called The Early Years Evaluation-Direct Assessment (EYE-DA; The Learning Bar, 2011) to provide leading indicators for district staff to discern which children are likely to benefit from early intervention to improve their chances for success at school (Willms, 2009). The EYE-DA is a standardized assessment tool that measures children in four developmental domains: 1) Awareness of Self and Environment, 2) Cognitive Skills, 3) Language and Communication Skills, and 4) Gross and Fine Motor Skills. All four of
these domains are closely associated with children’s preparedness to learn during the primary grades. Similarly, a preschool universal screening and progress monitoring measure used in thousands of schools in the United States is the Individual Growth & Development Indicators (IGDI; Greenwood et al., 2004). This tool assesses Oral Language, Phonological Awareness, Alphabet Knowledge, and Comprehension. Both standardized assessments provide detailed reports to administrators and teachers that enable them to intervene immediately when children enter school to address their learning and social needs. These preschool assessments identify needs before children enter school, but once children enter the school system continuous monitoring of their learning achievement is crucial to teach children skills they are ready to learn at a pace that maximizes their learning. Teachers need to be able to use information provided in all the types of assessment reports each diagnostic learning measure generates so they can address fully children’s learning needs.

**Available student assessment data.** Each school, district, or broader jurisdiction chooses how to acquire student achievement data through either universal screeners, standardized assessments, class-wide assessments, or benchmark assessments to identify student, class, school, and district needs and strengths. Ideally, in kindergarten through to Grade 3, standardized reading and literacy assessments should be administered frequently, with progress monitoring occurring at least monthly, if biweekly or weekly assessments are not feasible (Fuchs & Fuchs, 2006), to determine whether instruction is increasing student reading levels. There are various validated standardized assessments that can provide incremental data on pre-literacy and literacy skills. *The Test of Word Reading Efficiency–Second Edition* (TOWRE-2; Torgesen, Wagner, & Rashotte, 2012) measures fluency in sight word reading and phonetic decoding skills. The *Dynamic
Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2010) assesses fluency on a range of reading-related tasks to provide an indicator of whether and where a child might be struggling with specific reading skills. The Phonological Awareness Literacy Screening (PALS; Invernizzi, Juel, Swank, & Meier, 2005) is a more comprehensive measure that assesses emergent and early reading skills, including letter knowledge, letter-sound knowledge, print awareness, nursery rhyme awareness, and name writing. The Woodcock Reading Mastery Tests (WRMT; Woodcock, 2011) measures reading achievement of students from kindergarten through twelfth grade. The AIMSweb is a curriculum-based measure used as a universal screener and progress monitoring tool to ensure children receive appropriate intervention levels to meet their learning needs. Most such standardized assessments are not readily available in schools since they can be expensive to purchase and time-consuming to administer and score. There is typically a lack of personnel, especially teachers, who have been trained to administer, score, and disseminate assessment data. Departments of Education typically do not mandate or provide schools with individualized assessments like those listed here. Nevertheless, many schools use these and other similar assessment tools as a result of school- and district-level decisions.

When formal, standardized assessments such as those considered above are not used, primary grade teachers tend to use teacher-made and informal assessments several times a year to monitor foundational literacy skills such as alphabet knowledge, letter-sound correspondence, and word recognition. Unlike standardized tests that are field-tested and validated for content and scoring to identify student performance on expected grade level skills, teacher-made assessments are often viewed as being less objective and not as sound for determining acceptable levels of achievement. Teachers also identify
student learning needs by using phonological awareness assessments such as the
*Phonemic Awareness Skills Assessment* by Learning Resources Inc. (Heggerty, 2005), or
*Reading A-Z* to test how children manipulate words and sounds, such as breaking words
into syllables and naming beginning sounds in a word. Teachers may also administer
*Fry* (Fry, Kress, & Fountoukidis, 2000) or *Dolch* (Dolch, 1936) sight word checklists to
monitor word recognition skills. Some teachers use an *Oral Reading Fluency* (ORF)
assessment to monitor student reading success. For ORF, teachers select texts at an
appropriate level of difficulty for students to read aloud for one minute. Students who
have 40 or more words correct per minute (WCPM) at the end of Grade 1 on unpracticed
text passages are at low risk of future reading difficulty, while students below 40 WCPM
are at some risk, and students reading below 20 WCPM are at high risk of reading
difficulty (Good, Kaminski, Simmons, & Kame’enui, 2001). The challenge with the
ORF assessment is that there are no set texts to use with all students, so the assessment
typically provides different results depending on the difficulty and the content of the text
a teacher selects. Many researchers and practitioners consider these one-minute reading
fluency measures to constitute a crude and narrow measure of reading (Gersten &
Dimino, 2006). These teacher-designed assessments are not research-based and have not
demonstrated reliability and validity for assessing the level and growth in student
performance in areas of early literacy, phonemic awareness, reading, and reading
comprehension. Without a set of validated assessments that are administered
systematically, teachers may fail to identify students who are not performing at an
expected standard and who would benefit from interventions to prevent later reading
difficulties. The margin for guesswork and error is greatly diminished when teachers use
standardized, diagnostic assessments to identify student leaning strengths and needs (Sloat, Beswick, & Willms, 2007).

Running records—also known as reading records—are like oral reading assessments but somewhat more extensive. These are commonly used to monitor reading progress at least three times during the year in primary classrooms in most Canadian provinces. A running record is a written representation of a child’s oral reading of a text (Clay, 2007) where a child reads a teacher-selected leveled narrative or information text recommended by district or provincial educational leaders or programs. As a student reads the text, the teacher notes all correctly read words, word substitutions, self-corrections, repetitions, omissions, and words supplied to the student. Running records provide grade-based benchmarks to monitor student reading progress.

Benchmarks from reading assessments such as Fountas and Pinnell (Fountas & Pinnell, 2012) or the Developmental Reading Assessment (DRA; Beaver, 2006) provide a standard to help measure changes in reading achievement. Benchmark assessments use a series of increasingly demanding texts to identify a student’s reading level and progress along a sequence of text levels over time. However, because there is a limited number of texts teachers can select to assess students reading progress, students become familiar with the text. This familiarity may lead to errors in measurement results. Other factors that may affect a student’s reading level on a running record are the verbal and non-verbal cues teachers may provide to students as they sit side by side during the running record. In using benchmark texts for assessing reading levels, there are often concerns about and equivalency and consistency of text passages when determining student transition across benchmarked achievement tiers (Francis et al., 2008).
Across Canada, educators use formal and informal assessment tools in a wide variety of ways. This means there are no consistent data usage about when, how, and for what purposes student assessment data are collected in various grades and educational jurisdictions. As a result, it is difficult to determine the influence of RtI on student learning. The intent of RtI is that children receive targeted instruction on those skills that are not developing at an appropriate rate, followed by more intensive assessment monitoring to incrementally inform ongoing intervention needs (Wilcox, Muraksmi-Ramalho, & Urick, 2013). Research on the effectiveness of data-led instruction indicates that this teaching and learning strategy of using continuous data does not increase student learning as effectively as had been expected (Al Otaiba, Calhoon, & Wanzek, 2010; Konstantopoulos, Miller, van der Ploeg, & Li, 2016; Marrs & Little, 2014). There are several explanations for why this is the case, including a lack of PD, a lack of time to collaborate and use information from data (Datnow, 2005), the high cost of resources to target student needs, an unavailability of assessments to identify student strengths and needs (Means et al, 2009), and a lack of support from leadership to guide consistent use of data to make decisions (Mandinach & Gummer, 2013). Underlying many of these factors is the issue of teachers not having the skills to use data to inform their instruction to meet student learning needs (Hamilton et al., 2009; Jimerson & Wayman, 2015).

**Response to Intervention (RtI)**

Canadian Provinces and Territories are moving to implement a Response to Intervention (RtI) initiative aimed at increasing student learning, particularly in the areas of language, literacy, and reading ability (McIntosh et al., 2011). Research demonstrates that students who are weak readers by the end of Grade 1 tend to be weak readers for the rest of their school years and are less likely to pursue post-secondary studies unless they
receive early and ongoing targeted support (e.g., Juel, 1988; Torgesen, 2000; Vaughn & Fuchs, 2003; Entwisle, Alexander, & Olson, 2005). There is an urgent need for early interventions to help students develop literacy skills during the first years in school to prevent later struggles (Sloat, Beswick, & Willms, 2007). Educators need to use data to provide differentiated learning opportunities for students who are underperforming. Differentiated instruction consists of curricular modifications, teaching methods, resources, and learning activities to address the diverse needs of individual and small groups of students to maximize their learning opportunities (Tomlinson et al., 2003). Educators can change the complexity or structure of a lesson or use different resources in combination with knowing students’ strengths and readiness levels to increase the likelihood of learner success.

The goal of RtI is to maximize learning for all students (Fuchs & Fuchs, 2012). RtI helps identify the students who are at risk of experiencing reading difficulties, the reasons why these students are struggling, and instructional strategies to support these students through differentiated instruction (Gersten et al., 2009). RtI depends on evidence-based interventions designed to prevent or remediate academic difficulties. Research shows that long-term reading failure can be prevented when children at risk are identified early and receive explicit interventions to address learning difficulties (Snow, Burns, & Griffin, 1998; Torgesen, 2000, 2009).

RtI usually has four components:

1) a screening assessment to identify students at risk for learning difficulties and progress monitoring to determine whether students are benefitting from instruction,

2) a research-based curriculum with sequential outcomes and instructional
strategies to teach all children along with validated interventions for individual children or small groups of students who need additional supports,

3) three tiers of interventions ranging from quality instruction for all students to intensive interventions for students who do not make progress in becoming proficient readers following class and small group instruction, and

4) a collaborative problem-solving process that involves teachers, specialists, and parents working together to ensure students succeed (Buysse & Peisner-Feinberg, 2010; Fuchs et al., 2012; Seedorf, 2014).

The first step in using RtI is to administer a universal assessment screener to all students to identify students who are experiencing difficulties or who are at risk of developing academic problems without interventions (Johnson, Pool, & Carter, 2009). The National Center for Response to Intervention (2010) defined universal screening as brief assessments that are valid and reliable and that demonstrate diagnostic accuracy for predicting which students will develop learning problems. Screeners such as DIBELS (Good & Kaminski, 2010) assesses young children’s skills in phonemic awareness, letter/sound identification, word reading, and oral fluency. Once students are identified as being at risk of not learning to read, the next RtI step involves giving students research-based interventions at increasing levels of intensity to address their learning needs. As students receive instruction, educators need to monitor progress closely to generate student-level assessment data at regular intervals during the year (Burns & VanDerHeyden, 2006; National Center on Response to Intervention, 2010). Teachers use information from incremental assessment data to give students targeted instructional interventions. They adjust the intensity and nature of interventions depending on a student’s responsiveness (National Center on Response to Intervention, 2010). Targeted
teaching aims both to improve performance of students who are struggling and to challenge students who are well ahead of grade-level expectations (Goss, Hunter, Romanes, & Parsonage, 2015).

There are usually three instructional tiers to address student learning needs. The tiers are differentiated by intensity and duration of instruction, group size, and frequency of progress monitoring (Bryant, 2014; Bryant & Pedrotty-Bryant, 2008; Fuchs, Fuchs, & Vaughn, 2014). The first tier is primarily high-quality whole classroom evidence-based reading instruction, which usually meets the learning needs of 80 to 85 percent of students in schools. In Tier 1, teachers use differentiated instruction and assessment data to meet each student’s instructional needs so students can achieve learning outcomes outlined by provincial curricula. Differentiated instruction addresses individual student learning gaps while acknowledging various student backgrounds, readiness levels, languages, interests, and learning profiles so each student can experience success (Hall, 2008). The 10 to 15 percent of students who fall below a certain level or cut score on screening or progress monitoring assessments need more intensive, Tier 2 interventions administered by either classroom teachers or the Education Support Teacher-Resource (EST-R) in smaller groups. Tier 2 interventions include more explicit teaching that targets specific skills or gaps in learning, more specific feedback, and more opportunities to practice a skill. Students who receive Tier 2 interventions usually receive an additional 30 minutes of instruction two to three times per week on a specific skill or skills that are matched to their specific needs (Brown-Chidsey, Bronaugh, & McGraw, 2009). In addition to being taught the core curriculum and receiving regular class monitoring, students receiving Tier 2 interventions should have their progress monitored at least bi-weekly and preferably weekly (Burns & Gibbons 2012; Fuchs &
Fuchs, 2012; Hintze & Marcotte 2010). Approximately five percent of students fail to increase their reading skills following these two tiers of interventions. These students require Tier 3 interventions, which are systematic and explicit, and usually occur on a one-on-one basis with a reading specialist. Tier 3 interventions are implemented for between 45-to-60 minutes daily for at least twenty weeks (Vaughn, Wanzek, Woodruff, & Linan-Thompson, 2007). Students receiving intensive Tier 3 supports need to have their progress monitored at least twice a week (Buffum, Mattos, & Weber, 2009; Howard & Hoyt, 2009). Tier 3 supports, like all components of RtI, require classroom teachers and specialized teachers to work together to plan and deliver reading instruction and to provide students with immediate and individualized feedback based on ongoing assessment data (Love, 2004; McMaster, Fuchs, Fuchs, & Compton, 2005).

**Barriers to effective RtI implementation.** O’Connor and Freeman (2012) reported that even though RtI implementation has become more prevalent, some schools have not seen improved academic outcomes for students. As Canadian schools have increased their use of RtI in the last decade, they continue to face challenges with implementing and maintaining RtI initiatives. RtI implementation initially starts with enthusiasm but wanes over time as initial interest decreases (Burns et al., 2013). The question becomes, what is necessary for schools and teachers to ensure RtI works as intended for the long-term to address student needs and increase student learning? This section outlines several of these challenges with implementing and continuing to use RtI. The focus then turns to the data-informed decision-making process.

RtI requires a team also known as a professional learning community or PLC (DuFour, 2004) of teachers, specialists, and school leaders to collaborate as they study and discuss assessment results of various reports, and plan interventions so all students
can learn and succeed. However, just forming a team does not ensure successful implementation and continued use of RtI in schools or districts. To share expertise identifying student needs, strengths, and available interventions, create an implementation plan, evaluate the interventions, and maintain frequent communications amongst school-level team members. Research demonstrates that a lack of strong communication skills such as listening, facilitating, and conflict resolution is a significant barrier to effective team processes and outcomes (Whitten & Dieker, 1995). Collaboration works best when staff members support and respect each other as they learn together and use their expertise to solve problems. School leaders are most successful in using data effectively when they engage their school staff in making data-informed decisions collaboratively (Boudett, City, & Murnane, 2005; Katz, Earl, & Jaafar, 2009). A lack of sufficient training and support for successful team meetings and collaboration negatively impacts the success of RtI (Doll et al., 2005; Farley-Ripple, & Buttram, 2014; Meyers, Graybill, & Grogg, 2017).

According to Nellis (2012), a critical barrier to using RtI effectively is a lack of intervention resources such as access to online programs like the leveled book-reading program offered by Raz-Kids™ (n.d.), teaching activities that target needed skills, and services from specialists like speech language therapists in the school setting. The resources required for a school to implement an RtI reform effectively include PD, time, technology, materials and supports, substitute release time for teachers, curriculum materials, and evaluation materials (Datnow, 2005, Datnow & Hubbard, 2015). Teachers and schools are often expected to choose interventions to use with children without much-needed guidance or PD (Greenfield, Rinaldi, Proctor, Cardarelli, 2010). For this reason, evidence-based intervention programs are typically not used as frequently as
required. The distinct roles of classroom teachers, learning response teachers, and guidance counselors are often not clearly defined. This confusion further challenges the success of RtI initiatives as there is uncertainty about who makes the daily decisions about who will assess a child and when, and which interventions will be used. The time required to participate in team meetings, which is often insufficient and outside the regular teaching day, is another challenge in establishing effective RtI strategies in schools (Brewer, 2010; Burns, Wiley, & Viglietta, 2008). An often-overwhelming amount of paperwork is required to document all aspects of RtI strategies, including identified student needs, interventions used, and intervention effects and results. This paperwork further hampers teachers’ ability to implement RtI successfully (Buffum, Mattos, & Weber, 2009).

Teachers’ limited data literacy skills for using data effectively to target students’ needs and increase achievement pose a significant challenge for teachers in their RtI efforts (Mandinach, & Gummer, 2016; McIntosh, Chard, Boland, & Horner, 2006). Several studies (Hubbard, Datnow, & Pruyn, 2014; Mandinach & Gummer, 2016; Schildkamp et al., 2014; Staman, Visscher, & Luyten, 2014; Wayman & Jimerson, 2014) have demonstrated that teachers and school leaders lack the knowledge and skills to use data effectively. Love (2004) defined data literacy as “the ability to examine multiple measures and multiple levels of data, to consider the research and to draw sound inferences” (p. 22). Data literacy also requires knowledge and use of other data, such as perception, motivation, and behaviour (Mandinach & Gummer, 2012). One challenge to data use is that stakeholders—such as departments, district leaders, and parents—assume school systems that promote data use have structures in place to support educators in interpreting and responding to data (Marsh, 2012).
Teachers themselves report that they do not have adequate knowledge or skills in the areas of:

- using available data to identify learning gaps or needs of individual students,
- selecting the best assessment tools to measure student learning,
- interpreting assessment results reports,
- determining which interventions increase student achievement, and
- creating actionable solutions to address identified needs (DeLuca & Bellara, 2013; Farley-Ripple & Buttram, 2014; Mandinach & Gummer, 2016).

Based on evidence they obtain from assessments, teachers need to know how to adapt their lessons to meet students’ learning needs (Black, Harrison, Lee, Marshall, & Wiliam, 2003). However, teachers do not always have the competence to adapt instruction to meet learning needs (Heritage, 2007). Research into teachers’ data literacy challenges is emerging (Lai & McNaughton, 2013; Reeves & Honig, 2015; Schildkamp et al., 2014). There is a critical need to understand what prevents teachers from using RtI data to address student needs and to identify professional interventions to overcome these challenges.

**Professional development for RtI implementation.** Teachers need to receive carefully planned, ongoing professional development (PD) on the four core components of RtI, from developing their capacity to administer and use diagnostic screening assessments and monitor each child’s learning progress, to collaborating to address student needs at individual child, class, and school levels. Classroom teachers often do not receive PD on implementing research-based, high-quality instruction or interventions to respond to student needs (Kratochwill, 2007). Typically, school leaders
receive training and they in turn are expected to train and support their teachers. Although schools experience more success implementing RtI when there are strong informed leaders who support teachers, lack of direct training for teachers often prevents them from delivering interventions that address student learning gaps. Teachers struggle to use assessments and the data they provide to identify students who need Tier 1, Tier 2, or Tier 3 interventions. When students are identified for receiving tiered interventions, teachers need to know how to structure their classrooms to deliver interventions to individuals or small groups of students. Working with small groups of students is a crucial classroom management skill used with most, if not all, RtI initiatives. According to Mastropieri and Scruggs (2005), teachers often do not possess the knowledge or skills needed to implement Tier 1 interventions, which consists of basic, high-quality, explicit instruction in beginning reading at the whole class level. Thus, along with PD to support RtI efforts, educators also need PD that targets emergent and early reading skills. Many researchers (e.g., Gersten & Dimino, 2006) emphasize the importance of consistent and ongoing support in preparing teachers to implement and maintain RtI approaches.

**What Prevents Teachers from Using Data Effectively**

Several challenges prevent teachers from being successful data consumers and users. The time required to participate in team meetings, which is often insufficient and outside the regular teaching day, is a challenge in establishing and maintaining effective RtI strategies in schools (Burns et al., 2013; Grosche & Volpe, 2013). Teachers have not received necessary training on how to read and use data (DeLuca & Klinger, 2010; Schafer & Lissitz, 1987) or on how to work with and respond to incremental assessment data (Mandinach & Gummer, 2013; Marsh & Farrell, 2015) to maximize student
learning. When teachers receive reports on student achievement, they can be overwhelmed and unsure about how to use data to inform instruction or to form generalizations about student, class, or school performance. A lack of mastery of data skills can lead to a lack of confidence and result in teachers being unwilling to use available data. Teachers are more likely to use data in decision-making if they feel confident about their data literacy knowledge and skills (U.S. Department of Education, 2008). Educators receive reports that present data in multiple forms such as numeric (e.g., percentiles, cut scores, standard deviations, frequency, range, mean, raw scores), graphic (e.g., line, bar, and pie graphs, scatterplots, histograms), and colour-coded (e.g., RtI reports that use red for not yet meeting grade-level expectations standards, yellow for experiencing some difficulty meeting the grade-level expectations, and green for at or above grade-level expectations). The timing, length, and complexity of assessment reports can place heavy demands on educators’ capacity to work with student-level data. To make data easier to use, reports need to be well organized with clear charts and diagrams, a glossary, and a summary of results.

Teacher perceptions of data can be a barrier since some teachers do not see value in using data. They believe they can judge whether students are achieving required learning outcomes and how effective they are as teachers based on their own observations of student performance, engagement in learning, and their teaching experience. If teachers view data as irrelevant or of poor quality, they will not invest time in reading, understanding, or analyzing data reports. When teachers believe that data is only used to evaluate their effectiveness as teachers, they mistrust the data itself and the motivations for its use. Provincial criterion-referenced test results are sometimes presented to teachers in a manner that focuses on accountability by comparing or
ranking students, classes, schools, and districts (Volante & Jaafar, 2008). This may cause teachers to avoid studying the results to locate the strengths and needs of students, classes, or schools. Teachers then fail to see patterns of student achievement or school performance because the results feel personal. Even when teachers can see trends in student performance, data do not tell teachers what to do differently in classrooms to increase student learning (Supovitz, 2009). To be useful, the accessible data must be transformed into targeted teaching that increases student achievement (Hamilton et al., 2009).

**Overcoming Barriers to Using Student Assessment Data Successfully**

Teachers will embrace data initiatives when they are well implemented, relevant to students’ learning needs, and effective in informing their own practice (Guskey, 1989; Ontario Ministry of Education, 2013). Successful implementation of any intervention program depends on teacher buy-in and commitment, district and site level leadership, school culture and climate, PD, parent involvement, and funding and resources (Datnow & al., 2005; Desimone, 2002, 2009; Teddlie & Reynolds, 2001). Guskey (2003) contended that a key issue in overcoming challenges to using student assessment data effectively in classrooms is that it often requires teachers to change their attitudes and perceptions. Rather than being overwhelmed by data and considering it to be unnecessary, teachers must instead see their assessments as an integral part of the instruction process and crucial for helping students learn. Schools and leaders that support data use to improve teacher practice and student learning show growth in teaching quality and learning outcomes (Cicchinelli, Dean, Galvin, Goodwin, & Parsley, 2006; Guskey, 2007a). The small but growing body of research on data as a driver of student learning shows that application and implementation of data-use initiatives have
been uneven and inconsistent in schools and jurisdictions (Slavin et al., 2013). Though it is evident that using data effectively increases student learning (Black & Wiliam, 1998; Cooper, 2010; Hattie, 2012; Herman, Osmundson, Dai, Ringstaff, & Timms, 2015), Mandinach and Gummer (2016) pointed out that few educators are data literate or adequately prepared to use data effectively.

Several studies have identified the importance of providing PD to educators on using data and connecting data to practice (Black & Wiliam, 1998; Datnow & Hubbard, 2016; Datnow, Park, & Wohlstetter, 2007). Teachers must have a choice in their PD since not all teachers need the same learning opportunities. By first encouraging teachers to assess their data literacy skill competencies, PD can be customized to meet individual or group professional needs. Teachers may choose to focus on skills to understand data reports, interpret results, develop and use curriculum-based assessments, identify problems based on accumulated data, analyze data, or make instructional decisions based on information from data. Most providers of PD on data use admit they do not go far enough to connect student data to teachers’ pedagogical practices (Mandinach & Gummer, 2013). Pedagogy is the interactions between teachers, students, and learning environments along with learning tasks and instructional approaches used in classrooms (Murphy, 2008). It is essential that school leaders acquire data literacy skills, so they can support their staff as they integrate data into their pedagogical decisions.

Teachers must have opportunities to become data literate and instructionally adaptive to individual, class, school, and aggregate learning demands (Louis, Leithwood, Wahlstrom, & Anderson, 2010). Teachers can acquire data literacy skills in a few ways:

- through staff development focused on how to read and analyze reports of assessment results
• by attending data use presentations either virtually or in person
• by participating in school or district discussions on the use of data,
• by working with the Data and Accountability teacher at the Anglophone-West School District,
• by attending webinars, or
• by reading blogs on data use.

Earl and Katz (2006) stated that after receiving PD, educators need opportunities to practice, discuss, and reflect on data use. They need support as they work through multiple stages of reading, using, and applying data in this complex process of transitioning information from data into teaching practices that increase student learning.

One opportunity for teachers to learn by forming a data team (Lachat, Williams, & Smith, 2006) composed of school leaders, teachers, counselors, and even a data coach, who work collaboratively to analyze and interpret the data, develop interventions, monitor results, and make decisions (White, 2005).

**Five Stages of Data Literacy**

Most teachers find it stressful to make data-informed decisions because they are underprepared to do so (Dunn, Airola, Lo, & Garrison, 2013). As the research and applied literatures clearly indicate, PD to understand data sources and how to use data is urgently needed since it is crucial for improving the quality of schools (Desimone, 2009; Mandinach & Gumner, 2013; Van Veen, Zwart, Meirink, & Verloop, 2010; Wayman, 2005). In their study of interim assessments and policies that support their use in classroom, Goertz, Oláh, and Riggan (2010) found that although teachers accessed and analyzed data, they did not substantially change their instructional and assessment
practices in classrooms based on the data. However, it is essential that teacher practices change based on data for RtI success aimed at increasing student learning. Research now indicates that a key challenge with RtI is that PD is often limited to policy-makers and administrators, who are expected to train teachers. Less attention is paid in the classroom teachers themselves, even though teachers are central to data-driven school improvement initiatives (Little, 2012). Teachers need ongoing support while feeling valued for their expertise as they increase their data knowledge. When teachers see demonstrations or models that show them how to use data or examples of how data helps improve learning, they come to accept data as an informative resource rather than an accountability measure or an unknown entity.

A review for the Organization for Economic Co-operation and Development’s Centre for Educational Research and Innovation (OECD, 2013) found that professional learning must be ongoing, be guided by data on student learning, involve teachers in decisions about their learning, and be embedded in everyday practice and inquiry (Owston, 2007; Yates, 2007). There must be an emphasis on analysis and reflection, and PD must be connected to comprehensive change processes focused on improving student learning (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Smith, Hofer, Gillespie, Solomon, & Rowe, 2003; Wayman, Midgley, & Stringfield, 2005). However, as Smith et al. (2003) indicated, effective PD alone is unlikely to result in effective long-term change unless time, resource availability, and organizational support are also considered.

A comprehensive review of the research and applied literatures indicates that there are essentially five stages of learning that educators must go through if they are to achieve the level of data literacy required to implement RtI approaches effectively in
their schools. Figure 1 in Chapter One illustrates these five processes. Understanding and attending carefully to each learning stage is far better than a holistic learning approach since the five-stage model systematically guides teachers through an incremental and scaffolded learning process. Here are the five stages:

1) Reading: Educators need the basic capacity to read data in a range of forms from various types of assessment measures. Commensurate with simply reading the data is the capacity to understand what the data convey about a child on each assessment item, such as phonological awareness and print directionality in emergent literacy assessments;

2) Analysing: Once educators can read their data reports with understanding, they must learn how to analyze the data to see patterns, problems, and needs at the individual child, small group, whole class and, if collaborating with other teachers, at the grade and school levels;

3) Interpreting: After they have analyzed the data, educators need to interpret what the data convey about children’s specific learning needs;

4) Responding: Interpreting data to see what children need to learn leads to the natural next step of responding to the data. This step is far more complex than it might first seem. Responding appropriately to data requires educators to possess an extensive knowledge of both subject content and skills children are to learn and the evidence-based instructional strategies necessary for teaching the content or skills effectively; and

5) Reflecting: Educators need the capacity to reflect on and evaluate whether selected teaching strategies are meeting learning needs. If they are not
succeeding, educators need to be willing to and capable of selecting other targeted instructional interventions.

This model provides educators with an ongoing supported approach to learning that is planned, sequential, and individualized to address learner needs. As educators develop skills in each stage of the model, the goal is for them to increase their use of information from data to target instruction to meet identified student needs.

In the five-stage data literacy model, a list of guiding and reflective statements identify the skills educators need for using data effectively at each of the five stages. The researcher designed the rubrics such that educators can use the knowledge statements presented at each stage to assess their own data literacy skills. These statements are meant to help educators take notice of the skills they need at each incremental and developmental model stage to become successful data users. As educators reflect on their data use practices, they can determine their level of competence for each knowledge or skill statement, ranging from not yet mastered, to developing to confident.

For example, an educator who is just beginning to understand the terminology used in assessment reports (Stage 1 rubric) would select the first self-assessment option, not yet. An educator with some confidence and some knowledge of that skill but who believes it still needs work would select the second rubric option, developing. An educator who has already worked extensively on that skill to the extent of being able to mentor another educator would select the third rubric option, confident. These self-assessments allow educators to choose for themselves where they require the most support in using data to help students experience more success.

**Stage 1 – Read and understand data.** Although educators show interest in reading and understanding data, they often do not know where to begin the process
The rubric set out in Table 1 presents a range of tasks and capabilities associated with the first stage of reading and understanding data.

Table 1

Skills for Reading and Understanding Data

<table>
<thead>
<tr>
<th>Stage 1 – Read and understand data</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on reading and understanding data: I can…</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand the terminology used in assessment reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the purpose of student assessments (e.g., diagnostic, formative, or summative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand data from multiple data sources (e.g., teacher-made tests, observational data, standardized tests, provincial, national, or international assessments)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• read and understand charts, tables, and diagrams showing assessment results in reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• find relevant data in a table or graph (e.g., student, class, and school achievement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify the mode, range, median and mean for assessment results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• find relevant data in a table or graph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• read and understand qualitative, descriptive information data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• read and understand quantitative (e.g., percentiles, cut scores, standard deviations, frequency, range, mean, raw scores), graphic (e.g., line, bar, and pie graphs, scatterplots, histograms), and colour-coded (e.g., RtI).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the type of data presented in reports (e.g., population or sample, cross-sectional vs. longitudinal)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Before the prevalence of computerized data systems that make data readily available to teachers, one major hurdle was that teachers were unable to access that information and use it to inform their instructional decisions. Now, however, through
data systems such as PowerSchool and Desire2Learn, data are more readily available to teachers and presented in easier-to-read formats. While the ease of accessing data can be considered an advantage for teachers, schools, and administrators, it also means that educators and administrators across the spectrum require more sophisticated levels of data literacy to use the amount and complexity of information provided in multiple types of student assessment data. At the same time educators need to invest a lot of time, organization, and knowledge to access, read, and fully understand student learning profiles, results from provincial assessments, observational charts, absenteeism records, and other forms of data. To do a comparative analysis of classrooms or school performance, for example, would be time-consuming. Without knowing what questions can be answered with the available data, investing time in analytical comparisons does not always lead to effective changes in practice or increases in student learning. Cowie and Cooper (2017) noted that teachers must have sufficient basic mathematics and statistics knowledge and understanding to use data in meaningful ways. For example, they need to be able to compute a mean or understand what a standard deviation means to recognize how a student is performing based on established standards. To help with this, the first rubric posits a range of “I can…” reading and understanding statements that govern the knowledge, skills, and understandings that are foundational for educators to become highly competent and effective data reporting users and consumers.

**Stage 2 – Analyze data.** The literature on data-driven decision-making (DDDM), or data-informed decision-making (DIDM; Means, Padilla, DeBarger, & Bakia, 2009) supports the need to build educators’ capacity to analyze data effectively and appropriately (Choppin, 2002; Ikemoto & Marsh, 2007; Mandinach, 2009; Wayman & Stringfield, 2006; Mandinach & Gummer, 2013). DDDM in education refers to teachers,
principals, and administrators systematically collecting and analyzing various types of data, including input such as demographics, processes such as quality instruction, outcomes such as resources used, and satisfaction data, to guide decisions to improve the success of students and schools (Marsh, Pane, & Hamilton, 2006). Once educators can read and understand data, they can carefully analyze student data to prioritize their instructional time, target instruction towards students’ individual needs, and refine instructional methods in a timely manner (Hamilton et al., 2009). Educators need the skills to analyze the validity of test questions and performance assessment tasks to determine what specific knowledge and skills are necessary for students to complete tasks (Brookhart, 2011). Educators must also have a thorough knowledge of curricula and its standards to analyze data to determine how students, classes, or schools are performing. This stage is not always easy, especially when data show students have not succeeded or made progress.

When interim assessment data show students are not learning, educators must reflect on their practices and selected interventions. They must reflect on how well they taught a concept, how engaged students were during instruction, what pre-requisite skills students needed to benefit from the instruction, and what evidence of learning or difficulty each student displayed. Sometimes educators can study absenteeism or, more commonly, study types of errors made by students to identify and address student needs. It may be that students appear temporarily to grasp a concept, but learning was not sustained. Educators need to examine progress over time, consider results for the entire class, and analyze other classes that follow the same curriculum. Educators must also analyze data to determine whether students have achieved standards according to established cut scores. To share and discuss with colleagues the results of running
records, word recognition assessments, reading fluency, and other assessments such as DIBELS (Good & Kaminski, 2010), PALS (Invernizzi et al., 2005), and Keymath Diagnostic Assessment-3 (Connolly, 2007) can be intimidating for educators who fear being judged. However, this collaborative practice has been shown to increase teacher effectiveness (Goddard, Goddard, & Tschannen-Moran, 2007) in using data and increasing student learning.

Most educators in Canada use data from Fountas and Pinnell (Fountas & Pinnell, 2012) or the Developmental Reading Assessment (DRA; Beaver & Carter, 2006) to create instructional groups for guided reading and to identify reading levels for independent reading. Educators must also look for types of errors students make and plan lessons to teach skills students lack. Educators also need to analyze the test items that used to assess students on specific skills to check for validity and bias, which may impact student achievement results. Through assessment measure item analysis, teachers can identify whether students perform better on certain types of test questions such as selected response, numeric response, or open-ended questions. Student error may not be due to lack of mastery of the skills assessed. Rather, it may be a result of uncertainty about how to complete a particular testing format. Educators often focus on final scores as the only piece of valuable data. However, educators can break down the results to see whether students struggled with a specific type of question instead of the specific content of the question. Teachers must examine multiple data points simultaneously (e.g., school and district scores over time) to identify patterns and trends within data (Means et al., 2009). The rubric set out in Table 2 presents a range of tasks and capabilities associated with the second stage toward becoming competent assessment data users, that of analyzing data, once educators have read the data with understanding.
Table 2
Skills for Analyzing Data

<table>
<thead>
<tr>
<th>Stage 2 – Analyze data</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on analyzing data: I can….</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• collaborate with peers when using data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify curriculum-based standards and expectations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• determine if data are from assessments aligned with curriculum outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• determine whether student learning is increasing when looking at multiple data entry points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify students who are not meeting grade-level expectations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify students who are excelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• compare students in a class, similar classes, schools, districts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• compare student, class, and school achievement to a provincial achievement standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify the strand, subdomain, or group of skills that are stronger or weaker for a student or a group of students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• summarize results, so they are informative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• determine whether students are meeting the curriculum outcomes and achievement standards</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage 3 – Interpret data.** Data, in raw numbers, have no meaning unless educators interpret them to make those numbers informative and relevant to the needs of students, classes, and schools. The usefulness of data depends on the interpretations educators give it since it is the interpretations that guide teachers to make decisions for maximizing students’ learning. The validity of the results of assessments and other accumulated data depends more on how educators interpret and use the test scores than on how the test creators constructed the tests (Cronbach, 1976; Messick, 1989). For
example, when children write year-end criterion-referenced summative assessments, the results have more validity when educators interpret them to inform instruction by looking at the overall achievement of an aggregate of students rather than focusing on individual performance. Aggregate data helps identify trends across grades, schools, and other aggregates such as variations in performance based on demographics, gender, programs used, and schools attended. Aggregate data helps identify strengths and needs that are common amongst schools and students; educators use it as a guide for examining the contributing factors that produced the results.

Educators must have specific uses in mind when they examine data and make decisions that are strategic and timely. Assessments should be used for the purposes for which they were created to determine whether school or class goals have been met. Educators typically need to look at multiple sources of data to get a clear picture of the needs and strengths of students since no single assessment provides all the information educators need for making informed instructional decisions (Hamilton et al., 2009). When educators are presented with data charts and tables, they need to disaggregate particular data and compare other available data collected at different times or by different stakeholders. By interpreting results both individually and collectively, educators can identify trends or areas of strength or concern that may need to be addressed at the individual child, small group, whole class, grade, school, or district level. The literature shows that educators struggle with the essential task of examining data systematically and making sense of data about individual and group long-term learning trajectories (Confrey & Makar, 2005; Craven et al., 2014).

The rubric in Table 3 presents a range of tasks and capabilities associated with interpreting data. A strong capacity to interpret data enables educators to form
hypotheses about the instructional methods they choose for improving student learning. Data from many sources help teachers and school leaders identify children’s relative strengths and weaknesses so that educators can allocate time and resources to teaching necessary outcomes. Information from data can also provide clear and targeted feedback to students so they can measure their progress. For example, when educators use running records to assess reading skills, they can analyse miscues (errors) to identify student strengths to develop along with specific skills to target. Examples of skills to target with primary grade students include mastering letter sounds, chunking words into parts and syllables, or self-correcting reading errors. The underlying assumption around educational data use is that it will not only inform decisions but also enhance teaching practices, since teachers will focus on addressing learning gaps (Chen, Heritage, & Lee, 2005; Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006). These enhanced practices lead to improvement in student achievement or performance (Schomaker & Wilson, 1995). When educators interpret all available data, they are more prepared to make data-informed decisions about individual students, class, and school needs.
Table 3
**Skills for Interpreting Data**

<table>
<thead>
<tr>
<th>Stage 3 – Interpret data</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on interpreting data: I can….</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• interpret data based on group characteristics (e.g., gender, ethnicity, rural-urban)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• use multiple data sources (externally/externally developed, formative and summative) to explain results to a variety of audiences.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify patterns and trends in student achievement (e.g., misconceptions, common errors, success on different types of test questions, longitudinal data)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the impact of cut scores on results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the reliability, validity, and potential bias of data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• establish a specific purpose for examining data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify gaps in instruction and learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify the type of questions on which students perform well and those that students struggle to complete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify connections between multiple sources of data (externally/externally developed, formative, summative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• interpret provincial and other large-scale assessments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• summarize results so they are meaningful and contextualized</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage 4 – Responding to data and transferring data to action to inform instruction.** Even when educators have data, they will not necessarily use the data to make instructional decisions, improve or alter their teaching, or increase student learning. Many educators focus more on reading and interpreting data than on making instructional decisions based on results of data analysis (Jimerson & Wayman, 2015). Heppen et al. (2011) suggested that while educators often receive training on how to access data systems and reports, they do not receive in-service training on how to
translate data into instructional decisions or teaching activities in classrooms (Data Quality Campaign, 2014). After receiving data, how do educators draw on a range of pedagogical skills and strategies aimed at increasing student achievement? If educators do not have the skills to address students’ conceptual problems identified by data, they cannot adjust their instruction with research-based strategies or interventions. The information from assessments is then of little benefit or use (Heritage, Kim, Vendlinski, & Herman, 2009). A data-informed decision-making process systematically uses achievement data to inform curricular decisions and instructional practices, and to monitor those decisions and practices to determine whether student achievement is improving (DuFour, 2003). Educators need to combine data literacy with pedagogical content knowledge (Shulman, 1987) to impact instructional practice. Mandinach and Gummer (2013) analyzed issues around the growing need for data-informed decision-making in schools of education programs. They found that most educators are not trained to turn data into pertinent information that impacts teaching practices or decisions. Mandinach (2012) called this ability to use data to make informed pedagogical decisions “pedagogical data literacy” (p. 76).

When educators interpret data, they have decisions to make about changes to their practices or the resources they use so students’ learning will increase. To identify strategies, resources, and assessments that impact instruction at any level, they need to know about language structure, reading development, and pedagogy to differentiate instruction for diverse learners.

The National Reading Panel (National Institute of Child Health and Human Development, 2000) identified these essential components of reading instruction:

- phoneme awareness
Educators need to reflect on their teaching practices and the explicit strategies they use to make content meaningful and understandable for students. Educators must also critically analyze the resources they use to teach content for any kind of bias, such as gender or racial bias, that may prevent students from benefitting from those resources. The selected resources must also be at an appropriate level of difficulty to meet students’ needs. Educators must set instructional goals based on established standards and government mandated curricula as they address student needs based on information from data. Since educators have limited time to teach children, they need to structure lessons to maximize the time students spend actively learning skills. Educators are expected to use incremental and ongoing formative assessments to monitor how instruction is impacting student learning, to provide constructive feedback to students to help them master skills, and to group students to better address student needs. However, grouping students on learning needs alone will not increase student achievement if teaching is not targeted to students’ needs using research-based interventions. Giving students targeted interventions based on information from data addresses gaps in learning allows students receiving Tier 2 or Tier 3 supports to learn successfully with only Tier 1 instruction. This transition to fewer interventions indicates that teachers are making the best instructional decisions for students.
To impact student learning, educators need to collaborate with other classroom teachers, teaching specialists, and administrators, discuss research-based instructional interventions and strategies, monitor and record learning evidence, and establish learning timelines. Educators are expected to use data to inform a wide range of topics: students’ academic performance and needs, teacher effectiveness, program efficacy, resource allocations, and instructional practices. Data use needs to be part of day-to-day practice and not an addition to instructional time if it is to increase educator effectiveness. Data use must be an integral and integrated component of educators’ work and decision-making process. The rubric in Table 4 presents a range of tasks and capabilities associated with the fourth stage toward becoming competent assessment data users: responding to data, making sound instructional decisions, and transferring data into action to increase student achievement.
Table 4
Skills for Responding to Data and Transferring Data into Action to Inform Instruction

<table>
<thead>
<tr>
<th>Stage 4 – Responding to data and transferring data into action</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
</table>

Focus on responding to data: I can…

**Before teaching**
- formulate questions that can be answered using data
- set a learning target or goal
- select teaching strategies and approaches to address student needs (e.g., pacing, reteaching, scaffolding, implementing accommodations)
- identify similar learning needs among students
- create groups to target teaching
- change the order of teaching outcomes
- ensure classroom assessments align with curricular outcomes
- use data to set measurable goals for student achievement

**During teaching**
- use diagnostic, formative, and summative data to modify teaching practices
- implement ongoing formative assessments
- differentiate instruction based on student needs
- use continuous monitoring to make decisions on what to teach and the amount of time needed to enable students to master a skill

**After teaching**
- allocate resources to better meet needs of students, class, and school
- provide targeted informative feedback for students or groups of students
- communicate conclusions derived from data
Stage 5 – Reflecting on and evaluating use of data. According to Stenberg and Horvath (1995), teacher reflection is central to expert teaching. Educators must be able to reflect on what they are doing, along with the why and how of their practice, so they can adapt and refine their practice. Reflection helps educators use data to find solutions to problems. Educators need to evaluate how they use data to inform instruction and implement changes, and to ascertain how interventions affect student learning. Although reflection and evaluation form stage five of the professional learning model to determine how instructional decisions impact student learning and teaching practices, this reflection and evaluation must be an integral part of each stage of the learning model. Reflecting on data and its meaning should lead educators to talk with colleagues to analyze what is and is not working (Danielson, 2007). When they reflect on data about their students or classes, educators may discover new ways of thinking about their practice, which may yield positive impacts on student learning. Some questions teachers may reflect on are: Are my students demonstrating growth in learning? What data did I use when planning lessons? What data did I choose not to use, and why? Or, what do I need to change to increase student learning or address student needs?

Evaluating the effect of changes in teacher practice on student learning is more correlational than cause and effect. As they evaluate their increased use of data to inform instruction, educators may note increased student engagement since the teaching is specific to children’s readiness to learn at a certain level. Another result of using data may be that students move more quickly through the tiers as their learning needs are better identified and addressed. Educators may use their data evaluation to identify grade, class, and school-wide strengths and weaknesses, which can inform decisions about PD activities or resources needed to address student needs. See Table 5 for a range
of tasks and capabilities to guide educators’ reflection on how data was used and whether using data impacted student learning.

Table 5
**Skills for Reflecting on and Evaluating Data Use**

<table>
<thead>
<tr>
<th>Stage 5-Reflecting on and evaluating data use</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on reflection and evaluating use of data: I can…</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Evaluate data use</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• collaborate with teachers and other educators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• pose new questions about learning needs based on assessment results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• show how data supported interventions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• evaluate the effectiveness of teaching strategies and other instructional decisions (e.g., time on task, order of presenting the teaching outcomes)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify gaps in instruction based on summative data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• select targeted instructional planning based on summative data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Reflect on my professional learning about using data</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• reflect on selected teaching practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• reflect on the choice of assessments and their frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• reflect on the quality of classroom assessments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• state how using data changed classroom and instructional practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify professional development needs (e.g. content material, teaching strategies, developing assessments)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• contribute to a Professional Learning Community (PLC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• mentor a peer or intern in using data to improve learning</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Summary of the Professional Learning Model. The data literacy professional learning model outlines the data literacy skills educators need to make informed instructional decisions. These skills are divided into five stages of learning that focus on using incremental student, class, and school data. The model is designed so that teachers use a systematic approach to read and understand data, analyze data, interpret data, make decisions about how to use those interpretations, and then evaluate how those decisions impacted student achievement, which is the primary goal of using incremental data. As they work through each stage of the learning model as a staff, educators make informed decisions based on data to best meet identified student, class, and school needs. The bulleted points in each table are meant to help teachers reflect on their ability to apply the necessary skills to use data individually and collaboratively to make instructional decisions to increase student learning. Data-informed decision-making requires good data and good decisions based on that data (Hess, 2009). Since stand-alone workshops and courses have little effect on teacher practice (Guskey, 2003; Joyce-Showers, 1988), this professional learning model is job-embedded to incorporate and apply professional learning activities into the daily work of teachers. Research clearly shows that professional learning delivered and implemented in small settings at the school level has a bigger impact on improving teacher practice than traditional offsite PD sessions (Darling-Hammond & Richardson, 2009; Jimerson, 2011; Wayman et al., 2011).

Conclusion

Studies have shown that using a data-informed teaching approach in schools and districts can result in increased student performance levels (e.g., Carlson, Borman, & Robinson, 2011; Slavin et al., 2013). With increasing implementation of RtI initiatives,
educators are expected to have skills to use data to identify students at risk of failing and then use evidence-based interventions to improve learning. Coburn and Turner (2012) argued that future research on data use should focus on teachers’ practice, on what happens when people engage with data in their everyday work in classrooms and how that engagement relates to instructional change and organizational learning. The researcher began this study by identifying challenges teachers face in implementing RtI initiatives and using data to increase student learning. The five-stage model breaks down the complexities of using data into manageable tasks that educators can master before proceeding to a next stage of collaborative professional learning. Schools no longer need to attribute poor student performance to students’ lack of prior knowledge or their socioeconomic status since data can now show that students in similar schools with similar backgrounds show increases in achievement. An educator’s capacity to understand data about student learning, make inferences, and translate information into instructional decisions determines the quality of the assessment and teaching process that impact student learning (Bennett, 2011). No matter what evidence educators use to address student needs, maximize classroom instructional time, and engage students appropriately, data use must be an integral component of their work and their decision-making processes aimed at increasing student learning. Educators need opportunities to apply what they know about using data and to improve their data literacy skills. The next chapter describes in detail the study’s design and methodology for working with student data in an applied and collaborative approach to PL.
Chapter Three: Research Design and Methods

Introduction

This chapter describes the qualitative methodology selected to understand how educators use data, overcome challenges using data, and then further develop their data literacy skills. To accomplish this the researcher piloted the research-based five-stage Professional Learning Model (PLM) described in the previous chapter. The applied and collaborative research design used in this research informed both the educator and student learning as participants worked with the researcher to increase student achievement levels by addressing needs as soon as they were identified. The researcher sought to answer the research questions set out in Chapter One by working closely with educators to address their recognized need to embed data use more frequently and more purposefully into daily teaching and instructional planning so their instruction could have a greater impact on student learning. The theoretical framework for this research is a constructivist model that explains how people learn (Gordon, 2009). Specifically, the researcher used the theory of social constructivism since participants constructed knowledge by interacting with each other, with students, and with the researcher.

This chapter begins with an overview of the research methodology, including a description of and rationale for the research design. It then outlines the research setting and study participants before describing the six data collection methods. Next, it describes the five phases during which the researcher collected data, along with the data collection methods used in each phase. It then describes the data analysis plan, which is followed by a summary.
Research Methodology Overview

Research methodology refers to a plan for gathering and evaluating information to answer research questions (Creswell, 2014). The function of a research design is to ensure that the evidence obtained leads to answers to the initial research questions (Bhardwaj, 2001). According to Merriam (2009), researchers employ qualitative research to understand how people make sense of their world and the experiences they have in the world. Thus, qualitative research fosters a close examination of participants’ worlds because the researcher becomes involved with the participants’ contextualized experiences (Creswell, 2013; Yin, 1994). In pilot-testing the PLM aimed at increasing educators’ data literacy, the methodology chosen was an applied, collaborative study. Applied research tests theory in real-life settings and is driven by the need to solve practical, real-world problems (Denscombe, 2014). Applied research usually draws substantially on the literature to provide a theoretical base for the study (Burns, 2000). In this study the researcher pilot tested a PLM generated from an intensive literature review. Carnine (1999) stated that for research to be valuable to teachers, the research must be applicable. This applied research strove to improve our understanding of the challenges educators experience when using data, with the intent of helping them use data more effectively (Bickman & Rog, 2009). The researcher used a collaborative, continuing professional learning model focused on increasing educators’ data literacy that aligned with expectations of the New Brunswick Department of Early Childhood Education and Development that educators have essential skills to use assessment data to respond to student learning needs (Government of New Brunswick, 2016).

Creswell and Miller (2000) explained that collaborative research means that participants are involved in the study as co-researchers who work together to find
answers to the research questions and also inform procedural elements of the study, such as suggesting questions to ask in questionnaires, recommending practices to observe in classrooms, or providing feedback on data collected during the study. Participants may help form the research questions, assist with data collection and analysis, and make suggestions to improve data collection. Osher and Snow (1997) emphasized involving practitioners collaboratively at all stages of the research process—identification, conceptualization, implementation, evaluation, synthesis, and communication of information. Researchers and participants enter collaborative partnerships to improve practice by applying the research findings in a practical context (Ison, 2008).

The researcher used a qualitative research design because the research goal was not simply to measure change, as would be the case with a quantitative methodological design, but to describe both the changes that took place and how changes occurred in a natural setting as participants worked together to pilot the PLM. Qualitative research explores the broader context within which change takes place; it can capture factors that participants perceive as contributing to change (Ritchie, Nicholls, & Ormston, 2013). An applied approach maintained the study’s focus on the efficacy of the five-stage model. The researcher collected qualitative observational and interview data as the participant educators worked through the PLM stages at the kindergarten-to-Grade 5 levels in one elementary school during an entire school year. The applied and collaborative research design allowed the researcher to examine in detail what data educators already used, how they used those data to inform instruction, and what support and education the educators needed to work with data accurately and comprehensively. The researcher gathered this information using several data collection methods: a questionnaire, interviews, observations, field notes, and an analysis of documents teachers used during
or when planning instruction. A qualitative methodological approach employing an applied collaboration methodology was an appropriate design as this study

- investigated the challenges teachers encountered while using student data,
- identified and recorded the PD necessary to overcome those challenges, and
- examined the impact on student learning and achievement when educators used assessment data more frequently and purposefully.

As the researcher pilot-tested the data literacy PLM designed for this research, the chosen approach provided contextual knowledge of how teachers used data when teaching early literacy and reading skills, and whether increasing use of data to target identified student learning needs positively influenced student learning. Creswell (2007) identified four overarching techniques of qualitative data collection researchers can employ: field work, observation, interviews (including group interviews and focus groups), and document (and other artifacts) analysis. Drawing on these four techniques, the researcher used six specific data collection methods:

1) a teacher questionnaire
2) repeated semi-structured interviews with educators
3) observations of individual, group, and whole school educator interactions
4) field notes detailing the purpose, nature, and outcomes of ongoing educator-researcher collaborations and professional learning opportunities
5) analysis of documents such as classroom-based assessments
6) a standardized reading-based assessment measure (DIBELS) administered to all children in grades K-55 to aid in understanding each student’s learning status and instructional need.

63
The Dynamic Indicator of Basic Literacy Skills (DIBELS) is a set of procedures and measures for assessing the acquisition of early literacy and reading skills from kindergarten through sixth grade (Good & Kaminski, 2010). The measure was administered to all children at each grade level three times during the year. Child-level assessments served two purposes within the study: 1) to provide the researcher with clearly standardized and benchmarked indicators of every child’s emergent literacy and conventional reading skills at incremental time points throughout the school year; and 2) to work in tandem with the assessment data educators were already using to inform their school-wide RtI program.

Documentary materials and artifacts were an important data source. The researcher used them to examine and analyze the participating educators’ expected curricular knowledge and understandings, to find out which data-based and descriptive assessment measures they were already using, to see how they were taking action based on that assessment information, and to understand the professional resources they used during the study period to guide their data literacy acquisition as they advanced through the model’s five stages. A collaborative and applied study design employing qualitative data collection research methods was the best approach for gathering detailed information about the educators’ practices of choosing and implementing interventions, and for determining how the educators learned to use assessment data.

**Research Study Design**

**Research setting.** This study was conducted in a kindergarten-to-Grade 5 public school, Anthony Primary, in New Brunswick during one school year. Anthony Primary is located on the outskirts of an urban center and is part of a large Anglophone school district that has been implementing a province-led Response to Intervention (RtI)
initiative for the past three years aimed at promoting the use of data to inform instruction. Students in this school tended to perform at or above provincial grade-level averages on provincial literacy assessments, but educators sought, through our applied and collaborative research effort, to increase all students’ literacy achievement levels, particularly for those currently at a lower achievement level. The school was selected by the Chapters Bookstore during the 2017-18 school year to receive books to promote literacy in school and at home. It was exciting for each student who got to go to Chapters and select a book for the school library. Each month a newsletter went home to caregivers. It included information about upcoming events, important messages, a calendar, and congratulations to students, classes, teachers or the school for any notable achievements. All students had a communication bag that acted as the primary communication source with the home. Some educators maintained an active Twitter feed to share events and to celebrate student, teacher, class, and school successes.

Each classroom was a bright and inviting space with tables where students sat and worked together, spaces where students could work independently, a reading center with a large supply of children’s literature, games, a word wall, manipulatives, a posted daily schedule, and displays of children’s work. Many classrooms had dividers for students to use to reduce distractions when working on a piece of writing. Students willingly helped each other as they solved problems, read together, or completed any assigned task. In each classroom students could seek the support of the teacher, ask questions, seek clarification about directions, work with a classmate, use manipulatives, and consult word walls. Throughout the corridors and in the classrooms, there were samples of student work and positive messages on display. Each morning during announcements, the last message shared is remember “Anthony Primary is proud of you and you are
loved and cared for at Anthony Primary.” This school was selected because it had a relatively small population of students and teachers, which would best allow to pilot a school-wide implementation of the five-stage PLM. Information from this study will provide valuable foundational knowledge and understanding for scaling the professional learning model for implementation in other schools.

**Research participants.** The researcher recruited study participants intentionally. Of the six educators, five were full time teachers and one was a part-time administrator with teaching duties. There were also three educational support teachers, the school’s administrator, and 60 students distributed from kindergarten to Grade 5 levels. Due to the intentionality of the study site selected based on the study’s goals, participants were purposefully selected for study participation (Maxwell, 2005). From the initial coded interviews and initial questionnaires, it was clear that the educators in the study school had varied teaching experiences, educational backgrounds, and years of teaching experience. In the two years preceding this study, all the educators in this study had received some degree of PD on implementing RtI initiatives. Four of the six educators had been teaching together at the same school for over ten years, which had created a family-like camaraderie; they had a shared history of the shifts in the school’s focus for PD based on changing leadership. The remaining two educators were spending their first or second year at Anthony Primary. The educators received support and leadership from the school district through literacy, numeracy, and science lead teachers who often worked with teachers and a small number of students on specific skills identified by teachers or because of discussions with the lead teachers. The following paragraphs present a profile for each educator.
Susan Kelly began teaching as a supply teacher in January 2005 after completing a bachelor’s degree in Education and had since earned her master’s degree in Education in Exceptionalities. She had some experience teaching a multi-grade class, having taught a Grade 3/4 class for one year. Susan had experience as a district-level literacy lead teacher, which allowed her to learn about assessment, available resources, collaboration, and effective teaching practices. Susan took advantage of available professional learning opportunities in person at the school, district, and provincial levels, and online thorough webinars, blogs, and Twitter. She loved to engage in discussions about pedagogy, new resources, research, and student engagement. Susan had scored provincial writing and literacy assessments several times to understand the evaluation standards. She used one-on-one conferences, checklists, and pictures of student work to assess students and inform her instruction. Susan embraced play-based learning with mini-lessons using explicit teaching for skills or knowledge children need to grow academically.

Karen Andrews had a Bachelor of Education and was considering pursuing a master’s degree in curriculum. She had begun teaching in 2005 and most of her teaching experience was at Grades K to 3 in both one grade and multi-grade classes. Karen was eager to learn and strove to become a more effective literacy teacher by participating in almost all literacy PD sessions offered by the district, which usually included meetings of small groups ranging from 10 to 20 teachers. Karen had completed studies of Marian Trehearne’s book *Multiple Paths to Literacy* (2016) and Anne Davies’ professional book, *Making Classroom Assessment Work* (2011). She had participated in PD focusing on the structure of literacy blocks, how to do read alouds to better engage students, how to develop student writing skills, and using guided reading strategies. Karen used observations, running records, checklists, and reading conferences to assess students’
skills. She strove to develop other ways to assess student mastery of skills. Karen
admitted to struggling to meet the diverse needs of her students and felt she had not
received adequate professional learning to adapt to the impact inclusion has had on
students and teachers.

Gail Hynes started teaching in 2006 after completing her Bachelor of Education
degree. She had experience teaching students in Grades 1 to 5 and multi-grade classes at
different schools and districts, which had allowed her to gain a thorough knowledge of
the scope and sequence of curriculum outcomes for different grades and subjects. She
found it challenging not to have sufficient time to plan adequately for students in two
grades but loved the a-ha moments when students grasped a new concept. Gail did not
find that she received a lot of useful data from the district or the province and did not see
the value of comparing her class to other classes in the district. She felt there were more
tools available to assess mathematics than literacy. She used exit slips, checklists, and
one-on-one conferences along with Fountas and Pinnell running records to identify
student needs. She used guided reading regularly to target student learning needs. She
used the Smartboard and whole class instruction to introduce new concepts and then
differentiated activities to be at an appropriate level of difficulty for the children. Since
she worked part-time, it was difficult to create a rapport with her where I felt
comfortable going into her classroom and working together. Gail needed to have a
schedule and a plan for when I would be working in her classroom with her students.
The conversations were always about her students and it was a challenge to have
conversations about teaching practices and what assessment information she was using
to inform her planning. Since most of her students were making steady progress in all
areas of the curriculum, she did not display a strong interest in engaging in dialogue
about evidence of learning or research. This could be a result of her working part-time and not having sufficient time to meet.

Mandy White had a master’s degree in Instructional Design and had been teaching for approximately 20 years. Mandy loved teaching in a small school where it was possible to know all the students and teachers. She made learning fun by using games and active learning tasks. She stressed over meeting student needs and ensuring students were making progress. She used pre-assessments to determine what students knew so she could maximize the benefits of instructional time by providing students with prerequisite knowledge or advanced challenges. Her read-alouds were well thought out to teach her students essential lessons or skills. Mandy was teaching a multi-grade class where she strove to meet the needs of students who had reading skills well below grade level as well as students who were above grade level. Her class consisted of nine boys and four girls, which offered challenges when students worked together. She used class rewards to engage all students and developed a cooperative approach to learning. She wanted to see more collaboration amongst the teaching staff, so teachers could learn what strategies are used successfully to address student learning needs. I was always welcomed in her room to collaborate, teach together, support students as they engaged in any learning activity, and talk about pedagogy, new research, interventions, and available resources or strategies to meet the diverse needs of students in her class.

Brenda Jewer received her master’s degree in Exceptionalities in 2017 after having taught for approximately 12 years, mostly at the intermediate level. She had a Bachelor of Education degree with high school methods and admitted she had a steep learning curve when she began working with primary students. She was always seeking to learn and improve her teaching. She attributed her enthusiasm for learning and teaching after
10 years in the classroom to having worked closely with an experienced educator during her first teaching year and having had daily conversations with her mentor on classroom organization and teaching strategies, including flexible grouping, mini-lessons, changing the pace of instruction, and conferencing. She felt that she was sometimes inundated with data and believed there was too much focus on reading levels, which often prevented students from attempting to read books they might enjoy just because they were not at a certain level. Brenda wished there was more time to collaborate with colleagues to plan how to meet student needs instead of the current practice of teachers working in silos. Brenda felt she had not received sufficient PD on using data to implement RTI effectively to meet student needs and make learning more personalized.

Barry Thomas had a master’s degree in Educational Leadership and had been teaching for approximately 18 years. Barry had taught in a northern Indigenous community, a small rural school, and a larger urban school before working at Anthony Primary. Barry often felt there was too much data for the sake of data without corresponding benefits of the time invested in compiling data. Barry was an advocate of a school owning its successes and challenges rather than attributing them to an individual teacher or class. This approach leads to collaboration, brainstorming, and working together to increase the success of all students and teachers. Barry gave credit to a mentor who had inspired him as an educator to try new practices and use data to inform decisions. Barry had a vast knowledge of assessments used at the school, district, and departmental levels, such as balanced literacy surveys, which were completed twice a year by teachers, the OURSchool survey (The Learning Bar, 2009), and provincial literacy assessments. Barry was a strong advocate for and practitioner of various
formative assessments such as entrance and exit slips, peer teaching, self-evaluation, and guided centers.

The education assistants (EA) played an important role and impacted student learning in the school. Anthony Primary had four full time education assistants (EA) who were able to call every student by name. The EAs supported student learning by listening to the children reading, recording errors students made while reading, asking students questions about what they had read, and reviewing sight words and word families. Each EA worked closely with classroom teachers so they could reinforce concepts and skills the students had been taught.

Anthony Primary benefitted from having an administrator who was a strong advocate for the school, teachers, education assistants, and students. He strongly promoted using data to inform instruction and building teacher capacity using data. He believed that working with data supports the need for instructional practice to be open, observed, and then discussed with all members of the staff rather than something that happens behind closed doors. He participated in several online professional learning communities with other school leaders and was an avid reader of current research on the importance of collaboration, types of feedback, and samples of formative assessment that was shared with his teachers. He firmly believed that we should be looking for next practices rather than best practices since best implies there is no room for improvement, which is neither accurate nor the mindset he wanted to see displayed within the school.

Anthony Primary had already been promoting the use of data to inform interventions and instruction. Educators sought, through this applied and collaborative research effort, to increase all students’ literacy achievement levels. On the provincial literacy assessment, 100 percent of the eleven students who had written the test were at
the appropriate established provincial level. No students had been exempted from writing the test. The small size of the school and the small number of participants who had a desire to enhance their data literacy skills helped make it possible to pilot test a school-wide implementation of the five-stage PLM. Participants expressed confidence participating in the study because of the researcher’s background as a teacher in various grades and in second language education, the researcher’s experience as a teacher mentor, and several years the researcher had spent as an evaluation consultant overseeing the development, scoring, and analysis of provincial assessments. The researcher’s work as a literacy and assessment consultant with a team developing a research-based early intervention literacy program called Confident Learners (The Learning Bar, 2016) provided substantial knowledge of how children learn to read. These experiences helped the researcher develop a rapport with all participants.

Data collection methods. Yin (2009) stated that study findings and conclusions tend to be more accurate and convincing when they are based on several different sources of information. The research literature emphasizes using multiple sources of data and data triangulation to increase a study’s internal validity; data collection methods must be appropriate for answering the research questions (Crowe & al., 2011). The researcher collected six types of data during the school year starting in September as educators and the administrator worked collaboratively with the researcher to institute the RtI five-stage professional learning model to support their regular curriculum implementation. The six data-collection methods were:

1) a self-complete educator questionnaire designed to collect teaching background, demographic information, and perceptions about the use of assessment data to inform teaching and learning,
2) ongoing individual and group semi-structured interviews throughout the school year,
3) detailed observations of teacher practices during class visits and meetings to discuss data,
4) field notes I took during observations of classroom practice, meetings, and discussions with individuals and groups of educators while working with data during the five-stage PLM’s implementation,
5) the range of curricular, information sources, and assessment materials the educators used to inform curriculum content and pedagogical decisions on an ongoing basis, and
6) DIBELS assessment data I gathered and used to track individual student performance on the emergent literacy, early reading, and conventional reading skills of children across the K-to-5 grades.

Data collection was an ongoing process during the school year. The next section describes each data collection method.

The policies and procedures set forth by the University of New Brunswick Research Ethics Board, the New Brunswick Department of Education and Early Childhood Education, and the school were adhered to during the research. All data collected, such as recorded interviews, interview transcripts, interview notes, and documents, were kept confidential. All digital evidence was kept on a password-protected personal computer, and all paper evidence was stored together and protected in a locked file cabinet on campus.

**Teacher questionnaire.** The researcher designed a self-complete questionnaire (see Appendix A) to gather information about each educator’s academic background and
professional experiences, as well as to identify their data use and perceptions about using data to inform teaching practice. The questionnaire was administered to teachers and the administrator at the beginning of the study school year, prior to conducting one-on-one interviews with each educator, to gather preliminary information to inform the study’s design. Questionnaires rely on written information supplied directly by people in response to questions asked by a researcher (Denscombe, 2010). Kothari (2012) recommended that the researcher be immersed thoroughly in the subject matter to pose a problem to be studied through either field observations or a preliminary survey, often called a pilot survey. Hence, the preliminary questionnaire was necessary to guide the researcher’s initial understandings of educators’ data literacy knowledge and skills, all of which helped guide and inform modifications to the professional learning model and determine a suitable timeline to meet the professional learning needs of participants in the study. The researcher distributed the questionnaire as a Word document by email and provided paper versions to those who preferred to write rather than type their responses. An email questionnaire can provide results quickly and it is cost-efficient. Researchers have found little evidence that respondents provide different answers or supply different amounts of information using an online data collection method compared with a pen-and-paper data collection format (Casler, Bickel, & Hackett, 2013; Denscombe 2010, 2014), so the researcher used both formats.

The questionnaire collected two types of information aimed at informing the first three research questions. First, educators were asked to provide demographic information in terms of their education background, years of teaching experience, and specific grade levels taught. The second type of information captured educators’ perceptions about the importance of using assessment data in teaching practice, their
own sense of ease with using data to inform instructional decisions, and the types and amount of training they had received in relation to data use within an RtI teaching and learning framework. Questionnaire results helped guide the semi-structured interview protocols and determine the nature and scope of the PL the educators required at each of the five learning stages of the model’s implementation during the school year.

For most questions the researcher used a five-point Likert rating scale (Likert, 1932), one of the most widely used question response strategies for measuring opinions, preferences, and attitudes. This allowed the educators to reflect on their level of expertise and confidence using data. The range of responses range was: 1. Strongly Disagree, 2. Disagree, 3. Neither agree nor disagree, 4. Agree, and 5. Strongly Agree. The educators could indicate a neutral response if they did not feel strongly about any question posed on the questionnaire. This approach respected the participants by ensuring they did not feel forced to answer a question in a particular way (Allen & Seaman, 2007) given the heavy focus in the study, and from governing educational policies, people, and agencies, on using data to inform instruction. One question, designed to inform Research Question 3, asked educators to rank from lowest to highest a series of potential barriers identified from the research based on their own perceptions of, and experiences with, data use in the classroom. All remaining questions collected demographic information.

**Semi-structured interviews.** Interviews are used to generate deeply contextual accounts of participants’ experiences and their interpretation of those experiences (Schultze & Avital, 2011). Successful interviews start with careful planning that considers the focus of the research questions (Smith, Flowers, & Larkin, 2009). In qualitative research, interviews can be structured, semi-structured, or unstructured
(Robson, 2011). The interviews in this study were semi-structured with a limited set of predetermined questions and prompts (Holloway & Wheeler, 2010) so that participants were able to elaborate on their experiences. The researcher posed follow-up questions about information relevant to the study and its results to guide some aspects of the educators’ elaborated talk (Brinkmann, 2014). In the interviews the researcher sought answers to multiple open-ended questions to elicit ample views, practices, and opinions from the participants about how they used assessment data to respond to student needs (Merriam, 1998). The data gathered in this way allowed the researcher to perform a more detailed analysis to influence the PLM.

The study required three types of interviews. The first type was one-on-one interviews with the educators and the administrator in late November, following the analysis of the information from the survey questionnaires. The 45-60-minute interviews gathered relevant information that informed Research Questions 1, 2, and 3, all of which pertained to identifying each educator’s strengths and needs when using data for RtI purposes, perceptions of data use in the school, previous experience using data to inform instruction, challenges and successes faced when using data, as well as PD teachers had received to become data-literate. This background information helped establish an individualized learning plan for each educator aimed at increasing educators’ effectiveness with using assessment data to target student learning needs. The questions moved from general to more specific and were ordered by importance of information. The participant determined the time and quiet location of each interview. The experiences the educators recounted during the semi-structured interviews contributed questions, ideas, and information that influenced the set of “I can” statements I assigned to each of the four stages of the PLM (see Appendix B) for the questions set out for each
model implementation stage. The researcher repeated the same interview format and content in June to identify changes in the educators’ ability and willingness to use data after they had participated in piloting the data literacy PLM.

The second type of one-to-one interviews were more frequent and specific. The researcher conducted these as the educators and the administrator worked through each of the four stages of the PLM using reports from data collected on individual student performance. Throughout the school year, the researcher conducted individual interviews with classroom-based teachers, the administrator, and resource personnel on an ongoing basis between November and June as educators worked through each stage of the PLM. The purpose of these frequent 10-15-minute interviews was to gather information to inform Research Questions 3 and 4, which entailed identifying how to better address educator needs so they could use data effectively and revising the PLM to enable educators to better use assessment results to increase student learning. These brief interviews occurred during and immediately following each class visit or meeting to gather information on assessment data use, reflect on instructional decisions educators made based on information from the data, and identify strengths and needs of the PLM.

The researcher collected the third set of interview data through group interviews. Group interviews offer qualitative researchers the opportunity to interview several respondents systematically and simultaneously (Babbie, 2011; Krueger, 1988 in Boateng, 2012). Since the study focused on working collaboratively with all educators, group interviews occurred systematically after we received the benchmark assessment results of the PLM, approximately every 12 weeks. According to Denscombe (2007), appropriate group numbers are between six and ten, a range that encompassed all the educators in this study. These group interviews allowed the participants to hear and
reflect on each other’s comments, discuss information in more depth, and elicit memories and alternative interpretations. The participants built on and replied to each other’s comments and had their experiences and interpretations of events and actions questioned to produce greater clarity and thoroughness (Richard, 2013). Puchta and Potter (2004) stated that the moderator of the group interview needs to create a respectful climate while enabling members to contribute openly both their experiences and opinions. Since participants were actively working collaboratively in a respectful environment during the school year, group interviews yielded valuable data to add to the reliability of the study. Doody and Noonan (2013) and Creswell (2012) emphasized the importance of researchers establishing a rapport with participants, demonstrating sensitivity to ethical issues and challenges, and actively listening and asking questions that fulfil the research objective during interviews. During the interviews, it was important to provide participants think time and pace the questions appropriately to ensure participants could provide reflective, detailed responses. Maxwell (2005) stated that it is necessary to have a quiet place free of distractions. To benefit fully from interviews, Yin (2003) stressed the importance of developing relationships, phrasing questions in a friendly and non-threatening manner, and reading non-verbal cues of the participants. The researcher began each interview by stating the goals and procedures of the interview as well as verbally seeking the educators’ agreement to be interviewed. The researcher developed an appropriate semi-structured interview guide for each of the three types of interviews to help achieve a comfortable interaction with participants and increase the likelihood of gathering information to move the study forward while meeting the needs of both the study design and the participants.
Observational data. Yin (2012) believed that researchers should observe participants as they engage in real-world events because of the naturally occurring sources of information that can be gathered in a setting or physical space. Observations offer an immediate account of the practices under study and are considered an excellent opportunity to garner evidence of relevant behaviors and environmental conditions (Yin, 2003). Lewis and Ritchie (2003) promoted observation as a way to generate in-depth descriptions of organizations or events, to obtain information that is otherwise inaccessible, and to conduct research when other methods are inadequate. Throughout the study the researcher recorded individual and group observational information each week while working in classrooms with educators and attending meetings. The researcher documented what assessment data was being used, how the assessment data was used, how students responded to interventions based on assessment data, and what supports educators needed to work effectively through each of the four stages of the PLM framework. The purpose of the observations was in part to ascertain how teachers interacted with data and how data informed their instruction. The researcher also took notes on student reactions to interventions, the appropriateness of interventions based on assessment data, and student performance on literacy tasks. This helped provide a complete picture of what happened as teachers used data. The researcher developed observation protocols that included both descriptive and reflective prompts that guided collection of relevant data aimed at addressing the research questions. Relevant data included the types of data teachers used to inform instruction, the types of interventions they used once a child’s learning needs had been identified, when and how the educators made decisions about the interventions to be applied, and whether and how these interventions impacted student learning.
Field notes. Qualitative research methods encourage researchers to take field notes to enhance data and provide rich contexts for analysis (Creswell, 2013; Lofland, Snow, Anderson, & Lofland, 2005; Patton, 2002). Hence the researcher recorded field notes, always stating the date and location of each data collection session, throughout all phases of the study. Field notes consist of information collected from interviews, direct observations, and informal conversations (Merriam, 2009). According to Phillippi and Lauderdale (2017), field notes aid in constructing thick, rich descriptions of the study context, interviews, focus group discussions by documenting valuable contextual data.

The researcher recorded field notes using a voice-to-text audio recorder, photographs, and pen and paper to detail the purpose, nature, conversation details, and outcomes of ongoing collaborations with the educators as well as interactions between educators and students. During each interviews the researcher recorded the location and atmosphere under which the interview was conducted as well as comments on aspects of non-verbal communication the researcher deemed relevant to the data (Denscombe, 2010). Field notes helped connect interview data with what the researcher observed in the educators’ daily practice. During and immediately following class and meeting observations, the researcher recorded detailed field notes of lesson planning, strategies used, effectiveness of strategies, next steps, and observed student needs. The researcher used these notes to inform further discussions with the educators as they worked through each PLM stage.

The researcher also documented personal reflections and made observational notes to elaborate where necessary immediately following data collection meetings with educators. Researchers emphasize the importance of writing descriptive field notes as soon as an observation is completed (Taylor & Bogdan, 1984; Phillippi & Lauderdale, 2017).
**Document review.** Document analysis is a systematic procedure for reviewing or evaluating documents in both printed and electronic formats (Bowen, 2009). Merriam (1988) stated that “documents of all types can help the researcher uncover meaning, develop understanding, and discover insights relevant to the research problem” (p. 118). Throughout the study, the researcher collected and analyzed a range of curricula, information sources, and assessment materials the educators used to inform pedagogical decisions. This analysis guided revisions to the PLM and to plan instruction to meet student learning needs. Fundamental to document analysis was identifying the context of each document and establishing who wrote it and for what purpose (Robson, 2011). The researcher also used other documents such as meeting agendas, benchmark assessment data, teacher-generated assessments and results, and data reports from district, provincial, and national assessments. These helped the researcher engage the participants in dialogue and reflection on using assessment results to increase student learning and to build and strengthen data literacy skills. Since these documents were highly contextualized to their students and school, we analyzed them together to increase participants’ skills in reading, analyzing, and interpreting data. In tandem with other data collected throughout the study, the researcher systematically analyzed texts, documents, and assessment measures the participants used or produced. The researcher used other data and data reports to address learning needs the educators identified as we collaborated to develop data literacy skills. Examples of other data include individual student materials related to reading interventions, student progress based on teaching interventions, data team meeting notes, and questions teachers asked about using data that were addressed while working through the PLM. Bowen (2009) stated that applicable documents analyzed during studies can provide background and context,
additional questions to be addressed, supplementary data, a means of tracking change and development, and verification of findings from other data sources.

**Individualized student assessment data.** The researcher collected student data using the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2010) test administered in November of the study year, in late February of the next year, and again in June of that same year to inform Research Question 4. DIBELS is a technically valid and reliable measure consisting of a series of brief teacher-administered measures of reading fluency that focus on seven literacy skills in the K to 3 grades, with oral reading fluency and comprehension as the focus in Grades 4 to 6. The seven DIBELS NEXT assessment measures and the skills targeted in the measure are:

- phonemic awareness,
- the alphabetic principle (letter naming),
- initial sound identification,
- ORAL Reading Test - accuracy and fluency with connected text,
- DAZE reading comprehension, and
- Retell vocabulary.

Each one-on-one assessment takes either one minute or three minutes to administer. The researcher assessed each student in kindergarten to Grade 5 to identify individualized levels of early literacy and reading proficiency. DIBELS also includes comparable sub-tests that can be used to assess and monitor growth and RtI more frequently for those children who are struggling and for whom interventions are developed and implemented for defined blocks of time in the teaching schedule. The researcher used additional diagnostic measures of early reading fluency such as
Phonological Awareness Literacy Screening (PALS; Invernizzi et al., 2004) as part of the literacy data gathered on some children at the kindergarten to Grade 5 levels. PALS provided a more comprehensive diagnostic assessment that better isolated specific early literacy learning problem areas for emergent and early reading development skills. PALS provided more precise monitoring data to ascertain whether ongoing targeted instructional decisions worked. These assessments generated different types of data that the educators used as the basis for reading, interpreting, and analyzing meaningful data and then making decisions to increase student achievement. All DIBELS assessment reports were available electronically through Voyager Sopris Learning VPORT Online Scoring and Data-Management System, with guidelines to access the various student, class, and school reports. The use of standardized data from the educators’ own students made RtI learning more relevant and provided teachers with information they needed to transfer data into action. According to Italiano and Hine (2014), teachers use student achievement data most effectively when the data they access is gathered as part of a school-wide comprehensive effort to increase student learning.

**Data collection procedures.** This applied and collaborative research study designed to pilot the five-stage professional learning model had five phases. Although the stages are presented here sequentially—each phase was distinct in its purpose and content—in reality the learning phases are cumulative, and they overlapped as educators grew in their RtI knowledge, understandings, and skills. Phase 1 occurred before Phase 2 since it provided information and understandings foundational to undertaking the second phase of the model’s learning. The sequence for delivering each phase was organized by a tentative schedule and timeline of about six weeks, though the timeframe required for each learning phase depended on the rate at which a teacher moved through a given
phase. As such, the researcher individualized the PLM’s implementation to meet the
needs of each educator. Once the educators had created or received assessment results,
they worked through Stages 1 before working through Stage 2, which followed Stage 1
almost immediately. However, Stage 3 could take between two and eight weeks,
depending on how students responded to instruction and interventions.

The researcher developed the data literacy PLM while reviewing current research
on data-informed decisions educators are expected to make as they implement RtI
approaches to meet student needs and increase student achievement. There is no
unanimity among researchers regarding what constitutes essential knowledge and skills
for educators to use data effectively. For instance, some researchers have argued that
educators need a strong base of statistical knowledge to use data to inform instruction
(Confrey & Makar, 2005; Cowie & Cooper, 2017) while others have maintained that
educators need more knowledge and skill to provide feedback to students based on what
assessment data indicate (Guskey, 2007b; Black & Wiliam, 1998).

Before piloting the professional learning model, the participating educators
identified the data literacy skills they wanted to focus on throughout the study. The
reflection helped them monitor their learning and their perceptions about using data. The
researcher asked the educators to reflect on their data literacy skills using the self-
assessment scoring guides for each PLM stage. They used the list of detailed skills set
out in the self-analysis tables (see Appendix F) for each stage to guide their reflection.
As the educators worked through each stage, the self-analyses occurred regularly as they
spent 10 to 15 minutes reflecting on their learning and completing the self-assessment
orally during our meetings and then in writing at the end of the study. The educators had
to use the skills in the first three stages of the PLM, progressing from locating and
understanding the assessment data to analyzing and interpreting the results and then using information from the assessments to inform instruction and interventions. It was necessary for the participants to engage in ongoing reflection on their knowledge and use of the skills throughout the study.

**Phase 1.** This phase began when the researcher visited the school in November to meet with the school’s administrator and the teachers participating in the study. The researcher began to establish a collaborative rapport by discussing with participants the mutual and respective goals for partnering to conduct the study. The researcher took field notes both during and immediately following these initial meetings with school personnel to record participants’ questions, educators’ level of engagement in the meetings and discussions, aspects of school climate, school schedules, and other information foundational to the study’s design and subsequent success. The researcher also administered and collected consent forms for parents and educators during the first phase.

There is a general, emerging understanding of the challenges to effectively using data, based on the limited though growing body of research (Datnow & Hubbard, 2016; Marsh & Farrell, 2015; Slavin et al., 2013). Therefore, in addition to the start-up information shared and gathered early in the study’s timeline, this first study phase had two additional purposes. One was to document a comprehensive articulation of challenges and successes that occurred as all the educators within one school attempted to work with a range of assessment-led RtI strategies, including issues arising using data at the individual, class, and whole school level. The second purpose was to identify what assessment data were available to the educators, how they used this data, and their learning goals for the collaborative research study. Phase 1 included administering.
collecting, and analyzing the self-completed questionnaires referenced above, as well as initial one-on-one interviews at the school with participating educators, administrators, and other key personnel. Questionnaires and interviews provided information on the teaching experiences of participants, any assessment data they generated and used, and how they used commercial measures or assessment results derived from other sources to inform instruction. The researcher emailed the questionnaires and provided a hard copy to the educators following the first meeting, asking the participants to return the questionnaires within one week. The researcher digitally recorded each participant’s interviews, which the researcher and a professional transcriber then transcribed onto a computer in a Microsoft Word document.

Phase 2. This phase also occurred during November. It had two purposes. The first was to gather and organize student data by administering both standardized and teacher-created assessments. The second was to ascertain teacher competence and confidence using the results from student assessments to inform instruction. The first step—gathering child-level standardized assessment data with the DIBELS assessments—required approximately 10 minutes to administer to each child. Once parents had given consent, the researcher collected student data using DIBELS NEXT. The researcher visited each class and worked with teachers and students during the literacy block to develop rapport with the students before administering the one-on-one assessments to each child. Being familiar with the researcher probably allowed the children to be more willing to read texts and answer questions than if they had not met the assessor prior to taking the assessment. Meeting the children a few times before administering the assessment reduced the risk Gravois & Gickling (2008) found that direct testing in an unfamiliar environment by an unfamiliar adult may restrict a child’s engagement and
participation in the assessment. The researcher provided each teacher with a representation of each child’s reading skills that was as accurate as possible. This served as a tool to initiate conversations and to respond to the research questions. Results from the standardized DIBELS measures provided data on each student’s literacy skills and needs, complete with benchmarks at interim points across the school year. This student data showed with confidence the literacy skills each child had mastered and the skills each child needed to master to become a proficient reader. This assessment data ascertained the extent to which, and in what ways, educators’ existing student-level data agreed or disagreed with the standardized assessments administered for the study. The data gathered during Phase 2 addressed Research Question 2 about to educators’ evolving capacity to work with data effectively to identify and target learning needs at the individual, group, class, grade, and school levels.

The researcher used a train-the-trainer approach, as required by DIBELS, to train the administrator and teachers, if they wished, to administer and score the standardized assessment measures used to generate data. This added to their knowledge of standardized literacy assessments. Teacher participants could have chosen to use results of these assessments to address any questions they had about student achievement and about using incremental assessment data as they piloted each stage of the professional learning model to develop data literacy skills. During the study, some teachers preferred to use their own assessment data results in tandem with the standardized assessment results to identify student learning needs. These assessments included letter naming assessments, sight word checklists, benchmark assessments, running reading records, and reading comprehension assessments. The educators systematically used results from standardized assessments, teacher generated assessments, or both as they worked
through each of the five stages of the PLM. Throughout this phase, the researcher recorded observations and field notes about the student documents educators used, teachers’ data skills and the questions they asked, and the ways they recorded and stored information.

**Phase 3.** This phase was the largest of this study. It involved implementing the five-stage data literacy learning process depicted in Figure 1 in Chapter One. A comprehensive review and compilation of the literature indicates that there are five clear stages educators typically need to go through to acquire an embedded and intuitive comprehension of how to work with assessment monitoring data to target learning needs at the student, class, and school levels (Hubbard, Datnow, & Pruyn, 2014; Reeves & Honig, 2015; Slavin et al., 2013). The purpose of Phase 3 was to work with educators as they read, interpreted, analyzed, and made instructional decisions based on their own student-level data. Phase 3 began in early November using whatever assessment data teachers opted to work with. It continued until June; as a result, it overlapped significantly with Phase 4, which was monitoring student learning.

The researcher used a data team procedure (Schildkamp & Ehren, 2013; Schildkamp & Handelzalts, 2011) to guide the study design (see Figure 2). However, this study followed only five of the eight steps because this study consisted of a more collaborative approach between the researcher and the participants. The five steps are:

1) formulate a clear problem,
2) formulate a hypothesis (about the possible cause of the problem),
3) collect and analyze data to either confirm or refute the hypothesis,
4) implement improvement measures, and
5) evaluate the effectiveness of these measures (Schildkamp & Ehren, 2013).
This study’s focus was less on creating hypotheses or defining problems and more on using available data to identify and address student learning.

Figure 2. *The data team procedure (Schildkamp & Ehren, 2013).*

First, the researcher created a data team composed of all the school’s classroom teachers, the resource teacher, and the administrator. The researcher assumed the role of lead coach and facilitator and was an active member of the data team (Schildkamp & Handelzalts, 2011; Schildkamp & Poortman, 2015). It was also important for the school’s administrator to provide support while actively collaborating with teachers and
engaging in the data learning and use process. Together, the data team, coach, and administrator worked to solve educational problems identified by the student-level data, made decisions on how best to address student learning needs, determined whether instructional interventions were best administered at the student, class, or whole school level, and ascertained which instructional strategies best targeted learner need (Schildkamp & Poortman, 2015). This continuous, cyclical, and systematic gathering and use of assessment data informed other knowledge and skills teachers needed to use data effectively for implementing an RtI instructional approach.

The researcher asked teachers to reflect on their data literacy skills using the self-assessment scoring guides for each PLM stage. The reflection helped teachers monitor their learning and their perceptions about using data. Each stage in the PLM sets out specific knowledge and skills in order to segment the complexity of data literacy skills into manageable learning components. The clear delineation of components in each stage, along with the individualized nature of the PLM, helped educators set their own place for increasing their data literacy knowledge and skills. An in-depth analysis at each stage to a) ascertain whether, where, and how there were similarities and differences in how educators processed each stage, and b) identify the stages that were the most challenging. This analysis helped the researcher customize the PLM and strengthen teacher learning. The researcher scheduled meetings and class visits on a regular basis following the initial student data collection and analysis. However, factors such as storm days, other meetings, and teacher absences often made it challenging to keep scheduled meetings. Occasionally, the researcher used one-on-one conversations to replace scheduled meetings. The more frequently collaboration and class visits occurred, the more opportunities teachers had to learn and to work intensely with data to master
data literacy skills. As the educators worked through each stage of the PLM using different types of assessment, the researcher documented successes, challenges, questions, teacher and student participation, and evidence of learning. This data helped the researcher revise the PLM, as and where necessary, to better meet teacher needs and make it easier to transfer the PLM to other school settings.

The researcher had expected to spend approximately six weeks working through each data literacy acquisition stage even though the stages are not discrete learning steps; the steps overlap and the researcher tailored the implementation to meet each educator’s needs. The six-week implementation blocks served as a guide in scheduling individual and group interviews to address teacher questions and revise the PLM. To ensure participant learning was ongoing, the researcher continually analyzed and reflected on the model’s piloting in order to follow research-based recommendations that the PL must be connected to changes focused on improving student learning (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Wayman, Midgley, & Stringfield, 2005).

**Phase 4.** This phase was ongoing throughout the study. The purpose of Phase 4 was to monitor—with teachers throughout the school year—students’ ongoing achievement levels and to use instructional interventions as needed to address learning gaps. The researcher observed and evaluated this process of using data to monitor student progress in terms of whether negotiated instructional choices and decisions implemented by educators increased student learning. The researcher analyzed student assessment data on an ongoing basis and gave feedback to teachers right away to guide discussions, interventions, and teacher learning about using information garnered from assessment data. If students were not learning as planned, the educators implemented
different pedagogical approaches. At the same time, the researcher and educators used a Tier 1, Tier 2, and Tier 3 reading and literacy response framework for students, as depicted in Figure 3. Tier 1 consisted of ongoing class-wide evidence-based differentiated teaching instruction for all learners. Tier 2 was designed to target those children experiencing some degree of reading difficulty. Tier 3 targeted the learning needs of children experiencing more significant reading challenges. The aim was to ensure the school’s students’ reading ability was on track for their age and grade by the end of the school year, in keeping with department, government, and school goals (Government of New Brunswick, 2008; Government of New Brunswick, 2013; Government of New Brunswick, 2016).

Figure 3. Tiers of teaching interventions to prevent reading difficulties

**Phase 5.** The final data collection phase took place in June. The purpose of this phase was to ascertain the success of the pilot based on participants’ feedback in relation
to their own learning and that of their students. Phase 5 consisted of all participants completing the same questionnaire they completed in November that identified barriers to using data. The researcher used the second set of responses to the questionnaire to determine whether educators had overcome these barriers during the study. The researcher also conducted a final individual interview with each study participant lasting 45 to 60 minutes. This interview’s purpose was to review the questionnaires the educators had completed at the beginning and end of the study. The researcher revised the interview slightly to include additional questions about the overall model implementation process, along with questions to identify any issues they experienced during the study. As in the first interviews, the researcher digitally recorded each participant's responses. The researcher and a professional transcriber transcribed the interviews onto a computer in a Microsoft Word document. Information from this post-study questionnaire helped answer Research Question 4, which states: Through the iterative implementation process of the framework, what changes emerged? Based on the data gathered through this study, what does an optimal learning model, framework, and approach entail for moving educators, administrators, and support teachers to become strong data-literate educators and RtI professionals?

Throughout all five phases of the data collection, the researcher recorded field notes to document events, questions, and activities that happened in the classrooms along with the supports and resources needed and used to ensure teachers succeeded in reading and responding to student, class, and school achievement reports. Field notes provided rich descriptions to guide the study and the data analysis.

**Data analysis.** Data analysis is the process of making sense out of the data (Merriam, 1998) and finding answers to research questions (Merriam, 2009). The first
step in the analysis was a preliminary reading through the data to seek relevant
information to help answer the research questions. After the recorded interviews were
transcribed professionally into written text, the researcher validated them by listening
carefully to each interview and verifying the transcription of each participant’s
responses. Ensuring the interviews were captured accurately was important to allow the
researcher to understand the educators’ practices and the barriers they encountered when
using data (Rowley, 2012). Using validated interview transcriptions helped the
researcher better understand participants’ challenges and identified needs because the
researcher made notes during the transcription to reflect on both during and following
the transcription and data analysis processes. The researcher offered the interview
transcripts to the participants so they could review and react to their own responses and
clarify information captured in each interview, all of which contributed to the study’s
data and findings.

During this initial read-through, the researcher wrote short notes, phrases, or key
concepts in the margins of the interview transcripts and observation field notes to help
organize and interpret the data and to gain insight into study outcomes (Denscombe,
2010). This method of data analysis involved establishing an initial and gradually
revised coding system and coding data by allocating labels to events, actions, and
information gathered throughout all five phases of the data collection (Petty et al., 2012).
Creswell and Piano Clark (2007) stated that the key feature of qualitative analysis is the
coding process of grouping evidence and labeling ideas so that they reflect increasingly
broader perspectives. Coding refers to identifying topics, issues, similarities, and
differences that are revealed through the participants’ narratives and interpreted by the
researcher (Sutton & Austin, 2015). The researcher assigned codes, or labels, to
sentences, phrases, and paragraphs relevant to the research questions and included such terms as barriers to data use, use of assessments, teaching interventions, changes in practice, student performance, and professional development. The researcher then used line-by-line coding to identify key words and phrases that occurred frequently, such as formative assessments, tests, type of feedback provided to students, and educators’ attitudes towards using data and collaborative practices. The researcher used the initial coding process and line-by-line coding to determine whether there were patterns and themes within the data set to help answer the research questions. The qualitative research report should provide a “sufficient description to allow the reader to understand the basis for an interpretation, and sufficient interpretation to allow the reader to understand the description” (Patton, 2002, p. 503). Description gives readers important background and context in which to situate the study’s results; description needs to be rich and thick (Denzin, 1989).

The researcher also used the codes generated for the interviews and observations to analyze the field notes. The field notes helped the researcher reflect on evidence of shifts in teacher practice and of addressing student needs immediately based on the data (Phillippi & Lauderdale, 2017). Data from interviews, observations, field notes and document analysis provided clear insight into what supports educators needed to use data to inform teaching and targeting student learning. The researcher combined the information collected from class and meeting observations with data from the interviews and document analysis to provide a holistic view of how the participants used the data and developed their own data literacy skills throughout the study. The researcher performed several member checks throughout the study to confirm accurate reporting of teaching practices and use of assessments. The researcher obtained the participants’
feedback on the observations, interpretations of what was observed, and how the professional learning model was increasing participants’ skills and confidence in using assessment data. These member checks gave the researcher opportunities to ask the educators questions about how they used information from assessments to inform instruction, challenges they experienced, the impact on student engagement and learning. The researcher also used member checks to follow up on class visits. Most of those member checks occurred orally. However, the researcher also emailed with the educators to conduct ongoing verification and discussions during the study.

Document analysis requires that data be examined and interpreted to help the researcher elicit meaning, gain understanding, and develop empirical knowledge (Corbin & Strauss, 2008; Rapley, 2007). The researcher analyzed individual student, class, and school data to identify how teachers’ increased use of data helped provide targeted interventions that met students’ learning needs. As the educators acquired data literacy skills by piloting the PLM, the researcher studied evidence of increased use of data to describe how they were using data to make informed decisions. The researcher analyzed the rich, thick data and coded it to see how teachers had used data at the beginning of the study and discover whether participating in the study changed how they used data. Importantly, the analysis included the measures the researcher took throughout the study to refine the PLM based on observations and reflections, along with input from the participants. By analyzing the educators’ data use, their instructional decisions, and student learning, the researcher addressed the final research question, which asked what an optimal learning model entails for moving educators, administrators, and student support educators to become strong data-literate educators and RtI professionals.
Study timeline. The researcher collected data between November and June of the same school year as school teachers instituted a data-based RtI program into their regular curriculum. The researcher obtained background information about the educators’ data use and their teaching and PD background through survey questionnaires and interviews in November prior to assessing students and implementing the study. The researcher administered student assessments in early November, in late February, and in early June of the study year. The researcher collected student assessment data and qualitative data continuously throughout the year. The researcher analyzed the collected data both during the study and at the end of the school year.

Conclusion. Previous researchers have identified many challenges that prevent educators from using information from data reports. To assist educators in overcoming these challenges effectively, the researcher developed this applied collaborative continuing PL study to segment into five stages the complexities and demands of using data to improve student, class, and school achievement. For students to benefit from high quality instruction, educators must be able to use data to identify student needs, have the knowledge to select the evidence-based interventions that best address learning needs, and use data to evaluate how effective the instruction has been for increasing achievement levels. Wayman and Jimerson (2014) found that educators acknowledged that they need a particular skill set in order to use data to inform their practice and increase student learning. The experience of piloting and refining this five-stage data literacy professional learning model in a school with teachers committed to working collaboratively to learn new skills will inform future professional learning opportunities aimed at increasing educators’ data literacy.
Chapter Four: Findings and Discussion

Introduction

This chapter presents the research findings. The study’s primary aim was to pilot and refine, as necessary, a data literacy professional learning model (PLM) to determine its effectiveness as an in-school professional learning (PL) strategy for enhancing educators’ data literacy knowledge, understanding, confidence, and ability to use student, class and school data to inform instructional decisions. As set out in Chapter Two, a comprehensive review of the literature and applied research on what skills and knowledge educators need to make data-informed decision led to the development of the five-stage PLM. Ongoing input from the educators in the study school over a seven-month period helped refine the PLM.

Qualitative data analyses presented in this chapter include:

1) a self-completed educator questionnaire designed to collect perceptions about the use of assessment data to inform teaching and learning;
2) transcripts of individual and group semi-structured interviews;
3) detailed observations of teacher practices during class visits and meetings;
4) field notes during observations of classroom practice, meetings, and discussions with individual and groups of educators while working with data during the five-stage PLM’s implementation, and
5) curricular and assessment materials educators use to inform curriculum content and pedagogical decisions.

Data collection and analysis were an ongoing process during the school year to reconfigure the PLM based on educators’ feedback. The researcher analyzed each qualitative data source separately to inform each phase of the study. The researcher
transcribed the interviews and group meetings and a professional transcriber validated them before they were coded. Coding consisted of highlighting groups of verbatim words, phrases, and sentences that conveyed relevant and important ideas to answer the research questions. These groups of highlighted words and sentences were colour-coded based on common ideas and then placed in categories in tables to synthesize the data. Further analysis allowed themes such as available assessment data, attitudes towards using data, teaching strategies, and professional development to emerge from the multiple sources of data.

The sixth qualitative data collection strategy consisted of results of a series of short tests from Dynamic Indicators of Basic Early Literacy Skills (DIBELS) that assess students’ early literacy skills. Each student in Grades K-to-5 was assessed using DIBELS benchmark assessments in December, February, and May. DIBELS results tracked individual student performance on the emergent literacy and early reading skills across the K-to-5 grades. The researcher and study participants used DIBELS assessment results to generate student, class, and school-level data reports to analyze and interpret while piloting and refining the data-literacy PLM.

Sustained and ongoing professional development connected to teachers’ daily practices is essential to increase teachers’ assessment capacity and practices (Darling-Hammond et al., 2009; McLaughlin & Talbert, 2006; Wylie & Lyon, 2009). The study also aimed to build educators’ capacity and confidence using assessment data to target and increase student learning listed while simultaneously collecting data to respond to the study’s four research questions.

Another aim of this applied and collaborative research study was to learn, through a questionnaire and discussions with educators in the pilot school, what issues,
barriers, and challenges schools face while moving to a Response to Interventions (RtI) teaching and learning approach, in keeping with the RtI initiative currently being implemented in New Brunswick schools. RtI requires educators to work with student assessment information based on classroom and school reports teachers receive that show each child’s results on several literacy skills. Therefore, educators must have the necessary skills and knowledge to use assessment data to plan, implement, and revise as necessary their instruction so all students become fluent readers.

This chapter sets out the incremental implementation of the model and presents the study findings as educators collaboratively applied the skills in the model’s four stages in their classrooms to increase their data literacy knowledge and skills. The chapter begins with a comprehensive picture of the assessment data educators at Anthony Primary receive from the province of New Brunswick and the Anglophone West School District as well as the data they generate themselves to inform their teaching. The findings then turn to whether and how educators use information from assessments to inform their teaching. This is followed by an analysis of how DIBELS results aligned with educators’ evaluation of student achievement of essential literacy skills. Since research has found that using student data is challenging for educators (Datnow & Hubbard, 2016; DeLuca & Klinger, 2010; Mandinach & Gummer, 2013; Marsh & Farrell, 2015), this chapter next lays out the data-use challenges experienced and overcome to successfully implement the PLM by the educators at Anthony Primary. The chapter concludes with a description of the refined Data-Literacy Professional Learning Model presented in Chapter Two that guided educators through the process of using assessment data to inform instruction and increase student learning.
Research Question 1: Using the Professional Learning Model with Assessment Data

The initial key component of working with the data literacy PLM in any school setting is to derive a detailed understanding of the data available for educators to work with annually across the spectrum from individual, group, class, and grade levels to the whole school level. The second necessary component is to understand where, when, and how educators access data findings and reports. In ascertaining the assessments available to educators at the school, district, and provincial level and their use of various results and reports, educators first worked through the 12 items of the model’s Stage 1—Locating and understanding data, all of which focused on whether or to what extent they felt they had acquired the knowledge and skills necessary for locating data and understanding what the range of assessment data results convey. The PLM was highly beneficial to educators since it provided a map for identifying and understanding available assessment information in both qualitative descriptive form, such as anecdotal records, and quantitative data, such as provincial assessments. Throughout the study, the first stage of the model led participants to reflect on where to access student data, the purpose of each assessment, the time the assessments take to administer and score, what the data reveal about the skills assessed regularly, and how students benefit from the assessments.

When completing the 12-item self-assessment of data literacy skills of the model’s Stage 1 at the beginning of the study, educators rated themselves from 1–Not yet having the skill to 2–Developing the skill or 3–Confident using the skill. Initial results showed that a wide range of skills for locating and understanding available data existed amongst the educators at Anthony Primary. Four of the six educators reported being confident locating student data, understanding the purpose of student assessments, and
understanding data from multiple sources. Most of the educators were either developing data literacy skills or confident understanding data, especially qualitative data, although there was one educator who rated herself 1 on nine of the twelve skills since she was just learning to use assessment data and admitted, during an informal conversation in the study’s first week, that she wanted to understand assessment results and needed support in acquiring the necessary skills. Since there were no skills in Stage 1 for which all six participants reported feeling confidence to use, it was evident that each of the twelve skills needed to be addressed while working with student data and reports during the study. On the self-analysis of skills, there was a higher number of 1s and 2s recorded for skills related to understanding quantitative assessment data, such as the impact of cut scores on results and standard deviations. This finding is consistent with research by Confrey & Makar (2005) and Means et al., (2011), who found that educators often lack confidence and skills for understanding basic quantitative reports about standardized assessments. These skills are necessary for being strong data-literate educators if New Brunswick educators are to use information from provincial and district administered assessments effectively to inform instruction.

The PLM proved to be an extremely helpful device for developing a collective and individualized learning strategy for educators. Responses garnered from Stage 1 facilitated establishing a clear plan for investigating and discussing with educators what data are available to them, and where, when, and how they access findings and reports generated from that data. To increase educators’ knowledge of existing data, one-hour group meetings were scheduled for one Wednesday afternoon a month to discuss collaboratively the information presented in various reports such as the results from provincial, district, and class assessments that each educator used, or the standardized
DIBELS assessments used during the study to provide diagnostic reading development data at all grade levels. Early in the study, the PLM played a pivotal role in making educators aware of the amount of assessment data they collect regularly and developing their understanding about how these assessments can inform instruction. Throughout the study, the PLM provided continuously a systematic process of seeing, as a collective and in its entirety, all the assessment work occurring with students and to see and deal with the data one assessment at a time and also as a holistic system of assessment.

As part of the process while working through the PLM’s Stage 1 targeting educators’ assessment data reading and application knowledge, in the first two weeks of the data collection period the researcher gathered a comprehensive list of the measures used to provide assessment data that included how each was intended for use in informing educators’ understanding of student learning needs. This data was gathered in four different ways: an initial administrator interview; a series of individual teacher interviews; classroom visits for informal discussions; and small group discussions. Through these multiple data gathering activities, a comprehensive understanding of data sources and their use emerged. In the context of Anthony Primary, the initial semi-structured one-on-one interview with all participants determined school and individual teacher practices for informing their understandings of student growth. The educators shared what provincial, district, school, and class-level assessments they used, how they were administered, and how results were accessed and used. Once all data sources had been analyzed, it was evident that a substantial number and type of assessment results were available at each grade level. A comprehensive list of assessments is set out in Tables 6 and 7 for capturing just how much assessment activity at all levels occurred over the 2017-2018 school year. There were multiple provincial and district assessments.
administered across all grade levels that set the standard for the appropriate achievement level in the subject area assessed, with many of the assessments focusing on literacy skill development. Large-scale district and provincial assessments are described in Table 6, while class assessments are described in Table 7.

As Table 6 demonstrates, large-scale assessments were developed and administered by the province or the district, with the assessment results available for use at the provincial, district, school, grade, classroom, and at times the individual student level. Table 6 is organized such that the first column identifies first the assessment’s source and then lists the other system levels at which results can be interpreted and used to inform instruction and policy decisions. The second column describes each assessment in terms of whether it is a standardized measure or a survey. The third column identifies the grade or grades at which each assessment was administered or applicable. The final column explains both the purpose of the assessment and its intended use for increasing student learning.
Table 6
Provincial and District Assessment Data Available to all Educators and Grades

<table>
<thead>
<tr>
<th>Source</th>
<th>Type</th>
<th>Grade(s)</th>
<th>Purpose and Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provincial Assessments</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provincial, District, School</td>
<td>Provincial Grade 2 Standardized</td>
<td>2</td>
<td>A summative assessment to determine the level of reading proficiency of Grade 2</td>
</tr>
<tr>
<td></td>
<td>Literacy Assessment</td>
<td></td>
<td>students- to improve student learning</td>
</tr>
<tr>
<td></td>
<td>Grade 4 Pilot Standardized</td>
<td>4</td>
<td>A summative assessment to determine the level of proficiency in reading,</td>
</tr>
<tr>
<td></td>
<td>Provincial Assessments</td>
<td></td>
<td>mathematics and science skills- to improve student learning</td>
</tr>
<tr>
<td></td>
<td>Early Years Evaluation-</td>
<td>K</td>
<td>Multi-Domain/Early Learning to identify student readiness to learn</td>
</tr>
<tr>
<td></td>
<td>Direct Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early Years Evaluation-Teacher</td>
<td>K-2</td>
<td>Multi-Domain/Early Learning to identify student readiness to learn</td>
</tr>
<tr>
<td></td>
<td>Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>District Assessments</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fountas and Pinnell - Running</td>
<td>K-5</td>
<td>Identifying student reading levels and miscue analysis to guide instruction</td>
</tr>
<tr>
<td></td>
<td>Records</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Report Cards</td>
<td>K-5</td>
<td>Report student achievement of outcomes to inform parents and district of student</td>
</tr>
<tr>
<td></td>
<td>Survey</td>
<td></td>
<td>progress</td>
</tr>
<tr>
<td></td>
<td>Balanced Approach to Literacy</td>
<td>K-5</td>
<td>A tally of literacy practices used by teachers to meet student literacy needs</td>
</tr>
<tr>
<td></td>
<td>Assessment Survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Formative Assessment</td>
<td>K-2</td>
<td>A tool to track educators use of formative assessment to identify ways to support</td>
</tr>
<tr>
<td></td>
<td>Learning Scale</td>
<td></td>
<td>teachers using ongoing classroom-based assessments</td>
</tr>
</tbody>
</table>

105
As is evident from Table 6, numerous assessments were used or discussed by educators in Anthony Primary. Delving deeper into the assessments facilitated determining whether and how information from the provincial and district-level assessments provided educators with an adequate means for identifying and targeting children’s individual learning needs at the school, grade, and student level. Provincial and district administered assessments are discussed next.

**Provincial assessments.** In New Brunswick, most province-wide assessments occur annually at the kindergarten and Grade 2 level; however, during the 2017-2018 school year, the province of New Brunswick piloted a Grade 4 provincial assessment to test student skills in literacy, numeracy, and science. These four assessments listed in Table 6, including the pilot assessment, are an apparent effort by the Department of Education and Early Childhood Development to provide schools with a comprehensive early literacy monitoring system beginning at the age of 3.5 years, prior to beginning school, and through kindergarten and Grade 2. The Early Years Evaluation Direct-Assessment (EYE-DA; The Learning Bar, 2011) a province-wide assessment detailed in Chapter Two, is meant to be administered to all children in the province prior to beginning kindergarten. The EYE-DA assesses four domains strongly associated with readiness to learn at school:

1. awareness of self and environment,
2. cognitive skills,
3. language and communication, and
4. physical development.

Results of the EYE-DA at the provincial and district level inform programming and policy, and at the school, class, and individual level EYE-DA results inform school
leaders and classroom teachers of children’s instructional needs when they arrive in
kindergarten. A corresponding Early Years Evaluation Teacher-Assessment (EYE-TA; The Learning Bar, 2011) is a teacher-completed student observation assessment of
developmental skills subsequently administered in the kindergarten year in early
October. The EYE-DA and EYE-TA reports require educators to read pie graphs,
colour-coded graphs, and percentages, which are skills in the PLM’s Stage 1—Locating
and understanding data that none of educators rated themselves as confident to use.
Perhaps because the one-on-one interviews occurred in November and not in September
or October when the EYE-TA observational assessments were completed, the
kindergarten teacher did not discuss at length using information from either the EYE-
DA or the EYE-TA results to identify student needs and strengths. It was only during
one informal conversation that the kindergarten teacher discussed the time required to
complete the EYE-TA and how the school readiness observational assessment did focus
her attention on each child’s skills for identifying needs at the start of the school year.
The administrator, however, was the one who discussed how information from these
measures helped identify students who needed support as they began school and how
educators, student assistants, or other support such as speech language therapists
addressed each student’s identified needs.

To gauge reading comprehension skills at the individual student, class, school,
and district levels, most Grade 2 students in New Brunswick complete a 90-minute
English literacy provincial examination in May or early June. Results are provided to
educators electronically, or a hard copy is distributed to all teaching staff at a meeting to
consider how students in their school performed in relation to other schools in the
district and across the province. Reports indicating the number of Grade 2 students who
met established provincial standards are meant to reflect the effectiveness of instruction at the current and previous grades at the school level and to identify whether there is a need to change instructional practice. School results were positive for the 2016-17 school year, with all students meeting or exceeding provincial standards, which has been the school’s trend for the past three years. During our initial one-on-one interviews, however, none of the educators spoke positively about this provincial literacy assessment since they all would have preferred to get the results in the same year as the assessments were written so they could be analyzed to identify the strengths and needs of the school. They felt that receiving results in October or November for a reading assessment completed the previous school year did not provide relevant or timely information they could use to help either students currently in their classroom or students who were in their class last year but have advanced to a different grade, inform their instructional practices, or set annual school goals. As one teacher astutely observed, “A comprehensive score for school results without providing an item analysis is nearly useless to drive instruction or planning.” In November, when educators completed the self-assessment of data literacy skills for Stage 2—*Analyzing, interpreting, and evaluating data and their sources* and Stage 3—*Responding to data and transferring data to action* skills, initial results indicated that only one of the six educators felt confident interpreting provincial assessment results. If one of the goals of provincial assessments is to improve teaching and learning (Klinger, 2008), then this goal was not evident during the 6-month data collection period. Findings suggest that even though Anthony Primary received assessment reports, it did not necessarily ensure that the educators used the available information to inform instruction.
In terms of provincial-level assessments in Grades 3, 4 and 5, the only provincially administered assessment was the one piloted during the 2017-18 school year at Grade 4 to assess numeracy, literacy, and science skills. However, since the assessment was a pilot, data reports were provided based on student performance at the school, district, and provincial level for teacher information, but the pilot tests were more focused on testing items to develop a valid assessment more than to determine student achievement of skills. Because the assessments were more about the validity of items and results arrived in June, the piloted Grade 4 provincial assessments could not be really used in any substantive way at the end of the year. The province does not assess students into the 5th grade since additional assessments in Grades 1, 3 and 5 are administered at the district level.

**District assessments.** Unlike evidence of limited use of the provincial assessments, most of the educators indicated that they used data from district-wide mandated assessments, such as the Fountas and Pinnell (2012) benchmark assessments, to assist in planning instruction. Educators used the running record results to group students at the same reading level for small group instruction; however, students were usually assigned to groups based only on the attained reading level rather than through a diagnostic analysis of the types of errors students made to determine why a student was at a particular level and what instruction they needed to improve their reading. Class visits and follow up meetings verified the use of running record results to form guided reading groups and to select appropriate reading material for small group instruction. Only one educator discussed how she used the results of the running records and miscue (error) analysis to identify skills that students needed to be taught to increase their reading skills. Two educators stated that they used the running records as summative
assessments to send results to the district but did not analyze the results to look at the strengths and needs of their students. One participant expressed strong frustrations about how the Fountas and Pinnell (2012) reading levels are used to report a child’s reading level on report cards to inform parents of reading progress, rather than what she considered more appropriate using the reading levels to help plan instruction.

In February and June of each year, all K-5 educators complete the *Balanced Approach to Literacy Assessment Survey* and the *Formative Assessment Learning Scale*, both of which were developed in collaboration with educators and district personnel. The surveys are self-reported tallies of teaching and assessment practices—such as guided reading and read-alouds—educators use regularly to teach and assess literacy skills, noting the frequency of usage over a two-week period. The administrator received the results electronically and in turn summarized and uploaded them to a district portal. The questionnaires are intended to promote reflection on teaching strategies and identifying students’ strengths and needs as they engaged in learning activities; however, there was little evidence that the surveys increased effective practices or led educators to change their practice. Often, due to hectic and high-demand daily teaching loads, educators admitted that they periodically estimated how frequently they used the various activities—such as cooperative learning activities and modeled writing—or engaged in word work to complete the district’s survey. In discussing the surveys with teachers, it became evident that they do not use the surveys regularly to guide and inform practice. While working collaboratively with all educators in the school during the study period, these literacy profiles were never mentioned or visible in the classroom or during planning sessions with educators. The only instance where the survey was evident was during the last week of the school year with one teacher who, while completing the
assessment, stated that it was a waste of time doing the surveys since no one ever looked at the results. The focus on collecting the data seemed to take precedence over using information from the surveys and provincial assessments to plan instruction, which may explain why five of the six educators rated themselves as 1-**not yet** having or 2-**developing the skill** on the data literacy skills of interpreting provincial and other large-scale assessments, identifying connections between multiple sources of data, and summarizing results so they are meaningful and contextualized.

There were clear demands by the district for teachers to be accountable for effective use of instructional strategies and time; however, based on field notes gathered while working with educators in their classrooms, it was evident that collecting and reporting data was not strongly connected with increasing student learning. When asked about other district-wide assessment initiatives, three of the six educators discussed the Grades 3, 4, and 5 common math assessments used to identify the achievement levels of students, classes, and the school in comparison with other students, classes, and schools across the district. These results too were not strongly tied to instruction, which speaks to educators needing a stronger understanding of the purpose of these assessments and how results can be used to inform instruction.

The educators were provided with provincial and district test results, early literacy profiles, and survey results, either through hard copies or PDF files sent electronically to their work email or placed on the school portal for their perusal. Transcribed teacher interviews indicated, however, that four of the six educators stated they rarely looked for data, nor were they expected by the district to search for assessment data using the electronic student information system PowerSchool, which provides extensive information about course scheduling, attendance, and assessment
results. Educators completed summative assessments three times a year for district report cards, identifying for parents the extent to which students had mastered skills for each subject area during a semester. When completing report cards, educators used collected evidence of learning and their professional judgement on how well students achieved outcomes; however, based on observing educators and speaking with each informally, it was evident that they completed their report cards independently, although the EST-R, Brenda, did provide guidance for grades for students with whom she worked. To capture students’ results for report cards, all educators depended on their classroom-based assessments; however, based on the initial PL self-assessments, only one educator felt confident identifying the strand, subdomain, or group of skills for which a student or group of students would need more or less support mastering based on assessments, or understood the reliability, validity, and potential bias of available data. The skills in the PLM and Research Question 1 facilitated investigating the role of teacher-created assessments in teaching and learning. Specifically, the researcher looked at what assessments teachers created on their own for informing learning needs and instructional practices. Further to knowing what classroom assessments are created is knowing when, where, and how these assessments are used and whether such practices are effective for informing student learning challenges and needs.

**Teacher-created assessments.** The PLM and one-on-one interviews helped identify the types of assessments educators designed and used to target student learning needs. From a teacher learning perspective and for working with the model, it was important to know and understand not only the assessments used by educators, but, more importantly, how information from the assessments guided teacher planning to target student needs. As educators shared information about their assessments, the skills in the
PLM’s Stage 2—*Analyzing, interpreting, and evaluating data and their sources* and Stage 3—*Making instructional decisions based on data* led participants to question what the student data they generate through their own assessments reveal about the needs and strengths of each student and the class as a whole, and what instruction or interventions students need to make continuous progress, particularly towards reading proficiency. This level of information and detail about what teachers are doing in their classrooms in terms of collecting and using assessment data was essential for determining educators’ efficacy in creating valid assessments and determining whether the assessments were aligned with the curriculum outcomes and could be used to plan next steps for each child. In seeking to determine when, where, and how teacher-created assessments were used in professional practice, six themes emerged through the comprehensive body of data gathered through structured classroom observations, informal visits, interviews, and informal discussions. These themes are:

1) the variety of assessments used,

2) the level of confidence educators had in using their assessments,

3) the desire for more professional development to better use classroom-based assessments,

4) inconsistency amongst educators in establishing standards or grades,

5) how educators used the assessment results differently to guide instructional planning, and

6) how educators usually used data independently rather than collaboratively.

By using the listed skills for *Making instructional decisions based on data* in Stage 3 of the PLM, the educators reflected on their ability to select teaching strategies and approaches to address student needs, use data to set measurable goals for student
achievement, and provide targeted informative feedback for students or groups of students. Based on the completed self-assessments, it was clear that educators felt competent in planning instruction since only one educator rated herself 1, or *not yet having*, on only one of the 13 skills in Stage 3 and another rated herself *as not yet having* three of the skills in Stage 3, whereas, all other educators felt they were developing or confident using all the skills associated with making informed decision based on data. From the ongoing discussions and references to specific skills in the PLM, it was evident that the PLM’s data literacy skills did lead teachers to reflect on the learning outcomes they taught, their teaching approaches, evidence of learning collected from different sources, instructional resources used, nature of student responses to questions during learning activities to inform mastery or gaps in learning, the feedback provided to students, and the errors students make and what the errors reveal about student learning needs.

The provincial and district assessments provided limited information on individual student achievement of outcomes and learning needs, as was discussed by several educators during the initial one-on-one interviews and was evident through how educators rated their skills in using the provincial assessments. Five of the six educators rated themselves either 1-*not yet having* or 2-*developing the skills* for identifying the strand, subdomain, or group of skills that are stronger or weaker for a student or a group of students, and for identifying patterns and trends in student achievement. From the collected data and observations throughout the study presented in Table 7, it was obvious that educators relied primarily on classroom-based, teacher-designed assessments to monitor progress and measure student achievement. Table 7 is organized such that the first column describes each assessment in terms of the type of assessment
as well as the skills assessed. The second column identifies the grade or grades at which each assessment was administered. The final column explains both the purpose of the assessment and its intended use for increasing student learning. Guskey (2010) pointed out that classroom assessment can and should take many forms. From the extensive list of classroom-based assessments in Table 7, it was clear that this was the practice at Anthony Primary.

Table 7  
**Assessment Data Created by Teachers by Grade Level**

<table>
<thead>
<tr>
<th>Type</th>
<th>Grade(s)</th>
<th>Purpose and Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching upper and lower-case letters</td>
<td>K, 1</td>
<td>Letter recognition and letter name-symbol association -- to identify letter knowledge</td>
</tr>
<tr>
<td>Initial and final word letter sounds</td>
<td>K, 1, 2</td>
<td>Phonological awareness skills -- aural skills to distinguish initial and final sounds in a word</td>
</tr>
<tr>
<td>Rhyming word assessment</td>
<td>K, 1</td>
<td>Phonological awareness skills -- aural skills to determine auditory discrimination and pre-literacy skills</td>
</tr>
<tr>
<td>Alphabet letter sounds</td>
<td>K, 1</td>
<td>Match sounds with letter symbols</td>
</tr>
<tr>
<td>Sight word assessments</td>
<td>K-3</td>
<td>Word reading to monitor word recognition skills</td>
</tr>
<tr>
<td>Nonsense word reading fluency</td>
<td>K-5</td>
<td>Letter sound correspondence and decoding -- to assess student decoding skills</td>
</tr>
<tr>
<td>Checklists</td>
<td>K-5</td>
<td>Monitor student learning of various skills</td>
</tr>
<tr>
<td>Observations -- Anecdotal Records</td>
<td>K-5</td>
<td>Monitor student learning to identify learning needs</td>
</tr>
<tr>
<td>Reading Comprehension questions</td>
<td>K-5</td>
<td>Questions based on texts shared orally or read independently to determine student understanding of texts</td>
</tr>
<tr>
<td>Journal entries</td>
<td>1-5</td>
<td>Monitor student writing skills and sometimes content knowledge</td>
</tr>
<tr>
<td>Spelling word assessments</td>
<td>1-5</td>
<td>Assess encoding of sight words, thematic words, word families</td>
</tr>
<tr>
<td>Oral reading fluency tests</td>
<td>1-5</td>
<td>Monitor reading speed/fluency, expression and reading comprehension skills.</td>
</tr>
<tr>
<td>Assessment Type</td>
<td>Level</td>
<td>Summary</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Pretests for spelling, math, science</td>
<td>2-5</td>
<td>Check for prior knowledge before starting a unit to avoid investing</td>
</tr>
<tr>
<td>and social studies</td>
<td></td>
<td>time teaching content students already know</td>
</tr>
<tr>
<td>Demand writing samples</td>
<td>2-5</td>
<td>Monitor student writing skills- including skills such as organization,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>word choice, grammar</td>
</tr>
<tr>
<td>Student self-assessments</td>
<td>2-5</td>
<td>Allow students to reflect on their own learning and progress</td>
</tr>
<tr>
<td>Exit slips</td>
<td>4, 5</td>
<td>Ask a question at the end of a lesson about what was taught to determine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a student’s understanding of a concept based on a written or oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>response</td>
</tr>
<tr>
<td>Entrance slips</td>
<td>4-5</td>
<td>Pose a question prior to a lesson about a concept taught previously to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>determine students’ pre-requisite skills and knowledge</td>
</tr>
<tr>
<td>Create and use scoring rubrics and</td>
<td>4-5</td>
<td>Set examples of standards so students have guidelines for acceptable</td>
</tr>
<tr>
<td>exemplars</td>
<td></td>
<td>work</td>
</tr>
</tbody>
</table>

From the initial one-on-one interviews and the group meetings, it was evident that both the school district and the school expected teachers to design and use classroom-based assessments to monitor and target student learning. However, despite the frequency and variety of teacher-created assessments used, several educators stated they had received little to no guidance on developing and scoring valid and reliable classroom-based assessments to gather accurate evidence for measuring and determining student learning in relation to grade-based acceptable achievement levels. This need for more support was clearly indicated by five of the six educators who rated themselves as either 1 or 2 for their Stage 2—Analyzing, interpreting, and evaluating data and their sources skill of determining whether assessments are aligned with curriculum outcomes in terms of content and skill level. These comments and findings stand in contrast to the administrator and two teachers’ observation that the school district has provided numerous professional development sessions during the last three years on using formative, or ongoing, assessments to build educators’ capacity to connect instruction...
and assessment. Even with the availability of, or having attended, these PD sessions, four educators still felt that they had not received much in-depth explanation by the district about how to use assessment to inform instruction. As one educator summarized when stating a concern raised by most of the teachers during class visits and discussions, “It’s really left up to the teacher to figure out how to use assessments.” To some extent, teachers’ responses raise questions for future consideration and discussion about the nature, design, and effectiveness of the professional development delivered on the use assessment data to increase student learning and whether the content, and delivery models used, are adequately tailored to meet teachers’ learning needs.

During formal and informal discussions with educators and studying the educators’ ratings of their Stage 2 data literacy skills using formative ongoing assessment, several factors surrounding the assessments teachers themselves create to identify and target children’s individual literacy learning needs at each grade level clearly emerged. Perhaps the most striking finding in the data was the change in disposition and perspective about the use of assessment data to inform teaching and learning. Unlike when discussing provincial and district assessment, all educators spoke of the need to use information from their own classroom-level formative assessments to verify students understood a concept taught, monitor progress, and group students needing extra support to master a concept. Guskey (2003) stated that teachers’ classroom assessments must be an integral part of the instructional process and a central ingredient in their efforts to help students learn. This integration of assessment and instruction was obvious in two classrooms and the other educators were working on increasing the connection between assessments and instruction. Based on initial observations in classes, there was strong evidence that assessments were being used to guide instruction
in two classes; however, in the other classrooms lesson planning seemed more focused
on teaching curriculum outcomes in the sequence outlined in official departmental
curriculum guides versus addressing student needs identified through ongoing formative
assessments during instruction. As Brenda observed,

Some teachers take teaching each curriculum outcome in their classroom
very seriously whether or not the student needs to be taught it. I think
people get so caught up in teaching curriculum outcomes that they forget
that we are teaching people. (Brenda, December 2017)

A concern repeated by Mandy was that when teachers focus on teaching a
mandated curriculum, rather than teaching students the content and skills they are ready
to learn based on information gathered through assessments, students often struggle to
learn new concepts being taught for which they do not have essential prerequisite
knowledge or students become disengaged if they are being retaught content they have
already mastered.

Through the multiple forms of data gathering and interactions with educators, it
became evident that, collectively, there existed among educators a wide range of
knowledge and skills for using assessments to guide planning. For example, one stated
that 95% of her assessments were formative, and, of that, probably 90% were anecdotal
video and audio recordings in which students explained what they were learning by
responding to questions such as, “How did you do that? How do you know that is the
answer? Or Why did you do it that way?” While this ongoing use of assessment was
evident in this classroom, it stood in contrast with another educator who explained that
she “used mostly whole class assessments and tests to assess phonics, spelling, and
reading comprehension” to determine whether students had mastered skills taught. These
assessments usually occurred following, rather than during, instruction. The remaining four educators demonstrated assessment knowledge, skills, and practices that ranged between these two skill sets.

Assessments varied depending on the grade level, the educator, and the specific targeted skills. For the younger students, educators created assessments for skills, identified either individually or together as essential or foundational, for students to become proficient readers. The kindergarten and Grade 1 teacher shared other tools used to assess student achievement such as checklists for letter naming, letter sounds, beginning and final sounds, writing letters. The Grade 1 and Grade 2 teachers similarly used reading lists of sight words, oral comprehension questions, and spelling word tests. For the older students, in Grades 3 to 5, educators used conferences and pre-tests prior to starting a new unit or teaching new concepts for identifying what students already knew so they could maximize student learning time by not teaching concepts already mastered. As each educator shared how and why they assessed certain skills, it was evident that all educators varied their assessments based on the outcomes being assessed by using student writing samples, responses to oral questions, running records, sight word checklists, observations, anecdotal notes, and recorded and analyzed learning center work. Although several educators discussed the challenge experienced with recording information gathered from ongoing assessments, one educator pointed out that, “it is difficult to store all this student information in my head” and therefore wanted to learn efficient ways to record information about student performance that could be used when planning next lessons. A common theme that evolved from all participants was how results based on observations or assessments were often recorded or just observed but not always followed up by direct instruction to increase student learning.
hence the need for the skills set out in the PLM’s Stage 4—*Evaluating the impact of data use targeting student learning*. The Stage 4 skills guided educators to show how data were used to support interventions, evaluate the effectiveness of teaching strategies and other instructional decisions such as individualized or group instruction and time on task, and then set new learning goals for students or the class.

A predominant theme that clearly emerged from the one-on-one interviews, group meetings, and observations was the lack of collaboration among teachers when using their array of data gathered to inform instruction. Educators tended to work in isolation when gathering and applying information about student learning rather than working collectively to benefit from the expertise of the educators on staff and support each other to maximize student learning. This finding was in contrast to how the educators rated their collaborative skills in the PLM completed at the beginning of the study since four of the six educators rated themselves 3 or *Confident* that they collaborated with teachers and other educators to use data and make decisions to increase student learning, whereas one educator felt she did not yet have the skills and felt she was developing the collaborative skills necessary to use data.

Another theme that evolved was the lack of consistent expectations or set standards with their own assessments compared to assessments used by other educators in a different classroom. There were inconsistencies in what educators perceived as strengths and needs at each grade level and this impacted report cards. This is discussed in more detail in the section outlining the challenges and barriers educators experience when using data. Not all educators felt that the assessments they used were always purposeful and aligned to grade-level expectations, which were not consistently defined to identify students’ skills, knowledge, and understanding at each grade level. Two
educators discussed how they administered many assessments, but did not use, or appear to know how to use, results to adjust their instruction to meet the needs or increase the student learning based on information from the results, as evidenced from their shared query, “we collect all this data but what do we do with it?” This finding expands on what four educators shared during the initial interviews that too much valuable instructional time was invested in administering and scoring assessments. Another common theme that emerged through both during interviews and discussions and in observed during classroom visits concerned how formative assessments—especially observations during lessons prior to completing report cards—were used summatively rather than to address student learning needs even if that was not the intended purpose of the assessment. These themes clearly highlight the need both for greater teacher collaboration and support in the school.

**Resources to address identified student needs.** Following the assessments or class instruction, a meeting with the classroom teacher and sometimes with the EST-R, depending on availability, was held to work through the skills in Stages 1, 2, and 3 of the PLM, which entailed understanding, analyzing, and interpreting the assessment results and then deciding the strategic intervention needed to address student needs based on assessment results and other evidence of learning collected during instruction. From field notes of the initial meetings with educators at the beginning of the study, it was evident that all educators recognized the need to intentionally plan instruction to meet the learning needs of individuals, small groups, and the class. A challenge expressed by three educators was not knowing what new or necessary resources are available to address student needs, so compiling a list of interventions became a goal of the study. Appendix L contains a list of the key resources used for research-based strategies and
interventions during the study. Over time, as educators discussed and planned interventions and effective teaching collaboratively, more educators began to outline clearly to students the goals of each lesson, do more modeling, and explicitly teach skills that were gaps in students’ learning as identified by the assessments. Many interventions used were from *Oral Language at your Fingertips* by Ontario’s Association of Speech-Language Pathologists and Audiologists (OSLA, 2014), which all educators felt was a much-needed and well laid out research-based resource, and *The Reading Strategies Book: Your Everything Guide to Developing Skilled Readers* by Jennifer Serravallo (2015).

All educators were using some assessments to inform literacy instruction for individual students, small groups, and the whole class. However, during the follow-up meetings after working together in the classroom, most of the educators shared that they often felt they did not have the essential skills, even with the assessment data, to target and monitor student needs. Having collected and reviewed with the educators the types of assessments used and created, how information from the assessments was used by each educator, and what other assessment data were needed to identify individual student, class, and school learning needs, led to reflecting on the effectiveness of the school’s existing data-informed achievement monitoring strategy. In the next section the strengths, limitations, and needs of the school’s approach to gathering and using assessment data are discussed.

**Strengths, limitations and needs of the school’s existing achievement monitoring strategy.** Given the nature of the data available and how it is used, educators worked together and along with the researcher in her capacity as a professional development coach to determine, as part 3 of Research Question 1 posits,
whether and to what extent the school’s existing assessment-led instructional strategy provides an adequate means for identifying and targeting children’s individual literacy learning needs at each grade level. The data literacy PLM together with the comprehensive lists of the provincial, district, and teacher-created assessments guided educators to examine the strengths, limitations, and areas unaddressed by current practice, which thus constitute areas of need, in the school’s data-informed assessment monitoring strategy aimed at benefitting students through identifying their individual strengths and needs, and students experiencing the same needs for instructional grouping purposes. From the comprehensive Tables 6 and 7, it is obvious that there is a significant amount of student data from various types of assessments available to educators which, depending on how and whether they were used, could be a strength if they informed instruction or a limitation if they overwhelmed educators, were not valid nor reliable, or were not used to inform instruction.

All educators in the study acknowledged fully the need to assess student achievement on a regular basis. It is interesting to note, however, that all six educators pointed out that no school-wide data-use policy existed, so individual teachers were left to determine what assessment data they needed for guiding teaching and learning decisions according to students’ learning needs on an ongoing basis throughout the year. Developing a school-wide data-use policy was an identified need. Most of the administered assessments were informal, such as checklists and observations, rather than standardized assessments. They assessed a range of skills that were, for the most part, used to inform instruction. However, due to the realities of schools and classrooms in which educators in all subject areas are constantly busy planning instruction and assessments, differentiating instruction, attending meetings, and providing extra-
curricular student activities, it was evident that there was a willingness to use the range of data reports made available to them. Rather, this situation was influenced by a lack of time to delve into the results and collaborate, an inability to understand what various data reports say for classroom application to increase student learning, or a belief that what they were currently doing was working and did not need to be changed.

In Anthony Primary, there was a great deal of assessment activity occurring at the provincial and district-levels. Large-scale provincial and district monitoring and assessment systems seemed to work in isolation, at times from one another and also from schools and classrooms. Educators frequently indicated that they needed and wanted clear and specific child-level indicators of learning strengths and needs to inform classroom instruction in the more immediate and relevant term, rather than acquiring aggregate assessment scores long after the assessment period had ended. By reflecting early in the study on the purpose and quality of the assessments, the PLM initiated the important process of allowing educators to assess meta-cognitively their own capacities and limitations for reading, analyzing, and acting effectively on what data reveal about each of their students’ learning needs and challenges. The compiled lists of assessments established a starting point for moving forward with a range of items, which included deciding whether to increase or decrease particular types of assessments, refining and making more efficient processes for working with assessment results, and establishing a concrete, detailed, and targeted tiered instructional and assessment strategy for children at the individual, small group, and collective levels. Once the range and variety of assessments being used at the school were presented holistically, educators came to recognize the need to have a more systematic approach to gathering and sharing
assessment data so they were not working in isolation and there was a continuity in
shared data from one grade to other grades as well as from one school year to the next.

To strengthen the assessment data-informed teaching and learning cycle, an
interconnected, tiered, and sequential system of collecting data is needed to meet
educators’ monitoring and accountability needs, one that moves from individual children
at the classroom level to the school level and through to the district and provincial
levels. Such practice highlights the need for a learning model that can guide educators
effectively to use large-scale and classroom-based assessment to identify and target
better student, class, and school needs and strengths. A truly effective assessment
strategy supports good teaching and learning where the assessments provide educators
with information they can use to help their students excel and that illuminates what is
acceptable and expected at each grade-level. During the initial one-on-one interviews at
the onset of the study, several educators expressed a need for established acceptable
criteria for success for each grade level to identify students who are not making
sufficient reading progress and may be at risk of failing to become proficient readers
without interventions. This need for established criteria to monitor and compare student
performance over time was addressed in the study by using the standardized literacy
assessments Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good &
Kaminski, 2003) and the Phonological Awareness Literacy Screener (PALS; Invernizzi,
et al., 2005) discussed in the next section.

**Research Question 2: Standardized Literacy Assessments**

While collecting and analyzing data through interviews, observations, planning
sessions with educators, and from standardized and classroom-based assessments,
guiding question using the data literacy PLM considered how student results from the
standardized Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2003) and the Phonological Awareness Literacy Screener (PALS; Invernizzi, et al. 2005) align with what educators learned about each student based on their own observations and assessments. As was discussed in Chapter Two and detailed in Questions 1 and 2, the student data worked with during the study period were derived from two sources: assessments educators themselves created or administered, such as running records, pre-tests, and observations; and results from the standardized DIBELS (Good & Kaminski, 2003) and PALS (Invernizzi et al., 2005) assessments. This study used primarily DIBELS measures designed to assess the acquisition of early literacy and reading skills from kindergarten through fifth grade (Good & Kaminski, 2003), and PALS (Invernizzi et al., 2005), a comprehensive diagnostic assessment that isolates specific early literacy learning problem areas for emergent and early reading development skills (Invernizzi et al., 2005). Standardized assessments such as DIBELS (Good & Kaminski, 2003) vary from classroom-based assessments by having an allotted time of usually one-to-three minutes to administer each test for phonemic awareness, letter knowledge, and oral reading fluency. There are clear criteria for scoring and interpreting results, unlike classroom-based assessments, which may be scored differently depending on who administers and scores the assessment.

DIBELS, which are criterion-based measures, are typically more reliable and effective than informal teacher observation due to the use of research-based standardized administration and scoring instructions that are easily understood and implemented by practitioners in educational settings (Foegen, Jiban, & Deno, 2007; Fuchs et al., 1984 as cited in O’Keeffe, Bundock, Kladis, Yan, & Nelson, 2017). These standardized tests generated student, class, and school-level data common to all educators to establish a
shared assessment framework for using skills in the four stages of the PLM: Stage 1—
Locating and understanding data, Stage 2—Analyzing, interpreting, and evaluating data
and their sources, Stage 3—Responding to data and transferring data to action, and
Stage 4—Reflecting on and evaluating use of data. Each stage clearly outlined specific
skills in sequential stages used both to enable educators to become more data literate,
and to increase student reading levels as educators worked with DIBELS (Good &
Kaminsky, 2003) and PALS (Invernizzi et al., 2005) results. The data literacy skills
guided conversations about multiple sources of assessment data, information from
assessment reports, student learning needs, and teaching practices from the onset
through to the end of the study with each educator.

**Purpose of the standardized assessments in the study.** During the study, all
students in kindergarten to Grade 5 at Anthony Primary were assessed at three
timepoints (December, February, and May) using DIBELS to measure literacy and
reading development skills for five primary purposes:

1) to provide a common context and framework for using the PLM to discuss
assessment measures and results, and a Response to Intervention (RtI)
teaching and learning approach with all educators in the school;

2) to determine whether and to what extent the assessment monitoring tools used
in the school provided adequate diagnostic information about the foundational
components of reading, particularly for young children, as well as a measure
of reading fluency and comprehension for children in all grades;

3) to ascertain whether and to what extent existing school assessment measure
results aligned with results from the standardized measures administered for
study purposes;
4) to provide standardized data to guide instructional learning needs; and

5) to provide an ongoing diagnostic measure of learning to ascertain whether targeted instructional strategies yielded desired results.

DIBELS (Good & Kaminsky, 2003) progress monitoring measures and PALS diagnostic measures (Invernizzi et al., 2005) were used as an interim monitoring tool to identify specific learning gaps and assess whether some children who needed more intensive interventions were responding to instruction.

To begin the study, in November educators rated their confidence and ability to use the data literacy skills listed in the PLM. These completed self-assessments were used regularly throughout the study by the educators and the researcher to determine the stages or skills to work on when generating or receiving data. All educators began the process of using the learning model by working through the Locating and understanding data skills in Stage 1 to first ensure they understood assessment results. The specificity of the Stage 1 skills in the model allowed educators to determine their professional strengths and needs when receiving and using various assessment results and reports at the onset of the study. Three educators rated themselves as not yet having acquired the skill identify the mode, range, median, and mean for assessment results, and not one educator felt confident with the skill understand quantitative data reporting (e.g., percentiles, cut scores, standard deviations, frequency, range, mean, raw scores). Based on coded interviews and discussions early in the study, most educators sought to understand and use their various provincial and district assessment data reports online. As educators began to work with DIBELS reports of student results with the researcher in December and January, they questioned what class averages showed in relation to standards and the role of averages in presenting a complete picture of student and class
performance. Two educators wanted to understand better how to interpret the range of scores from lowest to highest, the role of cut scores in determining the tiers of interventions students needed. Four educators wanted to learn what the histograms, bar graphs, and pie graphs displayed about student achievement of literacy skills presented in the DIBELS reports.

Meetings sharing DIBELS results with several educators and subsequent analysis of questionnaire responses indicated a clear need to teach and discuss explicitly with all educators the concepts of score distribution, mean, median, mode, and standard deviation, and how to understand these concepts while working with different types of data reports. To meet this need, during separate small group meetings following benchmark and progress monitoring assessments, DIBELS results and reports were reviewed at the individual, class, and school levels. DIBELS reports required educators have basic statistical skills to understand fully the quantitative data in the different reports. During the meetings, training videos and sample reports available on the Vport Voyager Sopris website (https://vport.voyagersopris.com) were used to teach educators about the various DIBELS reports while developing their Stage 2 skills of Analyzing, interpreting, and evaluating data and their sources. The resources on the Vport website supported educators as they used data-literacy skills to understand, analyze and interpret student results.

A tentative schedule was developed to work with each educator in the classroom from December to June to transition student and class-specific assessment results into informed instructional practices. These working sessions occurred prior to, during, and following class observations and co-teaching sessions, and focused on using benchmark or progress monitoring and classroom-based formative assessments, all of which
provided information for increasing educators’ data literacy skills relevant to all four stages of the embedded PLM. During formal and informal discussions following each set of benchmark assessments, several factors surrounding the standardized assessments used to identify and target children’s individual literacy learning needs at each grade level clearly emerged. One significant finding evidenced in the data was that all educators were adamant about the need for information from standardized assessments to monitor the effectiveness of their teaching.

During meetings and informal discussions after the first and second set of DIBELS benchmark assessments educators shared the benefits they received from using standardized assessment results. Educators used the standardized assessments to:

1) ensure foundational skills were measured consistently with the same standard,

2) find evidence that students understood a concept taught,

3) determine skills students were lacking and needed to learn,

4) provide guidance for grouping students needing extra support, and

5) monitor progress over an extended period.

One educator summed up many conversations that occurred during the study using DIBELS and PALS results when she asked, “Why are we not always gathering and using this assessment to inform our instruction? She then added, “This is the kind of information we need so we are not guessing.” Unlike data generated in class or received from the province and district, which often do not indicate where to focus immediate instructional attention or how to increase learning, the standardized assessments provided essential information about student performance of specific skills to inform instruction. As one educator said following the first benchmark assessments, “The standardized reading assessments helped me to see specifically what the problem areas
are, not just to say, this child’s reading at this level or is not fluent or I need literacy support.” Another educator found that “the classroom teacher can know that there are gaps in students’ learning, but if we do not specifically know where to go next and do not have necessary literacy support, then we are not really teaching to the problem.”

Using student assessment data. During the study, the screening, progress monitoring, and benchmark assessments were used to identify students needing Tier 1, 2, or 3 interventions and to ensure instruction and interventions were effective in increasing all students’ reading skills. Tier 1 interventions are class-wide evidence-based differentiated teaching instruction for all learners, Tier 2 interventions consist of small group targeted instruction for those students experiencing some degree of reading difficulty, and Tier 3 interventions are usually intensive one-on-one instruction targeting the learning needs of children experiencing more significant reading challenges. In December, the first DIBELS results presentations to each educator began with locating student, class, and school results. Next, the educators demonstrated their understanding of the reports by describing the results using the PLM’s Stage 1 terminology. Feedback from educators while working collaboratively with DIBELS and PALS results indicated the need for support in locating and understanding information from reports provided by Vport on the Voyager Sopris Learning website. Most educators initially found the website daunting due to the amount of information and different data presentation formats ranging from colour-coded reports and pie graphs to descriptive qualitative reports. A commonly-heard acknowledgement during the follow-up meetings after the first set of benchmark assessments was, “I would not be able to use these data if you were not guiding me through the stages and the website.” Another educator stated, “I would not have delved so deeply into the results without the support of a coach or
working with other educators,” while another educator said she would have missed so much information about each student in the reports had she been examining them on her own.

Working through Stage 1 skills with some educators who had extensive experience using assessment data or previous experience working with DIBELS assessments required a brief meeting of approximately 30–45 minutes to locate assessment results and show understanding of the various student and class reports. A couple of educators who had limited experience working with assessment data required and requested to work through Stage 1 skills over several sessions as they revisited accessing different reports and ensured they understood the various results and could identify information pertaining to each student. Most educators had several questions about two skills—understand graphic data reporting (e.g., line, bar, and pie graphs, scatterplots, histograms) and understand the types of data presented in reports (e.g. population or sample, cross-sectional vs. longitudinal), which were frequently revisited throughout the study while examining the three benchmark assessments and progress monitoring results. One educator had expressed a strong desire to use assessment data effectively but required more support than the others due to her starting point of not yet having any of the nine skills listed in Stage 1 for understanding how to read and use assessment data. Following all DIBELS and PALS assessment, educators revisited Stage 1—Locating and understanding data skills and by the third set of benchmark assessments in May could independently use Stage 1 skills to understand each assessment report.

When educators felt they understood the DIBELS results, they worked with the researcher and one another to analyze and interpret them using the PLM Stage 2 skills,
particularly those specific skills educators for which had rated themselves as 1—*not yet* having or 2—*developing the skill*. From the completed initial self-assessment, Stage 2 was the area educators highlighted as needing to improve for better identifying student learning needs. In the initial self-ratings for the 21 skills in Stage 2 in the PLM, there were 23 instances of 1—*not yet* having the skills and 63 instances of 2—*developing* a skill. Only one educator rated herself a 3, or *confident* in nineteen of the twenty skills. All others rated themselves as not yet having or developing most of the twenty skills in this stage. Educators felt confident using most of the sixteen skills related to *making instructional decisions based on data* set out in Stage 3 despite not being confident in analyzing and interpreting assessment data. This finding is cause for concern and supports the need for systematic and focused PL to fill in gaps in educators’ knowledge and skills to understand, analyze, and interpret assessment data and make data-informed instructional decisions to increase student learning.

By using skills such as: *identify student learning needs from multiple assessment sources; identify patterns and trends in student achievement at the individual, class, grade and school level; understand the impact of cut scores on results; and determine whether assessments are aligned with curriculum outcomes in terms of content and skill level,* educators were much more equipped to identify strengths, needs, and trends in the student data. Educators worked with DIBELS cut scores and benchmark goals to learn the scores students had to attain on each sub-test to determine whether students required Tier 1, 2, or 3 support to meet grade-level standards. Reading and understanding student DIBELS results are facilitated by reports using different colours to distinguish recommended levels of interventions students required to make reading progress. DIBELS reports use green to show students who are at or above the benchmark and
require Tier 1 high-quality instruction, yellow to show students who are below the benchmark and require high-quality instruction and Tier 2 strategic moderate small group support, and red to show students who are well below the benchmark and require high-quality instruction and Tier 3 intensive one-on-one support. In the group meeting following the second set of benchmark assessments several educators began to acknowledge that cut scores are basically the minimum educators need to expect from their students. One educator, Susan, was pleased that most of her students were at or above the benchmark in the oral reading fluency test and was determined to teach to her students’ strengths. During a follow-up meeting after a collaborative working session in the classroom, Susan questioned,

Needling [Tier 1 quality instruction] core support is not saying this is all we want from students [is to meet grade-level expectations] but rather this is the starting point of where we want to build from, right? And if they are not here, we need to bring them up to here [grade-level] at least and then build their strengths from there. (Susan, February 2018)

Educators learned to look beyond the red, yellow, and green levels of achievement to consider the types of errors students made and determine differences in student results so they could decide how best to group them for instruction based on each student’s strengths and needs. For sharing and discussing benchmark assessment results in December, February, and May, each meeting began by looking at composite scores, which combine multiple DIBELS scores to provide the best overall estimate of a student’s early literacy skills and reading proficiency. We then moved to individual student results for each subtest in the sequence they were administered at each grade level beginning with first sound fluency and letter naming fluency, followed by
phoneme segmentation fluency, nonsense word fluency, oral reading fluency, retell fluency, and Daze comprehension task. To interpret the results fully, the actual assessments items, scores, and scoring protocols were studied to understand how each assessment was scored. Individual assessment booklets were also examined to determine more specifically what errors revealed about student strengths and the gaps in student learning. When educators could discuss students with similar learning needs and strengths and felt confident about their interpretation of results, we moved to Stage 3 of the model consisting of planning for instruction. Meetings to plan interventions and instruction often occurred within a couple of days of analyzing, interpreting, and evaluating data and their sources; however, one educator was so excited about the first set of DIBELS results in December and what she was learning about her students that she enthusiastically stated, “let’s start planning.”

Some learning gaps identified in December and March through analyzing and interpreting the initial and second DIBELS results were letter names, letter sounds, beginning sounds, middle sounds, linking letters to phonemes, oral fluency, and retelling what was read to ensure text comprehension. In the one-on-one interviews at the end of the study, all study participants indicated that, due to the universal screening provided by DIBELS and the consistent use of assessments, they were better able to identify each student’s specific strengths and needs through analyzing assessment results. Educators tended to form flexible instructional groups to target specific identified student and small group learning needs. In the final DIBELS benchmark assessments in June, educators were pleased to see that the earlier identified learning gaps had decreased for most students. Educators were not surprised by the DIBELS results showing student improvements because their instruction had targeted specific skills and ongoing
classroom-based assessments indicated students were reading more words, using taught strategies to decode words and were making less errors.

**Addressing student needs.** To address student learning gaps, educators worked with the researcher regularly from December to June focusing on skills from PLM Stage 3—*Responding to data and transferring data to action* to plan instruction for the class, small group, and individual students. After any administered and scored assessments or class visits, meetings with the classroom teacher and the EST-R, depending on her availability, were ongoing throughout the study to work through the Stage 3 skills. Meetings with the educators to decide the strategic interventions to address student needs based on DIBELS results and other evidence of learning lasted from 45 to 90 minutes and occurred at least once every two weeks. From the field notes recorded during each meeting, it is evident that all educators recognized the need to plan instruction and interventions intentionally to meet the needs of individuals, small groups, and the class based on assessment results. Educators frequently used a variety of approaches to address identified student learning needs: whole class instruction; temporary, flexible instructional groups; brief conferences with students; spending more time teaching key skills, and specific feedback.

Not all students struggled for the same reason, so the same approach did not work for all students. One educator began modeling skills more frequently, while another revisited the same letter sounds and embedded previously learned sounds into her instructional plans to reinforce prior learning. When working with students not reading at grade-level, educators began to acknowledge that providing more of the same instruction that had not worked to address student needs would not enable students to increase their learning. Different evidence-based interventions and resources were
needed. One educator shared that she felt frustrated when she tried new strategies and students did not show improvement, which forced her to again change her approach to targeting student needs. Another participant recommended creating activity resource buckets targeting specific learning skill needs that educators in any grade could sign out from a central repository.

All educators faced challenges meeting the needs of a small number of students needing Tier 3 intensive supports. Sharing results, ideas, support, and recognizing successes increased each educator’s desire to meet regularly and discuss assessment results more frequently. In Anthony Primary, there were several classes with students from two different grades. One classroom had ten Grade 1 students and three Grade 2 students, and another classroom had nine Grade 2 students and four Grade 3 students. During the second set of benchmark assessments in February, one interesting observation emerged showing the students in the grade with fewer students in each multi-grade classroom did not make as much progress as students in the grade with the higher number of students. Once this interpretation of the data was shared with educators, showing how the three Grade 2 students in the first classroom and the four Grade 3 students in the second classroom were not making as much progress as the ten Grade 1 students and the nine Grade 2 students in their classes, the smaller group of students in each classroom received more targeted instruction according to their assessment results. By the third benchmark assessment in May, the decrease in reading progress was eliminated as educators balanced instructional time between both grades rather than focusing primarily on the grade with the most students in their classroom. This increase in student results demonstrates clearly the impact appropriate targeted
instruction can have on student learning, and further supports fully the need for continuous, individualized, and skill-specific student and class level data.

As each educator used different strategies and resources to meet student needs, Stage 4—Reflecting on and evaluating use of data skills were used to ascertain the effectiveness of instructional decisions on student learning. Although educators were encouraged to regularly use Stage 4 skills throughout the study, educators tended to reflect on their assessment and instructional practices more following the DIBELS second and third benchmark results. Evidence of this reflection was clear through questions educators began to ask midway through the study such as, “Why are we doing what we are doing?”, “How are the resources or activities we use, instructional strategies, pacing of lessons, and feedback we provide impacting the students with whom we are working?”, “How do we know if our instruction is effective?”, and “How do we know what we are teaching is increasing student’s learning?” Dufour and Reeves (2016) promote posing similar reflective questions to create an authentic PLC where educators use relevant assessment and learn how to use the resulting data assessment to target student learning. Each discussion between teachers, the administrator, and the researcher was based on skills in the PLM and direct observations and analysis of student work showing their response to instruction in relation to learning outcomes and engagement displayed during lessons and independent work. Everything that happened in the classrooms while using assessment information needed to focus on increasing student learning, which was a shift for several educators as they often focused more on teaching outcomes than the specifics of monitoring student learning.

Meeting students’ needs through RtI and the PLM. Responding to individual student needs was a priority for all educators in the school. Each educator used
assessment data in diverse ways to identify and address student needs. This section provides supporting evidence of how educators’ use of the PLM increased their effectiveness as educators. The examples show how the DIBELS, PALS, and classroom-based assessments were analyzed and interpreted using Stage 2—Analyzing, interpreting, and evaluating data and their sources skills to determine student needs and how educators developed an instructional plan for individual and groups of students using information from the assessments and skills in Stage 3—Responding to data and transferring data to action.

DIBELS and PALS assessment results were used to identify the tier of intervention each student required to increase learning, and more importantly to develop an approach to increasing each student’s reading skills. The school did not emphasize the tiers of interventions each student needed since the school was small enough to focus on individual and small group learning needs as they were identified. Most students needed only Tier 1 interventions, which consist of evidence-based, high-quality instruction, administered by classroom teachers. These interventions often focused on phonological awareness and phonics in kindergarten and Grades 1 and 2, whereas in Grades 3, 4, and 5 interventions often focused on reading fluency and comprehension, although there were several students who had not mastered fluency with middle sounds in consonant-vowel-consonant words. The LRT used data generated from the study, in conjunction with other data she collected such as word recognition tests, to identify, in collaboration with classroom teachers and often with the researcher, the intervention and frequency of either one-on-one or small group support necessary to target student needs. One educator stated, “the best intervention is what happens in the classroom one-on-one with students with explicit instruction and feedback in a safe environment.”
For all grades, instructional strategies for teaching decoding skills for phonemic awareness, word recognition, and fluency were explored, discussed, and selected with the educators. Students were provided opportunities to apply the explicitly taught skills while reading connected text. The analysis of the DIBELS Nonsense Word Fluency (NWF), a test that measures the ability of students to associate sounds with letters and use the sounds to form words, and the PALS spelling assessment results revealed several Grade 4 students were lacking short vowel sounds, which prevented them from successfully decoding multi-syllabic words. These students received targeted phonics instruction on short vowel sounds. These skill gaps led to the elementary teacher working closely with the Grade 1 teacher to plan intervention and learning strategies to address the gaps in phonological awareness knowledge so students could acquire and transfer those skills to their reading. Classroom teachers worked closely with the researcher and the LRT using the PLM Stage 3 to plan instructional approaches based on the assessment data.

That educators valued progress monitoring from DIBELS was evidenced by more educators asking to have certain students assessed to determine whether they were progressing. Educators used progress monitoring results to determine whether instruction needed to be modified, adjusted, or supplemented. A challenge often expressed by educators was not having the necessary time to administer the assessments themselves since, during the school day, limited opportunities existed for educators to administer the DIBELS and PALS assessments. The education assistants offered support to students receiving Tier 2 and 3 supports in the classroom, small groups, and one-on-one during brief intensive sessions aimed at developing certain skills students had not yet achieved. Two educators expressed an ardent desire to plan tiered interventions using
the PLM Stage 3 skills with other educators rather than each teacher planning to meet their students’ needs individually. One educator questioned how, collectively, they could go about changing their thinking from “my” students to “our” students, so they had a collective and shared responsibility for each student in the school. One educator, in posing the following important question, demonstrated how working with the researcher in the role of a literacy assessment coach helped educators use the PLM and assessment data to identify, as early as possible, young students at risk of reading failure and use research-based interventions to enable these students to achieve critical foundational reading skills in the early grades preventing students from struggling to learn to read in upper elementary grades.

From the standardized assessments, the primary concern was the need to teach decoding skills and that became evident in the assessment from Grade 3, 4, 5. So at K-2 how can this information be used to direct our teaching so that decoding is no longer an issue or a minimal issue in the higher grades? (Mandy, April 2018)

This question led to an expressed desire by all educators to take responsibility collectively for all student progress. Their school-wide approach to RtI will take a sustained effort over several years, but having educators benefit from and increase collaboration was progress towards routinely using assessment data to address each student’s needs as a school. Working through the stages of the PLM with available student data allowed educators to identify students achieving the outcomes and those who needed more sustained or intensive support. The PLM provided essential information and an approach in the primary grades to identify students headed toward reading difficulties and reducing those difficulties by targeted interventions.
**Use of collaborative practices to build and use data literacy skills.** During two group meetings in February and June, educators shared DIBELS results with their colleagues and supported each other using skills from the four PLM stages. Each educator reported how they addressed student needs through implemented interventions and strategies. Some educators were confident about sharing this information while others were more hesitant to do so. To ensure educators shared results, a safe environment had to be created, especially for two educators who were apprehensive about sharing their results and interventions. One of these two expressed a lack of confidence in her knowledge of data and pedagogy, and the other was unwilling to share at first because of being quiet and not liking to speak in front of a group. Through ongoing conversations, truly listening to concerns expressed by participants, and offering continuous and encouraging support, the educators knew they were supported and could learn from each other’s expertise and suggestions. Both educators who were apprehensive sharing the second set of benchmarks did not show any hesitancy discussing the third set of benchmarks in June. By the final month of the study, all participants expressed how the expectation to share results and interventions with their colleagues increased their data-literacy skills. One educator stated, “When results of the DIBELS assessments for the three benchmarks were shared, it really forced me to reflect on what the data was telling me, not only about my students, but also about my effectiveness as a teacher to increase student learning.” Sharing what was learned about student progress or lack of progress from the assessments and the strategies used helped to create a collaborative team approach to using assessment results to enable all students to learn. Once educators looked at the data and could see the data points start to increase
for most students after the second set of benchmark assessments, there was a visible increase in the educators’ engagement in the study.

**Alignment of classroom-based and standardized assessment results.** In response to whether the information from educators’ existing data sources aligned with the standardized assessment-based monitoring system administered by the researcher, educators indicated that some student results surprised them, but for the most part the results reaffirmed what educators suspected or knew about each student’s progress. There were a few students who did not achieve as well as their teacher had expected; one teacher stated she felt that the students must have been off during the assessment and that she had already taught those skills. She was surprised the students did not do better on the oral fluency test. When educators received DIBELS assessment results, they usually aligned with observations and anecdotal notes made by the educators for most students. The educators shared that, overall, there were few surprises. Students identified by the DIBELS assessments in December and February as not yet at grade level were the same ones educators were already spending more time with in guided reading sessions. This finding gave credibility for DIBELS and PALS results and led to increased teacher engagement in the study and a desire for more standardized assessment data.

One revelation for some educators from the DIBELS results were the fluent readers who did not have comprehension skills. Once educators worked closely with each student, they tended to see evidence of the accuracy of the standardized assessment results. The DIBELS results often provided information about specific reading difficulties students experienced such as recalling explicit information from a text, retelling a story in sequence, summarizing a story, or making predictions about actions.
and events in a story. The DIBELS Oral Reading Fluency test identified specific word recognition errors students made, such as guessing a word based on the initial letter or letters or on context, skipping unknown words, not attempting words with more than one syllable, and not connecting words to previous words in the text. These results provided educators with information about student learning needs. Most educators learned about skills some students had not yet mastered that they had not observed through their classroom-based assessments as they analysed and interpreted the results and errors of oral reading fluency tests. Classroom-based assessments had not flagged some students who were having trouble learning to read and the educators therefore assumed these students did not have any learning gaps. The standardized assessment identified the learning gaps and the skills each student needed to develop, such as, in the case of primary grade children, initial sounds, letters for certain phonemes like ai, ea and gh, and, for elementary grades, comprehension skills needed to make continuous progress in learning to read. When the educators observed their students responding positively to the strategies selected, several stated they felt more capable of effectively meeting the literacy needs of their students through applying information garnered using the PLM Stages 1-3 skills. This success led to educators feeling more confident about the data they collected and that received from the DIBELS, their skills in analyzing and interpreting data to identify students’ learning and addressing needs, and their professional judgment about how to increase their students’ learning. As educators shared information with each other, they requested more assessment, progress monitoring, and meetings with the researcher and each other to increase their ability to analyze assessments to inform instruction.
Following meetings to share data and instructional strategies, one insightful comment demonstrated how an educator under-valued the standardized assessment results. The second DIBELS oral reading fluency benchmark assessments administered in January provided each educator with data about students’ reading progress. When one educator received her results, she stated, “I don’t have time to look at the results now since I am completing report cards.” Even when detailed DIBELS and PALS assessment information about individual student strengths and needs were readily available, this one educator did not look at the results due to being pressed for time to submit report cards. This educator clearly did not see the connection between the DIBELS and PALS literacy assessments, student learning, and report cards. However, most educators did analyze and use the benchmark assessment results to verify student progress and suggest ways parents could support their children.

The learning model led participants to reflect on their own assessments of individual student literacy skills, on teaching practices, use of assessments, interventions, and errors that students made. This reflection increased their effectiveness as teachers. During the final interviews, all educators discussed the difference in student literacy rates between the beginning and end of the study in relation to DIBELS oral reading fluency, decoding both nonsense words and real words, running records, spelling skills, and willingness to read new texts. A sample of such feedback is reflected in the following words from one educator:

The staff benefitted by getting a toolkit of teaching strategies, building confidence, and creating new competencies. But the students are the ultimate benefactors of this study. We have seen students go from non or struggling readers [at the beginning of the study] to [reading] almost at grade level or
surpassing the grade level based on numbers [results from the final DIBELS benchmark assessments]. But there are anecdotal things that we do not measure as much [that was evident from the beginning to the end of the study]—we are talking things like the number and types of books that the kids are taking out of the library and [students] discussing books. We have kids who did not want to read now wanting to read. We do not track those things although they are significant changes we observed. (Barry, June 2018)

From the coded field notes during and after meetings following class visits and co-teaching lessons, it was evident that several participants used assessment results from DIBELS and PALS to reflect on their teaching. Their reflections led to adjusting, changing, prioritizing, or enhancing instruction to be more effective and responsive to their students’ needs. Improving student learning took an ongoing, job-embedded, systematic approach using information from standardized and classroom-based assessments, progress monitoring, targeted instruction, and research-based interventions. All interview respondents indicated that, because of universal screening provided by the DIBELS and consistently using information from assessments, they were better able to identify students’ strengths and areas of concern. The PLM stage three skills were subsequently used to address the learning needs of all students.

**Discussion of assessment data.** Data can be a powerful tool to push educators to challenge existing assumptions about student learning and to reflect critically on instructional practices (Lachat & Smith, 2005). The assessment results from the DIBELS benchmark assessments and the PALS diagnostic assessments led educators in this study to reflect on what individual and class results revealed about the effectiveness of instruction students received to meet their identified needs. According to Gage and
McDaniel (2012), educators who do not use data may not understand how effective their instruction has been and when to “adopt or adapt new instructional strategies to positively affect student outcomes” (p. 1). Working through Stage 3—*Responding to data and transferring data to action*; and Stage 4—*Reflecting on and evaluating use of data* skills in the PLM during informal conversations, scheduled planning and data analysis meetings, and completed self-assessments derived from the beginning and end of the study, it was evident that all educators increased their confidence and use of data, even though some educators used data more frequently and consistently than others. The differences in how often and thoroughly educators used assessment data during the study may be due to each educator’s initial readiness and willingness to learn and to use the learning model’s skills. Educators who did not completely embrace the need for data did not invest as much time and effort into participating fully in the study to increase their data literacy skills.

Educators needed to be confident in the data they collected and received as well as their professional judgment to truly create a seamless process of using information from assessments to plan instruction. Most educators attributed changes in student results to targeted instruction and research-based strategies that met identified student needs. To counteract findings by Goertz, Oláh, and Riggan (2010) that even when teachers accessed and analyzed data, they did not substantially change their instructional and assessment practices, a huge focus of this study was on planning instruction based on what the data revealed and then studying through progress monitoring the impact of that instruction on student learning.

A safe collaborative environment focused on increasing student learning and sharing assessment results and instructional strategies was created to avoid findings by
Means et al. (2009) that individual teachers were generally reluctant to share assessment results, especially if colleagues perceived poor assessment results as a weakness in classroom practice. Sharing student results, planned instruction, and the effectiveness of that instruction on student achievement were foundational to building both capacity and a culture of collaboration focusing on student assessment results since a goal of the study was to increase assessment data use not only during the study but in future years.

This applied collaborative study was purposely designed to counteract findings by Daly (2012) that educational teams with limited expertise can misinterpret or misuse data or work together to perpetuate poor classroom practice. Building capacity for all educators at Anthony Primary to use data was essential. The PLM provided all educators at the school with the skills to understand, interpret, and analyze assessment results to consistently make data-informed instructional decisions to data.

To become assessment data-literate with a clear PLM and the support of a literacy assessment coach required a schoolwide collective effort. As Buffan, Mattos and Malone (2018) recommended, educators need to support and challenge each other to learn and therefore cannot successfully learn to use assessment data without collaboration and discussions with their colleagues. During the seven months working with educators at Anthony Primary, the need for an experienced coach to teach data literacy knowledge, understandings, and skills fully and effectively emerged from the data collected through interviews with the educators, observations of educators’ use or lack of use of information from assessments to inform instruction, and field notes recorded during data analysis and instructional planning meeting. Equally important was the identified need for a path forward to facilitate teaching of data literacy skills through the clear systematic piloted PLM.
Even when educators expressed a strong desire to make informed instructional decisions based on information from both classroom-based and standardized assessments, there were challenges that needed to be overcome before they could use data consistently to plan instruction. These challenges, issues, and barriers are discussed in the next section.

**Research Question 3: Issues, Challenges, and Barriers Educators Face When Using Data**

The purpose of this study was, in part, to determine, through applied collaborative research with teachers and the administrator in one school, the issues, barriers, and challenges faced while moving to an RtI teaching and learning approach so they could be addressed during the study while piloting the PLM. From the initial questionnaire (see Appendix A) and one-on-one interviews (see Appendix B), all educators identified challenges, barriers, and issues they encountered using data to identify and respond to individual learning needs. Many of the challenges were presented above in the sections about Research Questions 1 and 2, about how educators used provincial, district, classroom-based, and standardized assessment data. These are discussed in more detail in this section. Knowing the barriers at the school from the onset of the study was essential for supporting educators by ensuring the challenges were addressed, as much as possible, while working with them as they gained proficiency using all the skills in the PLM. The full range of challenges educators experienced, regardless of the type of data with which they worked, are presented first, followed by the challenges specific to the two standardized assessments (DIBELS and PALS) implemented for study purposes, and the challenges experienced using class-generated data.
Challenges using assessment data at the beginning of the study. At the beginning of the study, educators completed a questionnaire ranking eight different challenges, each representing a potential barrier to using data on a scale from 1—the lowest barrier to 8—the highest barrier. The barriers were extracted from the literature reviewed in Chapter Two. It was crucial that identified challenges were neither ignored nor perpetuated while working together with assessment data given that the study’s purpose was to enhance teachers’ assessment literacy. Decisions made about meeting times, using specific types of data, trying different approaches to professional development, and implementing the PLM were all made in collaboration with educators, which decreased the likelihood of ignoring pre-existing barriers at the school and negatively impacting study results. In the initial questionnaire results in Table 8, although most educators ranked barriers from lowest (1) to highest (8), one educator recorded a yes response to all barriers and later stated, “I found it really difficult to rank them since they are all barriers I experience, but the greatest barrier is time to meet, time to delve into the data, just lack of time.”
Table 8
Barriers to Using Data at the Beginning of the Study

<table>
<thead>
<tr>
<th>Barriers to using data-November</th>
<th>Ranking from 1-lowest to 8-highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of student data</td>
<td>4 2 yes 5 4 2</td>
</tr>
<tr>
<td>Too much student data</td>
<td>6 8 yes 2 3 4</td>
</tr>
<tr>
<td>Do not feel confident using data to make decisions</td>
<td>5 5 yes 4 8 6</td>
</tr>
<tr>
<td>Lack of professional development or skills to analyze data</td>
<td>8 6 yes 7 7 7</td>
</tr>
<tr>
<td>Lack of time to collaborate with other teachers</td>
<td>7 7 8 6 8</td>
</tr>
<tr>
<td>Lack of expertise in school to lead teachers to use data</td>
<td>2 3 yes 6 5 5</td>
</tr>
<tr>
<td>Fear of how data will be used</td>
<td>3 4 yes 3 2 3</td>
</tr>
<tr>
<td>Not an expectation at the school</td>
<td>1 1 yes 1 1 1</td>
</tr>
</tbody>
</table>

One noteworthy finding in Table 8 is the last item: *Not an expectation at the school to use data* is ranked (1) the lowest of the eight barriers by all participants. This finding was not surprising given conversations with the administrator during the study’s initial stages and throughout that clearly indicated a high expectation that was continuously conveyed to educators for everyone to use assessment results to guide teaching and learning. From data collected through interviews and group meetings, there were clear expectations not only by the school, but also the district and the province to employ student data within an RtI approach. Even with a clear mandate to use data, educators had to overcome several challenges to using data strategically and effectively to increase student learning.

Table 8 indicates that the two highest ranked challenges with using student data by almost all educators in the study were a lack of time to collaborate with other educators and a lack of professional development or skills to analyze data. The
questionnaire was completed anonymously, and the same two barriers were identified by all educators as the greatest challenges to using data prior to commencing the study. Since these challenges frequently arose during formal and informal meetings throughout the study, they warrant an elaborated discussion because they had to be overcome to successfully pilot the PLM.

**Lack of time.** The prevailing and greatest challenge, regardless of data type, was the time required to administer and score assessments as well as to analyze and interpret assessment results before using assessment information to plan instruction aimed at maximizing student learning. Since educators had limited time to meet and to work with data literacy skills identified in the PLM, it was essential for the researcher to be flexible to meet before school, during educators’ preparation periods, Wednesday afternoons during their PL time, or at any time convenient for each educator to work with collected data and determine the impact of interventions and instruction on student learning. This flexible schedule and availability to meet helped diminish the time challenge, although each educator expressed during the study the wish for more time to delve deeper into student data and work together using data literacy skills in the PLM.

While piloting the PLM, it was crucial that educators invest the necessary time to work through each of the stages and skills to have ownership of their own PL. Educators collaboratively engaged in learning data-literacy skills building confidence along the way to ask and answer questions based on the assessment results, use the reports from DIBELS benchmark and progress monitoring to target learning needs, and conduct error analysis to truly use data to identify and address student learning needs. As educators focused on building their expertise using skills in the model with the researcher, they
made more time to meet; however, arranging meeting times was mostly driven by the researcher.

Another time-related challenge frequently expressed by all participants during class visits and follow-up meetings was the feeling that they never had enough time to work together nor did they have any common preparation times to work with their colleagues. Educators often felt they needed more time to share and discuss assessment results from various assessments about specific students, especially those students receiving support from more than one educator. This lack of communication of student data was often shared in meetings and, despite knowing the importance of collaborating and planning together to meet student needs, most educators had trouble communicating regularly with each other due to other demands on their time, such as preparing lessons, correcting student work, and attending meetings.

There was a district-wide policy supplying all schools within the district student-free Wednesday afternoons so educators could take part in their school-based professional learning community (PLC) meetings. Most educators felt that one afternoon was not enough time to really focus on generating and using assessment data, planning interventions, and determining the impact of interventions on student learning. On several occasions, there were other necessary topics such as new programs or policies from the school, district, or department scheduled for discussion during Wednesday afternoon meetings. Occasionally this designated PLC time to focus on assessments and student learning was used for other activities such as presentations or preparing a collaborative inquiry-based student-centered Maker Space to enhance student learning. All activities benefitted the school but hindered the study since they decreased the amount of time educators could meet with the researcher and each other to focus on the
assessment, teaching, and student learning. During the study, several participants indicated that they felt that either the school or the district could have paid a supply teacher for a half-day or a full-day release so educators would have dedicated time to work closely with the researcher and each other. With increased dedicated time, educators could have planned and used assessment results to inform instruction, administered and scored the benchmark or progress monitoring assessments, or engaged in more PL with the researcher and each other to dig into results and plan interventions for students based on the results. As one participant suggested, “we would have benefited if we had gotten two or three supply teachers and then worked together as a staff to really hammer things out and delve into the assessment data using the skills in the PLM. That would have been money well spent.”

**Insufficient professional learning.** From the initial coded interviews and ongoing discussions, all but two educators felt they lacked the knowledge of, and therefore confidence with, using data quickly and effectively to target individualized learning needs. Two educators acknowledged *not understanding* and *needing more support* when it came to using data to create interventions and instructional plans. As they discussed various students in their classrooms with a range of learning strengths and needs they recognized the importance of using data but were unsure what assessments to administer and how to use the results to target student needs. Several times in informal conversations, educators shared that how they responded to data was based on instinct and experience and not on research or PL. Educators used their student-specific data from the classroom-based assessments and DIBELS to work at their own pace through the stages and skills in the PLM with both the researcher as a mentor and other teachers. Working through the data-literacy skills using timely
assessment results enabled each educator to become more proficient in understanding and using assessment results in their daily teaching.

One interesting finding from the final one-on-one interviews and the completed follow-up questionnaire (see Table 9) was that despite having embedded job-site PL working with the PLM and assessment data for eight consecutive months and feedback from educators about how much they had learned and their increased confidence using data, all participants still felt they lacked the PL necessary to analyze data. This need for even more professional development supports research findings indicating just how complex it is to use data to inform instruction (Protheroe, 2001). This finding may also echo what most educators discussed in the initial one-on-one interviews, that often new initiatives are not implemented for a long enough period to impact teaching or learning. Closely connected to not having enough professional development, most educators felt unprepared to analyze or interpret assessment data to inform instruction when they completed their undergraduate degrees and began teaching. Several participants also felt that data use expertise to inform instruction did not exist in the school because of insufficient time to benefit from the expertise of colleagues or not having staff members with the essential data-literacy skills within the building. During initial teacher interviews, one participant strongly recommended having data literacy leads to work with teachers learning about assessment.

We need to have literacy leads who work intensely with educators for four weeks at a time in a school, co-planning and then co-teaching and explaining the assessments, what they meant and what the next steps should be. Often in literacy, you are left on your own, and it is up to your own devices to say I think this is what I will do next to help this student. (Karen, 2018)
Karen’s suggestion reinforces the need for a PLM that can be used to provide literacy leads with the skills to work with teachers and increase their capacity to use assessment data effectively to impact student learning.

**Other challenges identified and addressed while piloting the PLM.** In addition to those challenges asked about in the questionnaire, educators also identified other challenges during one-on-one interviews, class visits, and data-sharing meetings, all of which also had to be addressed at the onset of and throughout the study so educators could grow professionally. Several educators reported not feeling confident in using assessment data to inform their instruction. Two educators perceived there was too much data from district and department assessments at their grade level, making it difficult to decide what data were most beneficial to use. Each identified challenge was discussed with the administrator and participants to brainstorm approaches to diminish their effect so the educators could benefit fully from participating in the study.

While working with educators one-on-one and in groups to collect, analyze, and interpret assessment results and plan instruction, identified challenges were discussed, addressed, and overcome so educators could become proficient using the skills in the PLM. All educators at Anthony Primary acknowledged being more confident using their informal classroom-based assessments than the provincial assessments or other more standardized assessments, so increasing their skills using standardized assessment data was a necessary study goal and one of the first challenges addressed. Administering the Dynamic Indicators of Basic Literacy Skills (DIBELS; Good & Kaminsky, 2003) and the Phonological Awareness Literacy Screener (Invernizzi et al. 2005) generated student, class, and school level achievement reports to build educators’ skills for locating, understanding, analyzing and interpreting assessment data, and addressed the
need for obtaining intermittent student progress monitoring data. Through using the clearly outlined skills in the PLM, the benchmark and progress monitoring results allowed educators to learn to work with data to determine the effectiveness of implemented interventions and planned instruction.

**Commitment to using the PLM.** Another challenge that needed to be addressed continuously throughout the study was ensuring educators became familiar with, and consistently used, the skills in the model to guide their own learning. They needed to reflect on whether they were becoming more proficient using data to inform their instruction or if they needed to keep working on specific data-literacy skills. To develop expertise using data-literacy skills, educators were encouraged to refer frequently to the description of the stages and skills during meetings and while collecting or using assessment data to plan instruction to meet student needs. The PLM guided numerous conversations around what assessment data to collect, what data showed about student learning, what evidence demonstrated student achievement and the impact of interventions on student learning. Before each meeting or working with classroom teachers in a team-teaching arrangement, educators identified the skills or the stage of the model to focus on, depending on their PL needs or the type of assessment data being generated or shared. For example, when working with classroom assessment data on phonological awareness skills from the DIBELS subtest Nonsense Word Fluency (NWF) or Initial Sound Fluency (ISF), Stage 3 skills such as *use results to set measurable, incremental goals for student achievement; identify similar learning needs among students; provide feedback to students that is timely, specific, clear, and constructive; and select teaching strategies and approaches to address student needs* were used to differentiate instruction or plan interventions. Some teaching strategies
used, based on the PLM, were grouping students, modeling skills, scaffolding lessons, or using new strategies or resources.

**Fear of admitting not knowing how to work with data.** It was informative and important to learn from initial interviews that three educators “feared” admitting not knowing how to work with data, which inhibited them from seeking learning opportunities to increase their data literacy skills. To alleviate this fear, it was essential to create a safe environment for educators to ask questions about what specific data meant and focus on the skills preventing them from using data to inform instruction. Initially, this required one-on-one meetings or email correspondence to discuss student assessments and lessons observed or co-taught. Following this, there were gradually more small group discussions where educators could share student data, ask questions, and work together and with the researcher to achieve the skills in all stages of the PLM.

**Too much data.** Three educators found that there were too many types of assessments to interpret and use. Assessment results from provincial and district assessments, DIBELS, and PALS, are reported in different formats such as colour-coded, numerical with some showing percentages, showing the actual number correct, or pictorial using either circle or bar graphs. Some educators expressed frustration over the different formats, which they felt reduced the presumed benefits of the information being presented in the reports. To overcome the challenge of too much data and too many types of reporting formats and reports, educators worked systematically through each of the PLM Stage 1 and 2 skills with all student assessment data so they could understand, analyze, and interpret information from multiple data sources at the student, grade, and school level during one-on-one and small group meetings planning for or following up on working together in the classrooms.
**Impact of teacher buy-in.** A challenge not included in the questionnaire that emerged during the study was educators’ lack of engagement in the study demonstrated at times. This lack of commitment or lack of engagement hindered educators’ PL, which requires educators’ active engagement and reflection. When an educator stated that student assessment data was not required because what they were doing was working satisfactorily to increase student learning, this was a challenge that required a different approach than when educators were excited about data and willing to work with the researcher and each other to learn. This challenge required presenting simplified reports from DIBELS and breaking down the skills assessed and the results, as well as more in-depth discussions about information the assessments revealed about student strengths and needs. There was also a component of promoting PL through sharing resources such as those in Appendix L and introducing educators to research findings through published articles and twitter feeds.

Teacher buy-in varied based on student needs in each classroom. Classes with many students not achieving outcomes seemed to increase educators’ buy-in for using data. Educators who had more students not achieving grade-level standards tended to invest more time and engagement in using assessment results, learning new strategies, and continually seeking ways to increase student learning throughout the study. Some educators were clearly uncomfortable with the frequent classroom visits. They often asked when I entered the classroom, “Whom would you like to work with today?” and did not participate fully in the PL. “There’s this feeling of being monitored,” noted the educator who gradually planned together with the researcher as she realized she was not being judged, and that together they were working towards the same goal of increasing student literacy rates and building knowledge and expertise.
There were several educators who, regardless of the composition of students in their class, had a passion for PL. They continually asked questions, discussed new research on teaching and learning, and provided feedback on the PLM. They regularly shared new resources and practices they were trying as they challenged previously implemented practices such as whole language, end of unit tests, use of worksheets, quiet classrooms, and homework. These educators compared themselves to doctors who need to keep current to help more students be successful learners. Instilling this passion for PL so beginning to experienced educators stay current on what research is revealing about effective teaching and learning is essential for all educators since it can positively impact student learning.

**Barriers to using data at the end of the study.** At the end of the study, all participants completed the same questionnaire they had completed at the beginning of the study. Initially, the questionnaire was only intended to identify the barriers at the school that needed to be overcome to pilot the PLM successfully. However, after the final one-on-one interviews, educators shared how much they had learned and how they viewed data differently than at the beginning of the study. They discussed the positive impact using data had on student learning. The results are included in Table 9. Surprisingly, when educators started to complete the same questionnaire using the same instructions as at the beginning of the study, several questioned how they should respond if they no longer found some identified barriers to be barriers after working so intensely with data during the school year. The decision was made for educators to identify only the barriers they were currently experiencing with using data. This explains why some of the fields in Table 9 show a line rather than an actual score. Having several educators identify fewer barriers at the conclusion compared with at the beginning of the study.
speaks to the positive effect of the PLM data-literacy skills on overcoming the barriers to using data. Another indicator of the success of the model in decreasing the barriers to using data is evidenced by the difference from November to June (see Tables 8 and 9) in how confident educators felt to use assessment data to make instructional decisions.

Table 9
Barriers to Using Data at the End of the Study

<table>
<thead>
<tr>
<th>Barriers to using data - June</th>
<th>Ranking from 1-lowest to 8-highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of student data</td>
<td>4  -  2  3  8  -</td>
</tr>
<tr>
<td>Too much student data</td>
<td>7  6  7  4  5  -</td>
</tr>
<tr>
<td>Do not feel confident to use data to make decisions</td>
<td>6  -  3  5  4  -</td>
</tr>
<tr>
<td>Lack of professional development or skills to analyze data</td>
<td>8  7  8  8  6  7</td>
</tr>
<tr>
<td>Lack of time to collaborate with other teachers</td>
<td>5  8  6  7  7  8</td>
</tr>
<tr>
<td>Lack of expertise in school to lead teachers to use data</td>
<td>-  5  4  6  3  6</td>
</tr>
<tr>
<td>Fear of how data will be used</td>
<td>-  -  5  2  2  5</td>
</tr>
<tr>
<td>Not an expectation at the school</td>
<td>-  -  1  1  1  -</td>
</tr>
</tbody>
</table>

Educators still listed lack of time to collaborate as a considerable challenge; however, educators did feel more confident using data and felt that they had received intensive professional development during the study through collaboration with the researcher and their colleagues as they worked intensely with their own student data that was meaningful and specific and through piloting the PLM. An observation made by one educator summed up what many educators shared during the study: “The more we use assessment data to inform our lessons, the more we realize that building assessment results into our planning is not as daunting as anticipated.” The discussion now turns to
challenges educators experienced working with different types of assessment data during the study.

**Challenges with standardized assessment data.**

For educators to engage in the study, all data had to be seen as reliable, valid, and student-specific. DIBELS provided student assessment information showing each child’s achievement level on several literacy skills to allow educators to plan RtI instructional approaches. Some challenges emerged when attempting to work with the student and class standardized monitoring systems implemented for study purposes. This challenge was addressed by sending an email reminder and guidelines on how to access the data prior to our meetings. Similarly, educators often looked at the results when they were available with the researcher, but during several visits to respond to information from the assessment results an educator would say, “I did not look at the results since we met. I just planned this lesson,” which led to discussions about which students needed the skill that was being taught. Highlighting how the assessments identified student learning needs helped overcome this challenge.

Finding time to administer the DIBELS assessment was an ongoing struggle for all educators when using other assessment tools such as EYE-TA and Fountas and Pinnell running records. To help alleviate this challenge for the DIBELS assessment, the researcher and the EST-R administered most of the one-on-one benchmark and progress monitoring assessments. To build educators’ capacity to use standards-based assessments, the researcher worked with students in the classroom doing modeled reading, read-alouds, and word work activities during the time that each educator administered and scored their assessments, which were then discussed and analyzed within the PLM’s criteria and guidelines.
Becoming familiar with the various reports was a challenge following the first benchmark assessments, but this decreased throughout the study once educators developed their skill in explaining the results to other educators. As educators achieved the skills in Stage 1—Locating and understanding data, and the Stage 2—Analyzing, interpreting, and evaluating data and their sources, they explored the DIBELS results and over time became more familiar with each report. Another challenge that emerged throughout the study when working with the DIBELS assessments was how educators periodically found maintaining their commitment to participating in the study challenging, especially when results did not show students were progressing between benchmark or progress monitoring assessments. When standardized results did not show as much growth over time as teachers had hoped or expected, they sometimes felt it showed they were not teaching effectively. This led to looking at how a student performed on classroom-based assessments that assessed the same skills as one of the standardized measures and then working through the skills in in the PLM’s Stage 3, focusing on teaching strategies used to target learning needs and considering alternative approaches aimed at better meeting student needs.

**Challenges with provincial and district data**

Provincial criterion-referenced testing occured at Grade 4 once a year in either May or June, with results available the next fall after students had moved to a new grade level. Because of the delay in receiving the provincial assessment results, teachers often did not review or attempt to take advantage of the information provided. Since reports were received for students no longer in their classroom, they did not see how their current students could benefit from the results.
Another challenge was the lack of student-specific data in relation to each of the assessment items. Since there were no individual results from provincial assessments to help teachers and schools identify where a student struggled, they highlighted the need for government reports to provide more specific item-related and individualized information to identify strengths and needs to inform instruction better. One educator shared, “if the assessment results show that all my students are low in reading, but it doesn’t inform me as to what to do to enable my students to learn, then the assessments are not as beneficial or informative as they could be.” Often educators saw the provincial assessment results as an evaluation of the instruction the students received from their teachers rather than to determine the strengths and needs of students, classes, or schools. These two challenges of how educators perceive the provincial assessment results initiated several discussions using the PLM’s skills targeting what these assessments reveal about student learning as well as the effectiveness of teaching to increase student learning.

A challenge shared several times by the educators during the study was a lack of support for understanding district and provincial assessments, since they often have assessment data but do not have the skills to use information from the assessments to target student learning. One educator shared, “the biggest challenge with provincial and district assessments was understanding what the results mean.” As previously discussed, several educators felt they needed more in-depth explanation by the department and district about how to use assessments to inform instruction.

Challenges with classroom-based assessments

From the initial one-on-one interviews and field notes from the classroom visits in December, it was clear that educators used mostly classroom-based, teacher-designed
assessments to identify student learning needs and strengths, monitor progress, and determine whether students were achieving grade-level curriculum outcomes. However, the challenge of not having received enough guidance on developing, scoring, and using valid and reliable assessments existed for classroom-based assessments as with provincial and district assessments. Ideally, frequent classroom assessments must occur when learning is taking place so instruction can be modified immediately to meet student needs (Black & Wiliam, 1998; Cooper, 2010; Guskey, 2017). However, educators struggle with recording assessment data during class time and reflecting on what the evidence of learning tells about a student’s next steps to continue making progress. Another challenge was not always knowing what interventions to use when a student continued struggling to learn a concept following instruction. Since the classroom-based assessments revealed student needs, several educators mentioned that finding enough time to plan was challenging, given their limited resources, if they were to meet those needs.

Another issue, according to two educators, concerned the lack of clear criteria for deciding what is acceptable as achievement of an outcome when educators create and score their own assessments. Intricately connected to the inconsistencies of clear standards at each grade level, two educators identified completing report cards as a challenge since there were inconsistencies in what teachers perceived as strengths and needs at each grade level. When different educators evaluate different students’ achievement of outcomes as a 2–progressing with difficulty, the 2s may not represent the same level of achievement or difficulty for all students receiving that result. There is an inter-rater reliability problem. Different ratings for the same skills at different grade levels was discussed during a group meeting following the second benchmark.
assessments shortly after the March report cards were completed. Most educators expressed the desire to work together to develop assessments and scoring guidelines to have consistent results and report cards. During that meeting in March, educators used the DIBELS graphs and notes they had made on student and class performance to share the second benchmark results for all their students. The educators also shared how the DIBELS results supported or refuted their classroom-based assessment results.

Another challenge that emerged during the study was that some educators resisted changing their assessment practices. Two educators shared that they had taught and assessed skills a certain way for several years and found it difficult to try something new that may not be as successful in meeting their students’ needs. Once they received the first DIBELS results and saw the colour-coded and student-specific reports, they were more open to using DIBELS assessment results to inform their instructional planning. The PLM and the DIBELS individual student results helped educators reflect on how, when, and why they assessed skills and how they used information from the assessments to target student learning.

**Discussion for overcoming identified challenges.** From the first group meeting introducing the study and subsequent one-on-one interviews throughout the study, it was evident that all participants were interested in:

- having standardized assessment data for each of their students;
- working closely alongside their colleagues to analyze the data;
- sharing teaching strategies and resources to respond to student needs;
- having embedded PL at the school grounded in day-to-day teaching practice; and
regularly scheduled meetings to discuss data and receive guidance on using data to increase student learning.

In the individual and small group meetings at the beginning of and during the study, all participants expressed a strong desire to learn more about using data since they realized the importance of having student-specific, standard-based, assessment data. Educators respected the emphasis the district and school leadership placed on using assessment data to increase student learning for all students, not just those struggling to meet grade-level achievement of skills.

To implement the PLM successfully, several essential school-level factors that facilitated PL included engaged leadership in the school, collaborative practices, and educators’ willingness to learn and engage in PL. The importance and evidence of how each of these factors impacted the implementation of the PLM at Anthony Primary are discussed in the next section.

**Engaged leadership in the school.** Supportive leadership plays a vital role in the implementation of any education initiative (Buffum, Mattos, & Weber, 2018; Ehren, Ehren, & Proly, 2009). Schildkamp and Kuiper (2010) and Wayman, Spring, Lemke, and Lehr (2012) found that school leaders can play an essential role in promoting data use. This was definitely evident in Anthony Primary as the administrator created a climate of trust and professional respect for educators engaged in acquiring new skills and trying new approaches, ensured educators had as much time as possible to meet and work on the skills in each PLM stage, discussed challenges and successes educators and students experienced from using data, and provided encouragement and recognition for educators willing to learn about data from each other using the PLM. All participants spoke positively about the support the school leadership provided. The school
administrator demonstrated his commitment to building teacher professional capacity to use student data to increase reading proficiency by participating in group meetings and discussing the assessment results with the EST-R and classroom teachers to ensure students’ needs were being met. The administrator's willingness to learn more about using data and his expectation that all educators invest in their PL through collaboration and implementing the PLM inspired educators to engage in the study more fully.

All participants expressed appreciation for the PL opportunities, books on teaching and RtI, and the materials and resources the administrator provided them. His participation in RtI meetings and other professional development activities with them showed his support for implementing the PLM. Although the school embraced participating in the study, the day-to-day demands of teaching often took precedence over meetings to review assessment results, planning instruction, or reflecting on the effect of instruction on student learning. This led to having more frequent informal conversations with each educator by arriving at the school early, doing supervision with educators, and eating lunch with them.

Regular meetings, albeit some short ones, were held with the administrator to ensure he was aware of the ongoing PL for each educator. He engaged in conversations with each teacher about how or whether using data and strategies were increasing student learning. When leadership supports PL and makes it an expectation, members of the staff tend to take it more seriously and apply what they are learning to their practice more readily (Long et al., 2008; Marsh, Bertrand, & Huguet, 2015).

**Collaborative practices.** Developing educators’ collaborative skills was a goal of the study. Recent research suggests a positive impact on students’ achievement when teachers at the same school collaborate (Ronfeldt, Farmer, McQueen, & Grissom, 2015).
Means et al. (2010) suggested that teachers can improve their use of data skills and implementation of data decisions through continuous opportunities to examine their own students’ data with the support of colleagues and instructional coaches. However, while piloting the PLM, opportunities to collaborate were not always successfully employed since meetings were usually after school when educators were tired and not at optimal engagement. The meetings occurred irregularly and sometimes there were long intervals between meetings due to storm days, holidays, and sometimes teachers being absent from school. More group meetings would have had a more positive impact on educators’ reflection and learning. Even when educators were hesitant to invest in PL, the collaborative nature of meetings with such a small group in a small school increased participants’ contribution since it was more noticeable when educators did not contribute to discussions at each stage of implementing the PLM. Educators committed to working and learning together to build their data-literacy skills benefitted from the professional respect shared amongst all staff members which enhanced the learning process.

Getting educators to share effective practices and learn from each other in a professional, collaborative way was challenging during the study since most educators tended to spend their free time in their classrooms rather than discussing instruction with colleagues. This observation during the study led to trying to arrange more group meetings to collaborate but finding time to meet was a constant challenge due to numerous factors like storm days, the school goals of creating a Maker Space for students, educators’ illnesses, other meetings, having to plan lessons, or having to complete report cards. Despite all participants discussing how collaboration increased confidence in their RtI skills and abilities to use data to help children learn, being available to meet to collaborate was a constant struggle.
Willingness to learn and engage in professional learning. From the initial meeting to present the data-literacy PLM to the ongoing implementation of the model, educators consistently acknowledged the strong need to become more data literate. Most participants felt they had enough assessment data but not the skills or the knowledge to use the assessment results adequately to increase student learning. Many reported having an abundance of data. Due to the length and complexity of reports, two educators found they sometimes delayed reading and using assessment results despite realizing that timely use of assessment results and targeting student learning are crucial to maximizing instructional time.

Educators’ willingness to learn is necessary if learning and professional development are to occur. Educators may differ in their willingness to learn, with some not seeing the need to learn, others wondering how to learn, and others eager to learn (Van Eekelen, Vermunt, & Boshuizen, 2006). From the completed initial PLM questionnaire, each educator started at different developmental points of the model. This enabled the PL to be individualized. The model helped each educator focus on areas they identified as a gap in their own knowledge. The study extends Opfer and Pedder’s (2011) findings that professional development activities must build on educators’ own knowledge and beliefs, perceived problems, and classroom practices, which were addressed through piloting the PLM.

Teacher intern preparation to use data. While focusing on the PL of experienced educators, the level of preparedness of new teachers to use assessment data also arose as a line of interest and inquiry. At Anthony Primary there was a Faculty of Education student completing her internship with an experienced teacher. During a planning meeting using the PLM’s Stage 3 skills aimed at making instructional decisions
based on assessments, she commented on the nature of university courses, stating, “We
did not learn a lot about assessment and how important assessments are to teaching
students effectively.” She had taken one course that focused on assessment; however,
she was disappointed in what was presented in the class since much of what she learned
was theoretical, with very little practice or application. She did not learn about
standardized assessments or scoring assessments since the message she received was
that testing was not necessary.

We were taught that it was important to take anecdotal notes based on
observations, but there was little to no discussion about standards or grade-level
expectations. Provincial assessments were not portrayed positively since
criterion-based testing, and rating student performance, was not seen as
necessary to teaching. There was no discussion of standards or assessing
achievement of skills because the focus was more on readiness and student’s
desire to learn. (Teacher Intern, February, 2018)

Mandinach & Gummer (2016) stated that developing data-literate teachers must
be an expectation of all teacher-training organizations moving forward since data use is
not a passing fad. This learning was not evident with the new teacher intern about to
begin her career as a teacher. Even the administrator stated, “there was almost no focus
at looking at and analyzing data” during the master’s degree program for school
administrators. Although there were courses available on assessment and using data,
they were electives and not required courses. It is strongly suggested that education
training programs mandate all undergraduate and graduate education students to become
data-literate as they prepare to enter schools so they can use data to target and increase
student learning.
Pertaining to the collected evidence during the implementation of the PLM, the findings now turn to the fourth research question and sub-questions: In what ways does evolving through a clearly articulated five-stage data-based model framework for addressing individual, group, class, grade, and school-wide learning needs influence the instructional decisions educators make when working with both existing and possibly newly generated student assessment data? Through the iterative implementation process of the framework, what changes emerge? Based on the data gathered through this study, what does an optimal learning model, framework, and approach entail for moving educators, administrators, and support teachers to become strong data-literate educators and RtI professionals?

**Research Question 4: Data Literacy Professional Learning Model**

The goal of this study was to pilot and refine a research-based professional learning model to enable all educators to become data-literate. This means each educator would have the knowledge, skills, and understanding to use both internal and external sources of data to measure student learning accurately and to use the information from those assessments to target student learning needs. The data literacy PLM, as set out in detail in Chapter Two, was piloted to determine whether this learning model would increase the participating educators’ understanding and use of a range of assessment results to address student needs during instruction. This would align instruction and assessment in a fluid process rather than leaving them as separate entities. Field notes recorded during more than seventy classroom visits from December to June, along with formal and informal conversations following each classroom visit, revealed that the educators piloting the PLM possessed a range of abilities to use assessments to guide their planning. The educators started at different levels of competency and confidence
using the data-literacy skills in the model based on their teacher training at the university, professional development they had received from the school, district or province, and their varied teaching experiences.

The researcher provided educators with individualized professional learning based on the selected stages or skills they wanted to acquire or continue to develop for using data to increase student learning. The educators used their self-assessments to identify gaps in their data-literacy skills so they could focus on those skills to change their assessment and instruction practice. From the educators’ ratings of their confidence to use each of the 63 skills in the model at the onset of the study, and their initial one-on-one interviews, it was evident that they each had different goals for piloting the PLM. Several wished to focus primarily on intervention and instruction to target identified needs from assessment results. One educator wanted to have a stronger understanding of cut-scores, score distributions, graphs, class averages, and accessing online data. Another educator wanted to compare different assessments to determine which ones provided the highest quality information. Yet another educator wanted to focus on the feedback she could provide her students based on formative and summative assessments. Having such a range of skills in the model enabled all educators to work towards achieving their own professional goals for participating in the study.

The PLM addressed the educators’ strong need, expressed during the initial interviews at the beginning of the study, to know how to intervene and teach students to be proficient readers. Through multiple periods of understanding, using, and applying information from data, the educators received necessary support from the researcher, the administrator, and each other to bridge existing and newly-generated student assessment data with instruction and student learning. The PLM provided educators with an iterative
and cyclical approach to learning to use data to inform their teaching practices. Each educator progressed through the model’s four stages using various sources of student data several times throughout the study. Piloting the PLM at Anthony Primary allowed the participating educators to self-direct their learning to become data-driven Response-to-Interventions (RtI) educators in teaching reading through embedded and ongoing school-based professional learning.

**Revised PLM.** As discussed in Chapter Two, the researcher developed the piloted PLM through a comprehensive review of the data-informed decision making and Response to Interventions (RtI) literature for teaching children reading skills. Following educator feedback received during the first DIBELS benchmark assessment group meeting in December one of the more significant modifications saw the model consolidated into four instead of five stages. The initial Stages 2—*Analyzing data* and 3—*Interpreting data* were combined after working through the first set of DIBELS benchmark results due to the close connection between analyzing and interpreting assessment results. The change did not seem to affect the pilot since the skills in each stage did not change.

The purpose of the PLM was to build educator capacity to create and use assessments and to understand data to maximize their teaching time. The model had to be simple enough not to overwhelm educators, but comprehensive enough to enable educators to achieve the level of data literacy needed to be highly effective. Using various types of student data, each educator piloted the PLM and provided ongoing feedback and editing suggestions. The edits were documented to make the model more educator-friendly and comprehensive and, where possible, applied to the final version of the model.
Changes resulting from the pilot included:

- omitting some redundancy in skills
- adding other skills teachers felt were essential
- clarifying ambiguous skills
- condensing lengthy skills
- dividing complex skills into separate, more finite skills
- deleting skills not considered highly relevant
- rearranging the order of some skills

The revised four-stage data literacy model consists of a set of rubrics with each one setting out a list of guiding and reflective statements that collectively capture the range of knowledge, understanding, and skills educators need for using data competently and effectively. The rubrics were designed such that educators used the knowledge statements presented at each stage to assess their own data-literacy skills and identify the skills they needed at each incremental and developmental stage for becoming successful data users. Stage 1—*Locating and understanding data*—has 14 skills, Stage 2—*Analyzing, interpreting, and evaluating data and their sources*—has 23 skills, Stage 3—*Making instructional decisions based on data*—has 17 skills, and Stage 4—*Evaluating data use to target student learning and reflecting on my professional learning about using data*—has 13 skills. The high number of skills in each step reflects the complexity of using assessment data knowledgeably and competently to inform instruction.

Educators’ input guided the development of an optimal learning model at the end of the study to move educators, administrators, and support teachers to become strong data-literate educators and RtI professionals.
The model begins with a brief description of the content and focus of the stage to set the context for the set of skills encompassed within and self-assessed in each model stage. The model then provides guidelines on how to self-assess one’s capacity to carry out each one of the model’s 67 data-literacy skills using a three-point rating scale from *not yet* able to complete a specific data usage task to *developing* and *confident* in employing a particular skill. The skills in each stage are posed as a series of *I can...* statements. These self-assessments allow individual teachers to reflect on and choose the skills they require the most support to use data to help students experience more success. When the educators saw the first draft of the five-stage PLM in November, one commented that the self-assessment of stages and skills would be difficult to complete due to the formatting used to set out the model. Suggested revisions for making the model easier to complete made the self-assessment more user-friendly. The revised and refined data-literacy PLM is set out in full below.
Data-Literacy Professional Learning Model

**Stage 1.** The *Locating and Understanding Data* stage outlines the knowledge and skills necessary to read and fully understand information in reports that present data in different forms.

Table 10
*Skills for Locating and Understanding Data*

<table>
<thead>
<tr>
<th>I can….</th>
<th>Not Yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Locate data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>locate all student assessment reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>locate student-level data (e.g., attendance)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>find relevant data in a table or graph (e.g., student, class, and school achievement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify the mode, range, median, and mean for assessment results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Understand data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>know and understand the terminology used in assessment reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand the purpose of student assessments (e.g., diagnostic, formative, or summative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand data from multiple data sources (e.g., teacher-made tests, observational data, standardized tests, provincial, national, or international assessments)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand the type of data presented in reports (e.g. population or sample, cross-sectional vs. longitudinal)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>read and understand charts, tables, and diagram showing assessment results in reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand qualitative, descriptive, and informational data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand quantitative data reporting (e.g., percentiles, cut scores, standard deviations, frequency, range, mean, raw scores)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand graphic data reporting (e.g., line, bar, and pie graphs, scatterplots, histograms)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand colour-coded data reporting (e.g., RtI, monitoring data)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>determine score distributions and mean scores</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stage 2. The Analyzing, Interpreting, and Evaluating Data and their sources stage outlines the skills and knowledge required to elicit information about individual student, class, and school successes and needs from multiple sources of data.

Table 11
Skills for Analyzing, Interpreting, and Evaluating Data and their Sources

<table>
<thead>
<tr>
<th>Stage 2—Analyzing, interpreting, and evaluating data and their sources</th>
<th>Not Yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can….</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Analyze data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>collaborate with peers when using data to improve student learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify student learning needs from multiple assessment sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify curriculum-based standards and expectations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>determine whether student learning is increasing or decreasing when looking at multiple assessment results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify students who are struggling and who are excelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>compare student, class, and school achievement to a given achievement standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>analyze classroom question and test items to determine the necessary knowledge and skills students require to respond</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>analyze reading texts and performance task assessments to determine the specific knowledge and skills students require to complete task</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify the strand, subdomain, or group of skills that are stronger or weaker for a student or a group of students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>determine whether students’ are meeting the curriculum outcomes and achievement standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interpret data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>establish a specific purpose for examining data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>compare student performance of the same skills from different assessments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>use multiple data sources (externally/externally developed, formative and summative) to explain assessment results to a variety of audiences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify patterns and trends in student achievement at the individual, class, grade, and school level (e.g., misconceptions, common errors, success on different types of test questions, longitudinal data)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand the impact of cut scores on results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>understand the reliability, validity, and potential bias of data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interpret data based on demographic characteristics (e.g., gender, ethnicity, rural-urban)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify gaps between instruction and learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify the type of questions (e.g. open-ended, recall, selected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>response) on which students perform better and struggle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify connections between multiple sources of data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(externally/internally developed, formative, summative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interpret provincial and other large-scale assessment results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>summarize results so they are meaningful and contextualized to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>student learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Evaluate data and their sources</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>determine whether assessments are aligned with curriculum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>outcomes in terms of content and skill level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify challenges with curriculum outcomes or policies</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stage 3. The *Making instructional decisions based on data from assessment stage* outlines the skills and knowledge required to elicit information about individual student, class, and school successes and needs from multiple sources of data.

Table 12  
*Skills for Making Instructional Decisions Based on Data*

<table>
<thead>
<tr>
<th>Stage 3–Making instructional decisions based on data</th>
<th>Not Yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Once I receive assessments, I can….</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Before teaching</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>formulate questions to be answered using data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>set a learning target</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>select teaching strategies and approaches to address student needs (e.g., pacing, reteaching, create groups, scaffolding, implementing accommodations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identify similar learning needs among students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>create groups to target teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>change the order of teaching outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>align classroom formative assessments with curricular outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>use data to set measurable, incremental goals for student achievement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>During teaching</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>use data for diagnostic, formative, and summative purposes to modify teaching practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>design and implement ongoing formative assessments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>differentiate instruction based on student needs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>use different strategies and resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>use continuous monitoring to make and alter decisions on what to teach and the amount of time needed to enable students to master a skill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>provide feedback to students that is prompt, specific, clear, and constructive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>record student learning strengths and needs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After teaching</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>allocate resources to better meet needs of students, class, and school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>provide targeted informative feedback for students or groups of students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>communicate conclusions derived from data</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stage 4. The *Evaluating data use to target student learning and reflecting on professional learning about using data* stage outlines the skills necessary for ongoing reflection and evaluation of how using data changes teacher practice and affects student learning through implementation of evidence-based instruction and interventions. This stage leads to identifying other essential assessment data then collecting and analyzing the new data to make decisions to increase student learning.

Table 13
*Skills for Evaluating Data use and Reflecting on Professional Learning*

<table>
<thead>
<tr>
<th>Stage 4–Evaluating data use to target student learning and reflecting on my professional learning about using data</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can….</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Evaluate data use**
- show how data supported interventions
- collaborate with teachers and other educators to use data and make decisions to increase student learning
- pose new questions and goals based on data
- reflect on and evaluate the effectiveness of teaching strategies and other instructional decisions (e.g., time on task, order of presenting the outcomes)
- identify gaps in instruction based on data from formative and summative assessments
- select targeted instructional plans based on information from formative and summative assessments

**Reflect on my professional learning about using data**
- reflect on selected teaching practices to address student learning needs and increase student learning
- reflect on the choice of assessments and their frequency to monitor student learning
- reflect on the quality of classroom assessments that are used to monitor student achievement of learning goals
- state how using data changed my classroom practices
- identify professional development needs (e.g. content material, teaching strategies, developing assessments)
- contribute to a Professional Learning Community (PLC) to use data to inform instruction
- mentor a peer or intern in using data to improve learning

**Using the professional learning model.** At the beginning of the study, educators assessed their confidence using the 67 listed data-literacy skills or statements as not yet
mastered, developing, or confident. For instance, educators who were just beginning to interpret data based on demographics characteristics (e.g., gender, ethnicity, rural-urban), a Stage 2 skill, selected the first self-assessment option, not yet. Educators with some confidence and some knowledge of that skill who judged that it still needed work selected the second option, developing. Educators who had worked extensively on that skill to the extent that they could mentor another educator selected the third rubric option, confident. These self-assessments allowed educators to self-direct their learning by reflecting on and choosing for themselves where they needed the most support in using data to help students succeed. The educators continued to reflect on their confidence with and knowledge of each skill throughout the study. At the end of the study, following a six-month site-based mentoring and professional development program, educators again completed the same self-assessment to capture changes in knowledge and skill growth, and to once again show which skills they felt confident using and which skills they still needed to continue developing. In the first assessment in November, educators selected not yet to rate their competence against the 67 data-literacy skills 63 times. At the end of the study in June, they chose not yet only seven times. The total number of times educators chose confident increased from 140 at the onset of the study to 228 at the end of the study. These changes are a clear indicator that educators felt they mastered essential skills to use data through piloting the PLM. The biggest change in educators’ learning was in their confidence using Stage 1 skills of Locating and understanding data. In the initial self-assessment, the educators selected not yet 13 times. By contrast, in June, no educator recorded not yet for any Stage 1 skill. These skills received ongoing attention throughout the study to meet educators’ self-identified need to understand data information in various types of assessment reports.
One-on-one meetings were held with each educator several times throughout the study to work through Stage 1, 2, and 3 skills to understand, analyze, and interpret the data, and then to use the information from the assessments to plan instruction within a week of receiving or generating assessment results. Educators came to realize they could not wait several weeks to receive, analyze, and interpret assessment data. The assessments exposed how student learning needs were continuously changing due to instruction. Students immediately needed the educators to provide targeted instruction and feedback based on information from the assessments to prevent learning from stalling or the student learning gaps from increasing.

During formal meetings at the end of the study, several educators shared how they were making assessment-informed instructional decisions to improve their students’ reading skills by using the skills in the four stages of the PLM. Educators used the sequence and scope of the skills to align assessment results with targeted instruction and interventions to meet student needs and reflecting on their effectiveness. As the educators increasingly used and applied the data-literacy skills to their planning, they analyzed, interpreted, diagnosed, and selected appropriate instructional strategies more confidently and rapidly. The professional learning was self-directed by the educators who selected the stages and skills for which they wanted and needed support to become more data-literate.

Though the PLM is presented sequentially, educators did not use it sequentially since they each worked on different skills and stages at different times during the study. The educators essentially became the architects and monitors of their own learning needs, rates, and progress. They used student-specific data and the before teaching, during teaching, and after teaching skills comprising Stage 3—*Making instructional*
decisions based on data—to select teaching strategies, resources, and interventions to increase student learning. From November to June, the educators developed essential skills to use their student, class, and school assessment data to plan instruction using the PL Stage 1 to 3 skills. Stage 4 skills—Evaluating data use to target student learning and reflecting on my professional learning about using data—then guided them to determine whether their selected instructional strategies increased student learning and to reflect on their professional learning and on student achievement. A sample of the Stage 4 skills the educators used for reflection are show how data supported interventions and determine the effectiveness of selected teaching practices to address student learning needs and increase student learning. Most discussions with the educators using Stage 4 skills were about analysing student work and assessments to determine how students responded to instruction both during the lesson and while completing independent work. The educators adjusted, changed, and prioritized instruction to meet student needs based on the assessment results.

During the study’s first month, most conversations with the educators focused on the content of lessons and strategies they were using to teach specific skills, rather than concentrating on student learning needs. As more planning meetings and co-teaching occurred from early January onward, almost all formal and informal conversations became about student needs based on assessment data using skills in Stage 2—Analyzing, interpreting, and evaluating data and their sources. Not only were changes observed in recorded conversations, but the analysis and coding of field notes from classroom visits and meetings with the educators over the course of the study indicated other changes in their assessment and teaching practices.
The changes emerging from the data, and discussed more fully below, were:

1) more reflection on the types of assessments they were using to identify student needs;
2) increased confidence in understanding, analyzing, and interpreting assessment data;
3) more reliance on student data prior to planning instruction;
4) more focused individualized and small group instruction; and
5) more collaboration amongst the educators and the administrator about student data and student learning.

**Changes in educators’ assessment and teaching practice.** As educators worked through the multiple stages of the PLM, they posed an increased number and variety of questions, which demonstrated an increase in their reflection on their teaching and assessment practices. Some questions they posed and were able to answer prior to, during, and following the lessons they co-planned and co-taught with the researcher were:

- “Why are we doing what we are doing during our lessons?”
- “How are the resources we use, instructional strategies, pacing of lessons, and feedback we provide, impacting the students with whom we are working?”
- “How do we know our instruction is effective?”
- “What other instruction or interventions do students need based on student performance during lessons?”

These questions and the PLM shifted the professional discourse from conversations about teaching to conversations about teacher and student learning.
The educators increasingly collaborated with their colleagues on available strategies or approaches to help their students make progress. For example, on April 7th, during a recess break Gail and Susan were observed discussing various strategies they had created to measure word-decoding skills, starting with one syllable vowel-consonant words and proceeding to increasingly difficult multi-syllabic words. As the educators explicitly taught skills and increasingly used mini-lessons, they usually incorporated classroom-based assessments in their lessons to determine whether students were learning. They used some assessments—such as letter naming and word lists—both summatively to determine results for report cards and formatively to provide feedback and timely interventions.

Following the first set of Dynamic Indicators of Basic Early Literacy Skills (DIBELS) assessments in December, Karen’s initial reaction was that she wanted to find and use a prescriptive, clearly-laid-out series of lessons to teach students to read and write. However, through regularly scheduled bi-weekly meetings to discuss student successes and needs, her student-centered approach and confidence evolved. Karen shared how she had learned—through co-teaching with the researcher and observing the lessons modeling how to use assessment results to teach skills—to ask her students specific questions that revealed whether they were learning and to provide clear and prompt feedback to her students. She used skills in Stage 3—Making instructional decisions based on data—to differentiate her lessons based on the student needs she identified through various assessments. Karen grew to trust herself and her knowledge, which was evident as she incorporated better teaching strategies and used appropriate resources in response to differing needs ‘in the moment.’ Another change observed from
March onward was her increased willingness to ask her colleagues for teaching strategies and resource suggestions to meet her students’ needs.

On April 23rd, during a meeting with the researcher analyzing the DIBELS progress monitoring results for several of her students, Karen noted that her students were reading more words and making fewer errors in the oral reading fluency test. Since they were responding positively to the Tier 2 interventions she had implemented, she expressed how she felt more capable of meeting her students’ literacy needs by applying information garnered from DIBELS results and using the PLM Stage 1 to 3 skills. This increased confidence was not unique to Karen. During meetings and class visits, several of the educators displayed more confidence collecting and using assessment results and their professional judgment in what the results revealed about students’ needs. Throughout and at the end of the study, several participants shared that using assessment results led them to reflect constantly on their teaching and to strive to do better in meeting their students’ needs.

Early in the study, while completing the initial questionnaire ranking the barriers to using data, Karen shared that she did not want to appear not to be doing a good job meeting her students’ wide range of learning needs. As a professional rapport was established, she began asking the researcher more questions about reading instruction, available reading assessments, and current research-based strategies while she used the PLM skills to improve her teaching. Her planning became more student-centered, based on results from her own classroom-based assessments and DIBELS. In June, the third set of DIBELS benchmark assessments revealed that all her students had made progress in their reading skills. Several students showed significant growth, which suggested they reacted positively to her use of assessment data to guide her teaching.
Another educator, Gail, described how she felt she benefitted from receiving and using data at the end of the study when she shared,

Using the skills in the model helped me because I feel like I am doing a better job with my students addressing their needs. I am no longer wasting my time on things that they may not be ready for, that they do not need, or that they already know that are in the teacher’s guide. The results show what I am doing is working. (Gail, June 2018)

From field notes recorded on March 19th during a meeting analyzing and interpreting the DIBELS nonsense word assessment results with Brenda, she noted that some students struggling to make reading progress were missing certain letter-sound associations. Therefore, the PALS spelling test was used to identify specific letter-sound gaps for a small group of students receiving Tier 2 supports. Several meetings were held lasting from 45 to 90 minutes each to discuss research-based strategies to address this learning gap. Brenda then explicitly taught the missing sounds for the letters and modeled the letter-sound association during read-alouds. Brenda used strategies from Oral Language at your Fingertips (OSLA, 2014) and a game developed with the researcher where students changed the vowels and consonant blends in small words to practice the targeted skills. During an informal conversation two weeks after that planning meeting, Brenda proudly described the progress her students were making as she used assessment results to determine and target her students learning needs. Her statement, “the assessment information is as crucial for helping students learn as are the actual lessons,” revealed how this educator began to see assessments as an integral part of the instruction process.
In Mandy’s class in early March, based on a planning meeting analyzing student progress monitoring results, we decided to use PALS assessments to determine why some students were experiencing difficulties making progress despite receiving targeted instruction. Mandy used the PALS spelling test to identify decoding two-syllable words was a need for several students who were not responding to interventions. Mandy began recording the words students were struggling to read and spell. She then planned explicit mini-lessons using the resource *Words their Way: Word study for Phonics, Vocabulary and Spelling Instruction* (Bear, Invernizzi, Templeton, & Johnston, 2016) to teach students the skills they were missing to sound out the multi-syllabic words. While we were co-teaching a lesson on May 8th, her students used different strategies to decode words and read more words fluently. Mandy observed,

We need someone in the school who can work with us to look at assessment results, help us deliver the assessments, and then come up with a plan or do the co-teaching. This could be done with literacy leads using your PLM like you have done with us this year. (Mandy, May 2018)

As the educators worked together using Stage 3 skills, several of them began to create their own learning materials to target student needs. They relied less on using pre-packaged learning activities from various sources such as Scholastic, Pearson, and Pinterest that looked interesting and fun but did not target specific skills students were ready and needed to learn. In June, the final DIBELS benchmark results showed most of the students had made tremendous progress in their oral reading fluency and retelling skills. Susan summarized how working through the PLM had changed her thinking process as she used data:
The model made me stop and think: Do I have the information I need? Do I understand what I am looking at? Do I know where to go from here? Does it help me become a stronger teacher, which in return reflects on my students and their learning? (Susan, June 2018)

The PLM also changed how Susan planned to meet her student literacy needs going forward which was evident when she shared,

I am going to be going back through my leveled reading that I do with the children through their pocketbook reading and re-evaluate the books that I have in each section. I will question why those books are there and do they match what the children need at this time. I will look at all the components so there’ll be a lot more triangulation between what I’m doing, what my children are doing and what the assessments are identifying and recommending. (Susan, June 2018)

On April 18th during a meeting with Brenda to discuss the DIBELS second benchmark results, Brenda explained how she used the PLM to direct her conversations with each educator as they worked together to address student needs: “The PLM provided educators with a roadmap on understanding data. The benchmark and progress monitoring strengthened our literacy program and our own assessments by highlighting what students were learning and which students needed extra support to move forward.”

During a group meeting on April 16th to discuss the second DIBELS benchmark assessments with all the educators at the school, it was evident through the discussions that the educators more readily used the PLM Stage 2 skills to analyze and interpret the results in relation to other data such as running records they collected during daily instruction. On March 19th, one educator expressed that the DIBELS results validated her classroom-based assessments of student reading skills, instructional decisions, and
report card results. The PLM provided educators with a means to examine and dialogue about student growth over time using data from DIBELS and their own assessments.

In June, the researcher conducted final one-on-one semi-structured interviews (see Appendix C) with the educators. The interviews gathered information on educators’ capacity to work with data effectively to identify and target learning needs at the individual, group, class, grade, and school levels as a result of piloting the data literacy PLM; how using the PLM influenced or changed the instructional decisions they made when working with both existing and possibly newly generated student assessment data; and what an optimal learning model must entail for moving educators to become strong data-literate educators and RtI professionals. Karen summarized what many of her colleagues had expressed while using the professional learning model data-literacy skills during the study:

Using data pushed me out of what I would normally do—teach curriculum and what was mandated for students to learn in my grade—rather than really identifying student strengths and needs through either a screener or ongoing assessments and then planning my instruction. (Karen, June 2018)

During class visits, the administrator and I observed that it was becoming a regular practice for the educators to use assessment data to identify student needs. It was evident that the educators valued assessments to inform their teaching when two educators discussed their plan to begin the following school year by doing an initial assessment of short vowel sounds, letter recognition and letter sounds, and an oral reading assessment to identify students’ strengths and gaps before planning instruction. To increase professional learning, the educators discussed arranging class visits to learn strategies with and from each other on teaching beginning sounds, teaching word
families, providing student choice in learning activities, and conducting writing workshops. The small number of teachers and limited free time during the school day made this potential learning opportunity difficult to implement in a small school. However, the educators were determined to continue working closely with each other and using the data-literacy skills in the model during the next school year.

The administrator, Barry, attended all group meetings and regularly analysed the DIBELS benchmark and progress monitoring results. As Barry observed the educators repeatedly and systematically working through the PLM skills, he observed changes in students and educators because of participating in the study. During our final interview June 16th, Barry shared some anticipated and unanticipated changes he observed.

We’ve seen huge changes—changes in procedure, changes in their own culture on how they’re presenting what they are doing in their classrooms, the increased confidence and willingness to try new approaches. It is a lot less guess and check…. When teachers decided to invest time and effort working with data, we saw huge gains in teacher change and student learning. The kids that made the biggest leaps are really from those classes [where the educators invested the most time and effort in using the PLM skills and student assessment results] (Barry, June 2018).

Changes in students were evident through the Fountas and Pinnell reading levels, which increased between November and June. The educators shared other observed changes in students both as the study progressed, and at the end of the school year. Some of the changes included improved results from DIBELS oral reading fluency assessments and running records, improved spelling and decoding skills, and increased confidence and willingness to read.
In the final one-on-one interviews, all participants expressed how working through the skills in the PLM changed their teaching. The educators all shared the need for a model to help them generate and use assessment data to target student needs based on the assessment results. The educators felt that the PLM provided them with a guide to become more data-literate. The embedded ongoing professional learning met their learning needs identified at the beginning of the study when they rated their confidence using the skills in the model. What was strived for, and what became evident with most of the educators during the study, was that assessment and instruction were no longer divided into separate entities. Rather, they were seamless, with a constant back and forth flow where assessment informed all instructional decisions. Using the PLM engaged educators in active and collaborative forms of learning through sharing assessments, information, strategies, and resources linking the research-based learning model to classroom teaching and learning.

**Educators’ feedback on the data literacy PLM.** During the final group meeting in June, educators were asked for feedback on using the model and suggestions on how to improve the PLM and make it more educator-friendly. Prior to the meeting, each educator was given a copy of the PLM to edit and make suggestions for improvement. Two educators said all the skills in the model were essential and did not see anything that needed to be changed. Others identified skills they felt were redundant or not clear. During that meeting, educators suggested minor edits to the sequence of skills and the wording of several skills. This requested feedback included suggestions on:

- which skills were essential and which ones were not necessary to become data-literate,
• edits to clarify, simplify, or elaborate the *I can* statements, as necessary,
• how the model guided their professional learning during the study,
• guidelines for other educators or school leaders to use the model to guide their professional learning to become data-literate educators.

It was interesting how, throughout the meeting, educators shared more about how the PLM had changed their teaching, rather than talking singularly about how to change the model. Using the skills in the model—especially Stage 4 after each set of DIBELS benchmark assessments—led educators to reflect on their teaching and how to adjust, change, or prioritize instruction to meet their students’ needs.

All participants expressed the usefulness of the PLM to teach them how to create and use assessment results to target student needs. The educators discussed various ways they had benefitted from piloting the PLM. Susan found that she

benefitted most from interactive conversations we had about assessment and teaching and the times you would come in the classroom and see things in action and talk about things you observed. You suggested new approaches and ways of collecting more evidence of learning, and that was all stellar. (Susan, June 2018)

All the educators stated emphatically at the end of the study that working through the model's four stages several times during the year allowed them to be more data-literate, more reflective as an educator, more confident, and more committed to growing professionally. Gail summarized how the model changed educators’ planning by stating:

The model made us question what we are recording and why we are recording it. So, if we are making anecdotal notes, what are we looking for, and why? If we
are doing a checklist or a standardized test, what are we testing, and why? (Gail, June 2018)

Mandy described the model as “relevant, authentic and simple and not wordy, not something that’s going to take hours and hours and tonnes of paper to use.” The “well-sequenced and logical model” enabled the educators to see their students benefit from their using assessment results consistently to inform instruction. The model provided educators autonomy over their own professional learning; they could select the skills they needed to improve. From the beginning of the study, educators used their own ratings of their data-literacy skills to guide their learning without fear that the administrator or I would judge their self-assessment results.

The PLM guided the educators as they reflected on and refined their data-literacy knowledge and skills through collaboration, ongoing job-embedded support, and working with a coach. Susan found that “the model guided her and other educators to ask what we are looking for and why.” Brenda discussed how she loved “the continuum of learning in the model” since she had a roadmap of how to improve her teaching and it was manageable because she did not have to change everything she was doing. She found that she just needed to have more evidence of student learning needs and strengths by using assessments more often. Susan found “the model guided conversations about data usage and having a coach who created a safety net around everyone while learning allowed most educators to immerse themselves into collaborating, reflecting, and applying what was learned into their planning and teaching.”

Not all educators subscribed completely to using a stringent four-stage model that required attending meetings, having a researcher in the class regularly to observe, analyzing assessment and instructional practices together, and trying new strategies.
Those educators who had concerns with the model’s processes and approach felt they did not need that much support to use data to inform their instruction even though the model gave them options for professional learning and acknowledged that they had different professional learning needs. All the educators used, to different extents, the PLM skills with their own student data employing the materials and strategies listed in Appendix L or developed to address student needs. One educator felt the model should focus only on student learning to increase student reading levels rather than focusing on teacher knowledge and assessment practices. Another felt there were too many skills even if they were all necessary. She recommended removing many of the skills or offering some skills as optional rather than essential to keep the model simpler and not as comprehensive whereas most educators emphasized the importance of including all 67 skills in the model.

To enable educators to better use Stage 3 skills concentrated on targeting students’ learning needs, over the course of the study the researcher and the educators worked collaboratively to develop research-based interventions relevant to reading skills. As such, a significant addition to the model would be to include a supporting document with research-based, subject-specific teaching strategies and interventions to support teachers in addressing student learning needs identified through assessment data.

The piloting process also identified the need to have a leader with a strong and experienced literacy and assessment background working with the educators as they acquire data-literacy skills. The PLM can be implemented in a school setting in various ways. A literacy coach or administrator can use the model’s stages and skills during a school year to guide discussions of teacher-generated or received student data in professional learning communities (PLC). A cohort of educators at the same grade,
division, or subject area in a school can use the model’s skills to discuss and analyze available student assessments, plan instruction and interventions, and determine how effectively they used information gleaned from assessments to increase student achievement. Several educators suggested that the model can be used not only for literacy, but for other subject areas as well. One educator observed that,

You could take this model and almost go into math as well. Use the Key Math and do the same thing, or with provincial results and do the same thing, depending on the reports that it generates, or the EYE [Early Years Evaluation]. It can be used with any assessments and all subjects. (Brenda, May 2018)

Any educator can do the self-assessment to decide which stages or skills to develop independently through self-directed professional learning or collaboratively with colleagues or a mentor to become more data-literate.

Positive factors for implementing the PLM. There were several factors at Anthony Primary that allowed the educators to use the “clear, concise, easy to follow model,” as it was described by Mandy. The factors educators identified that contributed to the successful piloting of the PLM were:

- supportive school leadership,
- available time to collaborate,
- reliable and relevant student data from curriculum-aligned assessments,
- research-based strategies to address student needs,
- a clearly outlined professional learning model identifying and developing skills educators need to become data literate.
Susan felt that “the DIBELS assessments provided screening procedures that do not currently exist. The benchmark assessments and progress monitoring were needed to identify students who were not making continuous progress or whose learning needs were not being met.” Following the second set of benchmark assessments, several of the educators did not feel that their teaching was judged based on student’s assessment results since results were used to identify students who needed extra support and the type of support they needed. Gail discussed the value of the assessments when she stated that “classroom teachers can know that there are gaps in the students’ learning, but if we do not specifically know where to go next and we do not have the literacy support, then we are not really teaching to the problem.”

In the final group meeting, Karen expressed the feelings of many of the educators that the pilot study was not long enough, and they would have preferred piloting the PLM for the second year. The educators thought that the PLM should be implemented in a school or district for at least two consecutive years to increase educators’ knowledge and skills using data. “If district buys in and says, it is going to be at least two years or a multiyear project using the PLM, then I feel the students and the teachers will benefit and the assessments and data will be more valuable.” However, the length of the study using the model will only increase educators’ knowledge and confidence if they are provided ongoing support by a knowledgeable mentor or coach and provided opportunities to apply their new learning to their teaching. As Karen highlighted,

We need teachers like you who have a strong background in literacy and who were trained in the assessment process to do a pilot project or become part of the school community or staff for an extended period using DIBELS or some other
assessments and follow the process through with the teachers. Then teachers know the support is there. If educators are given an assessment tool and then told to use it with two or three days of training throughout the year, they are not invested in it and they will not do as good of a job. We cannot just do DIBELS or some other assessment without follow-up with someone knowledgeable of teaching reading and using assessments. (Karen, June 2018)

Unlike prepared one-or two-day professional development sessions, this individualized professional learning using the PLM engaged educators in ongoing learning and dialogue about education research, data-informed decisions, and their educational practices. The model enabled them to read, understand, analyze, and interpret data from assessments and then to use their interpretations and analysis from Stage 2 to target student learning needs through evidence-based practices during Stage 3. Most of the educators met the study’s objective of using formative and summative assessments to increase student learning. The school’s administrator, Barry summed up how he observed the process of piloting the PLM benefitting all educators in the school:

I found what you did from the first meeting onward, you reaffirmed and supported educators. Everything was explained very well. It was very straightforward and clear-cut. The model made it easy to identify what was needed to improve our teaching and help our students. Using research was key, but also, some of the resources you provided this year were also key. And what I loved was that you worked one-on-one with each teacher. (Barry, June 2018)

Based on the feedback from the educators and the increases in students’ literacy skills at Anthony Primary, the revised PLM emerged as an optimal approach for moving
educators, administrators, and support teachers to become strong data-literate educators and RtI professionals.

Conclusion

In this study, educators used the data-literacy professional learning model and an assessment-driven approach to plan instruction to meet student learning needs. Educators determined, directed, and furthered their own professional learning to be more adept assessment data users through employing the skills in the PLM and assessment data while working closely with the researcher. The educators used the PLM to individualize both the knowledge and skills they learned and the speed at which their learning occurred. The embedded school-based professional learning enabled the educators to work together to overcome challenges found early in the study such as lack of time, confidence, and skills to use assessment results and increase their professional learning. Educators acquired data-literacy skills working with the researcher in the role of data-literacy coach using assessment results from the classrooms, district, and K–5 DIBELS benchmark and progress monitoring. The DIBELS standards-based assessments also validated educators’ actions, assessments, and decisions in working towards meeting student learning needs and increasing student literacy rates.

In conclusion, educators cannot be expected to both identify what they need to know to make data-informed instructional decisions and learn to use assessment data on their own. From the findings of this study, there is an urgent need for educators to have a clearly defined and systematic approach to using assessment results effectively to determine student learning needs. The educators in this study ascertained the strong need to have more professional learning on current research-based interventions and instruction and how to use these approaches to respond to student needs. The educators
admitted wanting and needing more time to generate and work with assessment results and to collaborate with the researcher and each other to acquire fully the skills necessary to move to an assessment-driven RtI approach to increasing student learning. Even with insufficient time, the support of a coach with a strong assessment and teaching background able to meet with educators individually on an ongoing basis served to increase educators’ confidence and competencies in using assessment data to target student needs.

The next chapter discusses in depth the study’s key findings and presents recommendations for increasing educators’ capacity to make assessment-driven instructional decisions. The study limitations and suggestions for future research conclude Chapter Five.
Chapter Five: Discussion and Conclusion

Introduction

The overarching purpose of this applied and collaborative research study was to pilot and refine a data-literacy professional learning model (PLM) to increase educators’ knowledge and usage of assessment data to recognize and address needs to increase student learning at the grade K-5 level. Two overarching objectives guided the qualitative research design and data collection of this study. The first objective was to identify barriers and challenges educators experience as they move to using assessment data consistently to inform their instructional decisions. These barriers had to be addressed to meet the second objective of the study, which was to pilot a multi-stage learning model that would provide educators with the essential data-literacy skills to meet students’ needs successfully following a Response-to-Interventions (RtI) approach. The educators provided feedback and suggestions to refine and validate the PLM. The findings in this study offer an approach to address the issue that, despite the widespread adoption of RtI (Castillo et al., 2016) and evidence that RtI does reduce the number of students requiring Tier 2 and 3 interventions (Buffum, Mattos, & Malone, 2018), educators continue to struggle with its implementation (Balu et al., 2015; Cavendish, Harry, Menda, Espinosa, & Mahotiere, 2016).

The PLM provided a systematic and comprehensive approach for all educators to understand, analyze, interpret, and use assessment data to identify and respond to student learning needs. The model addresses recent and ongoing research findings that schools need support in the use of data to help students by better informing targeted instruction. (Balu et al., 2015; Schildkamp, Smit, & Blossing, 2019). This study identified the essential skills that must be included in an ideal professional learning model to allow
educators to be adept users of assessment data. The PLM helped educators use available data systematically or generate necessary assessment data to inform interventions and teaching strategies targeting student learning needs.

This chapter first presents a detailed discussion of the key findings for the following research questions that guided this study.

1. **What data are available to NB educators in the research study’s school? Where, when, and how do they access findings and reports generated by the data? In what ways do educators use the school’s existing assessment-led instructional strategy and their own created assessments to identify and target children’s individual literacy learning needs at each grade level?**

2. **To what extent, and in what ways, do educators’ existing data sources, and the student-level information they provide, align with the standardized assessment-based monitoring system administered by the researcher for study purposes?**

3. **What issues, barriers, and challenges do educators and administrators identify when attempting to work with data they generate at the class and school level, receive from the district or provincial levels, or receive based on the standardized monitoring system implemented for study purposes?**

4. **In what ways does evolving through a clearly articulated research-based model for addressing individual, class, and whole school learning needs influence the instructional decisions educators make when working with both existing and newly generated student assessment data? Through the iterative implementation process of the model, what changes with and for educators emerge? Based on the data gathered through this study, what does an optimal learning model and
approach entail for moving educators, administrators, and support educators to become strong data-literate educators and RtI professionals?

The answers to these questions are critical if schools and educators are to successfully use assessment results to increase student achievement and successfully implement the RtI approach to meeting student needs and increasing student achievement. A discussion of the findings related to each question are set out first. The chapter then outlines the implications and significance of the findings for educators, school leaders, and higher-level education organizations. The chapter continues with study limitations before presenting recommendations for implementing successfully the PLM. The chapter concludes with suggestions for future research.

**Discussion of Key Findings**

**Available assessment data.** Price and Burton (2004) found through their research that before schools can effectively use data, they must determine the type of data collected, the type of data that will be gathered, and how that data is being or will be used to pinpoint areas that need improvement. In answering the first research question, findings from this research show that educators have an abundance of assessment data. Although they receive student assessment data from the province and district, findings clearly showed that they indisputably rely primarily on classroom-based, teacher-designed assessments to monitor progress and measure student achievement. This finding is strongly aligned with Guskey’s (2017) findings that educators tend to put more trust in results from their own assessments of student learning: classroom assessments, observations, assignments, in-class performance, and portfolios of student work than on results from other forms of assessments. This finding has significant professional development and practical implications for schools, districts,
provinces, and teacher preparation programs to ensure both new and experienced educators can develop and use ongoing classroom-based assessments to identify student successes and their learning needs.

The study found that the educators need and want guidance on developing and scoring valid and reliable classroom-based assessments to gather accurate evidence for measuring and determining student learning in relation to curricular content and grade-based acceptable achievement levels. Initially the PLM did not include skills to help educators generate quality assessments, but it became evident early in the study that this was a priority learning area for the teachers. The researcher revised the model to include the development and use of educator-designed assessments. To this end, educators learned that they must have a thorough knowledge of the curriculum outcomes they are teaching and the commensurate data-literacy skills necessary to create, evaluate, and score valid and reliable classroom-based assessments that accurately identify student strengths and needs in relation to those outcomes. These essential data-literacy skills that enable educators to use information from classroom-based assessments must be addressed through undergraduate university assessment-based courses and systematic and clearly-defined embedded professional learning.

Assessment-based monitoring system. In answering the second research question, the findings showed that the educators believed they were lacking essential student assessment data that the DIBELS screener, benchmark, and progress monitoring measures provided during the study. According to Johnson, Mellard, Fuchs, and McKnight (2006), the first step to implementing an RtI approach fully is to administer a universal literacy screener to identify student instructional needs. However, findings from this study suggest that these student, class, and school-level data are often a
missing component of the RtI implementation in New Brunswick Anglophone schools. Although kindergarten educators used information from the Early Years Evaluation-Direct Assessment (EYE-DA; The Learning Bar, 2011) to determine student and class readiness to learn some literacy skills, the EYE-DA does not assess all essential emergent literacy skills. Grades 1 to 5 educators often relied on classroom observations and information from Fountas and Pinnell running records, administered three times during the school year, to monitor student progress. The running records results were infrequent and did not provide detailed information on students’ specific learning needs. Research indicates that progress monitoring should occur at least monthly, but preferably biweekly or even weekly for RtI to be effective (Fuchs & Fuchs, 2006). At Anthony Primary, educators did progress monitoring informally and irregularly since they had neither access to nor the time to use a standardized screening process to identify which intervention tier students required to meet grade-level standards. Despite the research clearly showing that using data is essential for screening and monitoring each student’s progress and designing interventions for those not making adequate progress (Arden, Gandhi, Zumeta Edmonds, & Danielson, 2017), this study identified that there was no formal or standard screening process or progress monitoring such as DIBELS or PALS being used at Anthony Primary.

The results of this study identified the need for a valid and reliable system of screening and progress monitoring, so educators could accurately determine whether their instruction and interventions were targeting learning needs and, more importantly, increasing student learning. Most standardized assessments are not readily available in schools since they can be expensive to purchase and time-consuming to administer and score. There is a lack of personnel, including educators, trained to administer, score, and
disseminate assessment data. Departments of Education typically do not mandate or provide schools with individualized assessments like the DIBELS and PALS used in this study. When educators use standardized, diagnostic assessments to identify student learning strengths and needs, the data reduces the margin for guesswork and error (Sloat, Beswick, & Willms, 2007). Hence, this study demonstrated the need for and significant benefits of a standardized screener and progress monitoring tool to provide essential data on student achievement. Having student-specific reading assessment data helped educators focus on what students needed next to move forward in their learning.

**Addressing challenges to using assessment data.** In response to Research Question 3, this study found that the two largest challenges to using assessment data were a lack of time to work with available data and to collaborate with colleagues to address the identified learning needs, and insufficient PD to learn to use assessment data effectively. This finding adds to the growing body of research synthesized by Sun, Przybylski, and Johnson (2016) on educators’ data use, a conclusion of which was that insufficient time and PD are the most important barriers to educators’ data usage. The educators in this study wanted and needed more time to invest in their learning and applying data-literacy skills to maximize instructional time. This finding has implications for scheduling both during the school day, with course assignment and supervision, and after school with extra-curricular and meeting demands. Educators must have designated time to collaborate, generate, and delve into student assessment data to consistently use and therefore enhance their data-literacy knowledge and skills. This study found that the second challenge to using data is a lack of effective PD. After working for eight months with the educators with varied levels of competencies pertaining to student-based data use, the researcher found that all educators felt they
needed more PD to be competent and confident assessment data users. Using the PLM with their own student data supported research that calls for sustained and ongoing professional development connected to educators’ daily practices (Darling-Hammond et al., 2009; Wylie & Lyon, 2015). In this study educators used the PLM to direct and drive their own learning through collaboration with their colleagues and the support of the researcher. Van Gasse, Vanlommel, Vanhoof, & Van Petegem, (2017) found that educators who collaborate when using data make more use of data to inform their individual practice than educators who use data independently. Through collaboration and the PLM, educators in this study connected their student data to classroom instruction, addressing findings by Mandinach, Gummer, and Muller (2011) that professional development programs on use of data typically do not make the connection to instructional actions. Since educators’ capacities to use data are shaped within their professional communities and in their interactions with coaches and other educators, it is imperative that the time invested in acquiring data-literacy skills is systematic, goal-specific, and educator-driven. In this study, educators applied a systematic and coherent approach to learning to use assessment data through piloting the PLM.

**Optimal data literacy professional learning model.** In responding to Research Question 4, this study’s findings aligned with other research indicating that educators have had little structured and ongoing professional development to aid in their understanding of data or in their instructional planning based on data (Davidson & Frohbieter, 2011; Jimerson & Wayman, 2015). The PLM provided a clear path for facilitating teaching based on assessment results and ensuring educators have the skills needed to make data-informed decisions. The 67 skills in the PLM reflect the extensive amount of knowledge and skills educators need to be adept data users. The model is
applicable to multiple contexts, grade levels, and subject areas using various assessment tools and reports to increase learning and move RtI to large-scale implementation and success.

A strong data-literacy mentor or coach can support educators throughout the process of using the PLM as part of their ongoing PD. The coach can help educators learn both what assessments and what resources are needed to better target student learning needs. In the context of this study, the PLM allowed educators to assess their individual and ongoing capacity to use data, identify their strengths and areas where they need support, and then work collaboratively with their colleagues and guided by the researcher to increase their learning and confidence with making data-informed instructional decisions. The PLM facilitated educators’ increased knowledge and confidence when a knowledgeable mentor supplied ongoing support. The findings showed that when educators had professional support and a systematic approach to using student assessment through their incremental and ongoing work with the PLM, they identified how assessment results and evidenced-based practices improved their teaching and increased their students’ literacy skills achievement.

This study employed an incremental multi-stage approach, rather than the top-down holistic approach typically employed in PD sessions, that helped educators become more data literate because this approach systematically guided them through clear and distinct learning stages. The PLM clarified evidence-based practices and provided guidance as to how to implement effective practices at the classroom level. Gummer and Mandinach (2015) found that we have yet to identify an established framework for data literacy acquisition that schools and districts can use to ascertain student strengths, diagnose needs, and provide support with data-informed decision-
making practices. This study addressed this specific need for a clearly articulated and tested data literacy professional learning model to increase educators’ data literacy knowledge and skill. The PLM provided incremental and developmental stages with specific knowledge and skills for educators to strengthen their data-literacy skills.

**Discussion of the Professional Learning Model**

At the beginning of the study, most educators at Anthony Primary stated that they had plenty of assessment data and had received adequate professional development on accessing and understanding that data. However, they needed and wanted more professional development to know how to address student needs identified through the assessments. This expressed need for more professional learning on using data to make informed instructional decisions supports research findings by Datnow and Hubbard (2016) that professional development linked to data use rarely aims to expand teachers’ repertoire of instructional strategies and their skills in differentiating instruction. This study also clearly supports assertions made by other researchers in that the administration and frequency of assessments on their own is not enough to improve a student’s reading capability (Blair, Rupley, & Nichols, 2007). Educators need to know comprehensively and well how they are to use information from various assessments, so they have the capacity to target student learning needs. According to Wiliam (2013), shifting educators’ focus from teaching to learning requires that they use data to identify where students are in their learning and identify what specific knowledge and skills students need to increase their learning. Piloting the data literacy PLM provided the educators in this study with intensive ongoing support from an experienced coach concentrated on understanding and using information from assessments—including standardized, diagnostic, provincial, district, and classroom results—to inform their
teaching. Study findings reinforce Marsh et al.’s (2015) claim that effective coaches focus on helping educators analyze and link data to classroom instruction. Throughout this study, most of the meetings, planning sessions, and co-teaching with each educator focused on understanding, analyzing, and interpreting student, class, and school data to devise plans to meet students’ identified learning needs. During this applied and collaborative study, all participants shared how planning and working together to connect assessment results to instruction increased their confidence in using data to target their students’ needs.

Researchers recommend that educators at the classroom level engage in professional development that clarifies what qualifies as evidence-based practice and that they learn how to implement the practice (Regan, Berkeley, Hughes, & Brady, 2015). Finding the time to learn and implement research-based instructional strategies for reading with their students requiring Tier 2 and Tier 3 supports is a challenge for educators (Dearman & Alber, 2005). For this reason, the focus in this study was on working with educators equally to increase their assessment data knowledge and to develop research-based interventions and instructional strategies to meet their students’ needs. As we used assessment data to guide our planning and co-teaching, a list of resources and strategies used to increase student literacy rates at Anthony Primary was developed. It was validating when the school administrator stated, “Working with data with you benefited staff by providing them basically a toolkit and built on their teaching skills and confidence creating new competencies.”

Findings in this study support White and Anderson’s (2011) findings with Australian mathematics teachers that when professional learning opportunities were arranged so that teachers could dialogue around data and strategize about pedagogy,
teachers’ instruction improved impacting student learning. Piloting the PLM for a sustained period allowed educators to practice, discuss, and reflect on the way they used data. According to Earl and Katz (2006), ongoing dialogues are essential for changing teacher practice. In this study those conservations were with an experienced coach and with their colleagues. Research suggests that effective implementation of RtI requires a minimum of three years, but it is likely to take five years to recognize the full impact of new practices on student achievement (Ehren, Ehren, & Proly, 2009; Hall, 2008; Mellard & Johnson, 2008). Implementing RtI requires educators to learn the components of RtI discussed in Chapter Two and use assessment data to inform Tier 1 (high-quality instruction for all students), Tier 2 (moderate small group targeted instruction), and Tier 3 (intensive targeted instruction) interventions. Educators embedded the PLM knowledge and skills into their daily teaching practice as they worked through the four stages, several times responding to student learning needs based on data. All the educators in the study identified the importance of using the model for a longer and sustained period to effect change in teaching practices. Educators, as those responsible for delivering high-quality instruction, recognize that it requires time for programs and approaches to become consistent practice and to take full effect. The educators in this study felt, based on the previous program implementations in the school, that often when new curricular resources or approaches were just beginning to be effective, the school, district, or province would decide to discontinue them.

Educators at Anthony Primary realized that learning and changing teaching practices takes both time and commitment to adopt. While validating the PLM, this study built each educator’s capacity to select or create assessments simultaneously with strengthening their ability to research and select relevant pedagogical materials and
approaches to identify and address student needs. Educators acquired the skills and the
desire to continue using assessment data without the support of a mentor after the study
ended. Each educator in this study committed to collaborative meetings in September of
the school year following the piloting and validation year so they could continue to use
the revised PLM and the DIBELS and PALS student assessment data. This commitment
compensated for not having at least three years to work with a coach to support their
learning, which was their preference. Continuing to use the PLM skills with their student
data to identify and target learning needs demonstrates that the PLM allowed educators
to grow professionally. Several educators acknowledged they needed such a strategy to
continue using the PLM and student data since the external support they had been
receiving ended at the study’s completion.

To add to the educators’ intent to continue using the PLM during the 2018-2019
academic school year, during the researcher’s informal visits to Anthony Primary on
October 16, 2018 and January 21, 2019, there was evidence from conversations with
each of the educators that they were using assessment results to inform instruction.
There was an expressed desire to continue using the standardized DIBELS assessments
for certain students, as was evident when three educators asked if the researcher would
administer these since they did not have time to do so. Several educators wanted and
missed the student achievement information the assessments provided since they
realized that the standardized measures provided information about their students’
learning that differed from own their classroom-based assessments. It was powerful to
hear the educators share that most of the students who responded to the interventions
during the study year were continuing to experience success through assessment-driven
targeted instruction. They also shared, however, that finding time to administer the assessments was an ongoing challenge.

**Significance of the Research**

This study makes several significant contributions to educators’ professional learning research on data-use. Findings add to the literature pertaining to challenges educators must overcome and the skills they must have to use data to inform student learning (Datnow & Hubbard, 2015; DeLuca & Bellara, 2013; Desimone, 2009; Kippers, Poortman, Schildkamp, & Visscher, 2018; Lai & Schildkamp, 2013; Mandinach & Gummer, 2016; Marsh, 2012). All participants expressed a keen desire to learn more about using data since they realized the importance of having student-specific and standard-based assessment data. The results from this study provide information about how educators use assessment reports to inform their daily planning and instruction. The study also identified factors educators believe best support, and those that most inhibit, their use of assessment results. Most importantly, the study helped identify the professional learning opportunities and supports educators need to use assessment results systematically in their teaching.

The study at Anthony Primary provided a thorough, in-depth knowledge of the experiences of a teaching staff using data both holistically and individually to examine the professional learning strategies used in relation to how teacher practices changed because of the PLM. This pilot study also identified clearly the key components of professional learning that educators need to use data systematically for addressing student learning needs and increasing teaching effectiveness. A significant study outcome of piloting the data literacy PLM was identifying the supports and resources educators need to increase their understanding and use of data to inform instructional
decisions. In turn, the increased knowledge acquired while working through each data literacy stage built educators’ capacity to target and increase student literacy skills.

In this study, educators worked with a researcher with teaching and assessing literacy curriculum expertise to develop collaboratively a comprehensive set of research-based teaching strategies that targeted a wide range of emergent, early, beginning, and conventional reading challenges children encounter across the K-5 spectrum. By employing the Tier 1, Tier 2, and Tier 3 interventions approach, the educators increased their knowledge and expertise of both the sources and causes of children’s reading challenges and the range of interventions that can be employed to meet student needs. The educators received ongoing professional learning experiences about integrating assessment results in their day-to-day instructional practice. A strength of the study was the inclusion of the standardized DIBELS and PALS student literacy data related to teaching practices and interventions since the goal of professional learning was to increase student learning. Through the collaboration process, all educators at Anthony Primary gained the professional knowledge and capabilities needed to use assessment results in a Response to Intervention (RtI) teaching and learning approach aimed at addressing student learning needs in day-to-day teaching practices.

This study adds to the growing body of research on using student assessment data based on a tested model that began with an extensive literature review designed to help future educators understand the complexities of effectively using data to increase student learning. The results from piloting the PLM provide information about what data educators prefer to work with when structuring teaching and learning within an RtI framework and insights into how educators use reports of achievement data to inform their daily planning and instruction. This study also identified those factors educators
believe best support, and those that most inhibit, their use of assessment results. Most importantly, the pilot study helped identify the professional learning strategies and approaches educators need to use data systematically in their teaching. The findings should aid school leaders and jurisdictions with providing differentiated support to educators to use student assessment data to inform planning, teaching, and evaluating student learning. The findings should also inform teacher preparation programs at universities and teacher colleges on the importance having compulsory courses on the various reasons and methods for collecting assessment data, commensurate with how to use that data to inform instruction to increase student achievement.

Study Limitations and Directions for Future Research

Limitations are potential weaknesses or problems with a study (Creswell, 2002), and there are three key design features of this study that may be considered limitations. The results of this applied, collaborative qualitative research study should therefore be considered in light of these three potential limitations, and in the context of the three directions for future research also specified below, which include:

School size. One limitation is the concern that implementing the PLM in a small school with only six educators prevents applying study results to other schools and a greater number of educators and students might reveal added issues, challenges, barriers, needs, and successes when working with assessment data for informing practice. However, working with six educators and four classes was beneficial to this initial study since it made it possible to have frequent and ongoing formal and informal meetings with educators collectively and individually for collecting detailed PLM piloting data. It was possible to work with each educator through the model’s four stages iteratively and
repeatedly throughout the study, as was necessary for gathering input to inform the model’s revision. At the same time, had the study been conducted in a larger school it is likely that there would have been greater collaboration among educators and more expertise to draw on that would ultimately be a benefit to educators themselves, and in turn, students.

However, an underlying study assumption was the need to work with a defined and limited number of study participants for the purposes of piloting and refining a comprehensive and detailed PLM, a key part of which entailed administering and analyzing reading assessments for all children in every grade three times and administering and analyzing frequent progress monitoring assessments for a select number of students during the study period. An important direction for future studies, therefore, is to employ a high-quality, consistent embedded and prolonged teacher learning approach in school settings of differing sizes and configurations.

**Single research setting.** A second potential concern is that all study participants were from the same school, which may mean that educators had previously received the same RtI professional development, which would influence the degree of educators’ data literacy skills brought to this pilot study. In saying that, educators at Anthony Primary began the study with different learning needs, class configurations, and professional backgrounds. Situating the study in one school for piloting the PLM allowed educators to build collaboration and data-literacy skills while working as a system to increase grades K–5 students’ reading successes. As the research clearly shows, school-based professional learning is more effective in facilitating educators to incorporate newly learned knowledge and skills into actual classroom practice than off-site PD sessions (Darling-Hammond et al., 2009; Desimone & Garet, 2015). Since Anthony Primary was
representative of a fairly wide range of educator and student backgrounds, the study was widely informed. A second important direction for future research is thus to work with multiple schools within a single study context to garner a wider breadth of information about student and educator challenges and needs using data through implementing the PLM. Such studies would help specify the supports needed for the learning model’s implementation to guide more educators for collecting, generating, and using large-scale and classroom-based assessment to identify and target student, class, and school needs and strengths.

**Study duration.** A third concern may be that the eight-month study timeframe was too short for ensuring an adequate degree of teacher learning and substantive change in professional practice. Professional learning success is determined by how changes in teacher knowledge and pedagogy increase student learning (Darling-Hammond et al. 2009). Research shows that periods of sustained and systematic professional development for more than one school year while working with a coach on how to use data and evidence-based interventions to target student needs are of greater benefit than either or both short periods and off-site PD. (Ehren, Ehren, & Proly, 2009; Garet et al. (2008, Anderson, Feldman, & Minstrell, 2014; Yoon et al., 2007). This might therefore mean that the study results of how educators used data would be more conclusive had the pilot been extended over a longer period. Given, however, that this was the first testing of the PLM, a key aim of which was to revise the model as and where necessary at each progressive implementation stage throughout the study, an eight-month timeframe was deemed appropriate so that educators can, if they so choose, continue to work with a more enhanced and enriched model design during subsequent school years. Future studies are required to determine the extent to which working with a data literacy
coach using the PLM for at least two consecutive years ensures professional change is firmly established for experienced educators, and new educators have a clear process for learning to make assessment-driven decisions.

**Recommendations from Study Findings**

Several recommendations have emerged from the study’s findings in relation to informing the PLM’s implementation and addressing the needs of educators to become strong and adept data users.

**Identify educators’ current level of data-literacy skills.** Any improvement effort in education must have high-quality professional learning if it is to be effective and impact student learning. A first recommendation, therefore, is to identify the professional learning educators in New Brunswick and other jurisdictions need to acquire and apply fully the essential data-literacy knowledge and skills to identify and address student learning needs. This investigation has demonstrated that the PLM is a highly effective strategy for determining individualized in-servicing needs that can be delivered through a Department of Education and offer academic upgrading in collaboration with faculties of education when appropriate to provide all educators with a strong background in using assessment data to increase student literacy rates.

**Ensure current educators are data-literate.** A second key recommendation is that all new principals and education leaders be required to complete a graduate level course in using data to increase student and school success. All current principals, vice-principals, educational coaches, and teachers should equally receive training to understand, analyze, and interpret assessment data effectively to identify students’ learning needs and inform instructional decisions. It is simply unfair to expect such a
massive shift from focusing on teaching curricular content to focusing on assessment-driven instruction in pedagogical practice without adequate professional learning.

**Prepare future teachers to be data-literate educators.** Pre-service educators’ assessment knowledge and confidence are hampered by a lack of dedicated coursework on assessment (DeLuca & Klinger, 2010). A third recommendation is to conduct an analysis of the pre-service training of new educators to determine their readiness to use assessment data to impact student learning. All undergraduate students pursuing a Bachelor of Education degree should complete at least one, but preferably two, compulsory courses to learn how to generate and use information from diagnostic, formative, and summative assessments for making instructional decisions to target and increase student learning. As Mandinach and Gummer (2016) stated, developing data-literate educators must be an expectation of all teacher-training organizations moving forward.

**Provide educators with coaches and time to collaborate using data.** Competent data-literacy coaches should be assigned to support educators as they acquire and apply the skills to use assessment data to increase student learning. The coaches must be competent using the data-literacy skills in the PLM developed in this study, so they have the skills needed to mentor other educators to use assessment results to plan instruction. A fourth recommendation is for Departments of Education to provide more support for educators. This support could include

- access to coaches with strong pedagogical practices and data-literacy skills,
- other program and curricular support resources such as Words their Way (Bear, Invernizzi, Templeton, & Johnston, 2016; and Oral Language at your fingertips (Blaxley, 2014),
- course learning opportunities for identifying and addressing student learning needs,
- adequate time for educators to administer assessments, and
- mechanisms for educators to collaborate with one another to use data effectively to inform instructional decisions and assessment-led decision making.

In addition, educators require more systematic and structured ongoing job-embedded professional learning specifically targeting how to generate, analyze, and interpret student data to make informed instructional decisions to increase student learning.

**Develop a school, district, and province-wide data-use policy.** A fifth recommendation is for all schools, districts, and departments to develop a data-use policy that provides a list of class, grade, school, district, and provincial assessment data available in schools. The data-use policy should provide a list of assessment measures that are made available to schools for their ready use to determine student learning needs and achievements. It should also include guidelines to help educators make data-informed decisions at each grade level and across all grades.

**Use universal screeners and benchmark assessments.** This study demonstrates the need for assessment screeners and benchmark assessments such as DIBELS and PALS to measure student reading skills in Grades K to 5 more accurately. A sixth recommendation is for Departments of Education to provide educators with the
resources and the support they need to administer universal screeners, benchmark assessments, and progress monitoring assessments to identify student needs and ensure the implemented RtI approach reduces the number of students struggling to learn to read. Educators need to commit to using the information from assessments to target student learning.

Conclusion

Since the use of assessments and data are important to improving instruction and learning (Castillo et al., 2016), educators and school leaders need to acquire essential skills to work with assessment data provided within a RtI framework. The success of RtI implementation depends on the data expertise of educators. To use data for instructional improvement, educators often need new knowledge and skills (Gummer & Mandinach, 2015). The need for high-quality, effective teacher education initiatives is even more pressing given that educators themselves acknowledge that they have neither the required knowledge nor the skills to understand all data, nor do they know how to change their teaching practices to capitalize on what data convey about each child’s learning strengths and limitations.

Given the many challenges and complications identified in relation to implementing RtI systems in schools, this study piloted a data-literacy professional learning model to support educators in using data to identify student, class, and school needs, along with learning strengths and limitations at the student, class, and whole school at the grade K-5 level. Through teacher input, reflection, and collaboration, the refined data-literacy PLM now constitutes four interdependent stages of knowledge, understandings, and applications that are foundational for using data effectively to
inform learning. The four stages of the model include:

1) educators’ ability to access and understand what data reveals about student successes and needs;
2) educators’ capacity to analyze data and interpret what data actually mean;
3) educators’ capacity to respond to data through targeted teaching and interventions that draw on a range of instructional skills and strategies that will increase student achievement levels, and
4) educators’ capacity to reflect on and evaluate critically the effectiveness of data-informed instructional choices and to rely on further diagnostic assessments to ensure intended learning outcomes established for each child are achieved.

A collaborative and applied study design was the most effective approach for ascertaining clearly and in detail model elements at each progressive stage of becoming data-literate. As Datnow, Park, and Wohlstetter (2007) argued, making data-informed decisions is a reform that cannot be implemented in isolation but, rather, must be done with leadership support that works in partnerships and with colleagues during the learning and implementation stages. Piloting and refining the data literacy PLM promoted participant engagement in learning to use data to better target individual child, small group, and whole class learning needs. Since educators used data pertaining to their own students during the study, the professional learning was highly relevant, current, contextualized, and based on individual teacher and student learning needs. This job-embedded eight-month study provided ongoing professional learning targeting student needs based on various assessment data to inform instruction. Bernhardt (2005 and 2017) argues that if a school wants to improve student learning, it has to use data.
The data literacy PLM presented here has been shown to be a highly effective way of addressing the pressing need for schools and educators to be more data-literate and to use more data to increase student learning.
References


Burns, A. (2000). Action research and applied research: what are the relationships? The Language Teacher, 24(7), 3-5.


Heggerty, M. (2005). *Phonemic awareness: The skills that they need to help them succeed!* River Forest, IL: Literacy Resources Inc.


homemad data warehouse: TUSDStats. In E.B. Mandinach & M. Honey (Eds.),
Data-driven school improvement: Linking data and learning (pp. 209-232). New
York, NY: Teachers College Press.

from http://dx.doi.org/10.1787/5kgox3kbl34-en

links to improved student learning [Final report of research findings]. New York,
NY: Center for Applied Research and Educational Improvement, University of
Minnesota, Ontario Institute for Studies in Education, University of Toronto, and
The Wallace Foundation.


improving learning for all students: Unleashing the power of collaborative inquiry.

and challenges to use in schools and districts. Presentation at the NEI Research and
Evaluation that Inform Leadership for Results Conference, Louisville, KY.

making to inform practice. Educational Psychologist, 47(2), 71-85.
doi:10.1080/00461520.2012.667064

Mandinach, E. B., & Gummer, E. S. (2012). Navigating the landscape of data literacy:
It is complex. Washington, DC and Portland, OR: WestEd and Education
Northwest.

Mandinach, E. B., & Gummer, E. S. (2013). A systemic view of implementing data

Mandinach, E. B., & Gummer, E. S. (2016). What does it mean for teachers to be data
literate: Laying out the skills, knowledge, and dispositions. Teaching and Teacher
Education, 60, 366-376.

Mandinach, E. B., Gummer, E. S., & Muller, R. D. (2011). The complexities of
integrating data-driven decision making into professional preparation in schools of
education: It’s harder than you think. Alexandria, VA, Portland, OR, and
Washington, DC: CNA Education, Education Northwest, and WestEd.


Vport Voyager Sopris website (https://vport.voyagersopris.com)


Appendix A - Educator Questionnaire

This questionnaire asks about your teaching experience, your background using assessment data, practices in using assessment data to respond to identified student, small group, class, and school learning needs, perceptions regarding professional development to use assessment data to impact student learning, available resources, and use of data implementing RfI framework. The questionnaire is completely anonymous and voluntary, so feel free to answer only those questions with which you are comfortable.

Please choose the best response to each question.

**How many years teaching experience do you have?**

___1-5 years  ___6-10 years  ___11-15 years  ___16-20 years  ___21+

**What is your highest degree attained?**

___ Bachelor’s  ___ Masters  ___ Doctorate

Please use the following scale to reflect on the role assessment data plays in assisting you to make instructional decisions to address learning needs.

1. **Strongly Disagree**
2. **Disagree**
3. **Neither agree nor disagree**
4. **Agree**
5. **Strongly Agree**

___ There are data available that I can use to monitor student learning.

___ I feel confident generating my own data to assess student learning.

___ Before planning instruction, I regularly consult student data to inform my decisions.

___ I am encouraged by school leaders to use data to inform instructional decisions I make for my students and class.

___ I am encouraged to collaborate with other teachers when I receive student assessment data.

___ I have time available to collaborate with staff members on analyzing assessment items and results.

___ When I receive achievement reports from the district or province, I can read and understand what the reports tell about an individual student, a class, or a district performance.
___ I can use data to identify learning problems of students.

___ I feel confident in using data to monitor student progress.

___ I feel response to intervention framework is successful in meeting individual academic needs of students in my class.

___ I have received effective professional development to use data to increase student learning.

Below is a list of possible barriers that may prevent you from using student achievement data to inform your teaching to meet student needs. Please rank these factors from the lowest barrier (1) to the highest barrier (8).

___ Lack of student data

___ Too much student data

___ Do not feel confident to use data to make decisions

___ Lack of professional development or skills to analyze data

___ Lack of time to collaborate with other teachers

___ Lack of expertise in school to lead teachers to use data

___ Fear of how data will be used

___ Not an expectation at the school

What are some other challenges or barriers to using data to inform instruction?

________________________________________________________________________________________________________

________________________________________________________________________________________________________

________________________________________________________________________________________________________

________________________________________________________________________________________________________

Thank you for completing this questionnaire!
Appendix B - Semi-Structured Teacher Interview Protocol

Teachers’ experience using assessments results to inform instruction

Before we begin the interview itself, I would like to confirm that you have read and signed the informed consent form, that you understand that your participation in this study is entirely voluntary. This collaborative study will allow us to work together focusing on using assessment results to address identified student learning needs and to monitor student learning.

This interview strives to gather information on teachers’ experience with using data from assessment reports to make decisions to increase student reading achievement. There are guiding questions for the semi-structured interview. These questions may be asked in a different order, depending on the flow of the interview. All participants will be asked each of the eight questions at some point during the interview. I will also follow up participants’ answers with other probing questions, also included, to collect more information where needed.

1. Warmup questions - to break the ice and build a rapport with participants.

Could you please tell me a bit about your teaching background? How many years have you been teaching, grades you have taught and what aspect(s) of teaching you find the most rewarding? the most challenging?

2. What student assessment data are available to you and your school?
(Prompt: Where, when, and how do you access findings and reports generated by the data? What are the expectations of the district about how schools should use data? Can you give me an example of how literacy data has been used in your classroom to design instruction for a group of students? How are your teaching strategies influenced by assessment data?)
3. What assessments do you create to inform learning needs and instructional practices? When, where, and how are these assessments used? 
(Prompt: Describe for me some of the literacy assessments you use in your classroom? Why do you value these types of assessments? What kinds of information do these assessments provide you? How do you use these assessments to determine interventions needed to increase student learning?)

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

4. Does the school’s existing assessment-led instructional strategy provide an adequate means for identifying and targeting children’s individual literacy learning needs at each grade level? 
(Prompt: How does assessment data influence school decisions about PD, resources, or collaboration? How does your school support the use of assessment data results? For what purpose are data analyzed at the school or grade level? To what extent is data use prevalent in your school/district?)

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

5. What are the issues, barriers, and challenges when attempting to work with the data you generate at the class and school level, receive from the district or provincial levels, or receive based on the standardized monitoring system implemented for study purposes? 
(Prompt: What factors support your use of assessment results to inform instructional plans? What factors inhibit your use of assessment results to inform instructional plans? Do you feel well-prepared to use data you receive from reports to identify and address student learning needs? What types of support would improve your capacity to use assessment results to implement interventions or instruction in the classrooms?)

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
6. What professional learning opportunities would best enable you to use assessment results systematically in your teaching to target instruction at the student, class and school level?
(Prompt: What assessment data professional development has been most useful in about you have received? What has been the least useful? How can the professional learning be tailored to meet your needs?)

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

7. When has your instruction changed as a result of using literacy assessment data for a student or a group of students?
(Prompt: What data sources did you use? What did you do to analyze How do you know it worked or didn’t work?)

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

8. Is there anything else you think would be helpful to learn about how you use data?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Thank you for your time, for the information you have shared, and for your participation in the study.
Post-study: Questions for final interview

1. What do the standardized literacy assessments reveal about educators’ evolving capacity to work with data effectively for identifying and targeting learning needs at the individual, group, class, grade, and school levels?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. To what extent, and in what ways, do educators’ existing data sources and the student-level information they provide, agree or disagree with the standardized assessment-based monitoring system administered by the researcher for study purposes?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. In what ways has evolving through a clearly defined and delineated five-stage data-based framework for addressing individual, group, class, grade, and school-wide learning needs influenced the instructional decisions you made when working with both existing and possibly newly generated student assessment data?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. Through the iterative implementation process of the framework, what changes emerge? Based on the data gathered through this study, what do you think an optimal learning model, framework, and approach entail for moving educators, administrators, and support teachers to become strong data-literate educators and RtI professionals?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
Appendix C - Semi-Structured Administrator Interview Protocol

Administrator's experience with data-informed decision-making

Before we begin the interview itself, I would like to confirm that you have read and signed the informed consent form, that you understand that your participation in this study is entirely voluntary. This collaborative study will allow us to work together focusing on using assessment results to address identified student learning needs and to monitor student learning.

This interview strives to gather information on educators’ experience with using data from assessment reports to make decisions to increase student reading achievement. There are guiding questions for the semi-structured interview. These questions may be asked in a different order, depending on the flow of the interview. All participants will be asked each of the eight questions at some point during the interview. I will also follow up participants’ answers with other probing questions, also included, to collect more information where needed.

1. Warmup questions - to break the ice and build a rapport with participants.

   Could you please tell me a bit about your teaching and administration background? How many years did you teach, grades you have taught and what aspect(s) of teaching you find the most rewarding? the most challenging?

____________________________________________________________________
____________________________________________________________________
______________________________________
______________________________________

2. What student assessment data are available to your teachers and your school?
   (Prompt: Where, when, and how do you access findings and reports generated by the data? What are the expectations of the district about how schools should use data? Can you give me an example of how literacy data has been used in your classroom to design instruction for a group of students? How are your teaching strategies influenced by assessment data?)

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

3. What assessments are teachers expected to use or are expected to create to inform learning needs and instructional practices? When, where, and how are these assessments used?

(Prompt: Describe for me some of the literacy assessments you use in your classroom? Why do you value these types of assessments? What kinds of information do these assessments provide you? How do you use these assessments to determine interventions needed to increase student learning?)

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

4. Does the school’s existing assessment-led instructional strategy provide an adequate means for identifying and targeting children’s individual literacy learning needs at each grade level?

(Prompt: How does assessment data influence school decisions about PD, resources, or collaboration? How does your school support the use of assessment data results? For what purpose are data analyzed at the school or grade level? To what extent is data use prevalent in your school/district?)

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

5. What are the issues, barriers, and challenges when attempting to work with the data at the school level, from the district or provincial levels, or based on the standardized monitoring system implemented?

(Prompt: What factors support your use of assessment results to inform instructional plans? What factors inhibit your use of assessment results to inform instructional plans? Do you feel well-prepared to use data you receive from reports to identify and address student learning needs? What types of support would improve your capacity to use assessment results to implement interventions or instruction in the classrooms?)

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
6. What professional learning opportunities would best enable you and your teachers to use assessment results systematically in your teaching to target instruction at the student, class and school level? 
(Prompt: What assessment data professional development has been most useful in about you have received? What has been the least useful? How can the professional learning be tailored to meet your needs?)
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
___________________________________________

7. When has your instruction changed as a result of using literacy assessment data for a student or a group of students? 
(Prompt: What data sources did you use? What did you do to analyze How do you know it worked or didn’t work?)
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

8. Is there anything else you think would be helpful to learn how you use data?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Thank you for your time, for the information you have shared, and for your participation in the study.
Post-study: Questions for final interview

What do the standardized literacy assessments reveal about educators’ evolving capacity to work with data effectively for identifying and targeting learning needs at the individual, group, class, grade, and school levels?

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________

To what extent, and in what ways, do educators’ existing data sources and the student-level information they provide, agree or disagree with the standardized assessment-based monitoring system administered by the researcher for study purposes?

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________

In what ways has evolving through a clearly defined and delineated four-stage data-based framework for addressing individual, group, class, grade, and school-wide learning needs influenced the instructional decisions you made when working with both existing and possibly newly generated student assessment data?

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________

Through the iterative implementation process of the framework, what changes emerge? Based on the data gathered through this study, what do you think an optimal learning model, framework, and approach entail for moving educators, administrators, and support teachers to become strong data-literate educators and RtI professionals?

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________
### Appendix D - Reflection and Evaluation Interview Protocol

Brief interview following each class visit working through the PL stages.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>What were you pleased with? What data did you use? How did you use the data to impact student learning?</td>
<td></td>
</tr>
<tr>
<td>What changes will you make based on data we used today? Looking at the list of “I can” skills, what skills did you use today? How can we extend the learning?</td>
<td></td>
</tr>
<tr>
<td>What questions do you have? What data literacy skills will we work on during the next session and why?</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix E - Observation Protocol Form

<table>
<thead>
<tr>
<th>Classroom Observation ____</th>
<th>OR</th>
<th>Data Meeting Observation_____</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants’ Actions – Observation 1</td>
<td>Field notes, conversations, student participation, ideas for follow-up discussions</td>
<td></td>
</tr>
<tr>
<td>Date________ Location_______</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants’ Actions – Observation 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date________ Location_______</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F - Data Literacy Professional Learning Model

In the five-stage data literacy learning model presented here, a list of guiding and reflective statements is provided that identify those skills needed to use data competently and effectively at each of the four stages. The rubrics are designed with “I Can” statements presented at each stage to assess your data literacy skills and identify what skills are needed to be a highly data-literate teacher. As you reflect on your data use practices, you are asked to reflect on your level of competence ranging from “Not yet,” to “Developing,” to “Confident” in a skill. For example, if you are just beginning to work on mastering a skill listed on the rubric, then please select the first self-assessment option, “Not yet.” If you have some confidence and some knowledge of that skill but still need to work on it, select the second option, “Developing” on the rubric. If, however, you have worked extensively on that skill to the extent that you could mentor another educator to use that skill, select the third rubric option, “Confident.” These self-assessments allow you to reflect on and choose the skills you require the most support to use data to help students experience more success.
<table>
<thead>
<tr>
<th>Stage 1 – Read and understand data</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on reading and understanding data: I can…</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the terminology used in assessment reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the purpose of student assessments (e.g., diagnostic, formative, or summative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand data from multiple data sources (e.g., teacher-made tests, observational data, standardized tests, provincial, national, or international assessments)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• read and understand charts, tables, and diagrams</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• find relevant data in a table or graph (e.g., student, class, and school achievement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify the mode, range, median and mean for assessment results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• find relevant data in a table or graph</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• read and understand qualitative, descriptive information data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• read and understand quantitative (e.g., percentiles, cut scores, standard deviations, frequency, range, mean, raw scores), graphic (e.g., line, bar, and pie graphs, scatterplots, histograms), and colour-coded (e.g., RtI).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the type of data presented in reports (e.g., population or sample, cross-sectional vs. longitudinal)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Stage 2 – Analyze data

<table>
<thead>
<tr>
<th>Focus on analyzing data: I can….</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>• collaborate with peers when using data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify curriculum-based standards and expectations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• determine if data are from assessments aligned with curriculum outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• determine whether student learning is increasing when looking at multiple data entry points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify students who are struggling and who are excelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• compare students in a class, similar classes, schools, districts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• compare student, class, and school achievement to a given standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify the strand, subdomain, or group of skills that are stronger or weaker for a student or a group of students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• summarize results, so they are informative</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Stage 3 – Interpret data

<table>
<thead>
<tr>
<th>Focus on interpreting data: I can….</th>
<th>Not yet</th>
<th>Developing</th>
<th>Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>• interpret data based on group characteristics (e.g., gender, ethnicity, rural-urban) use multiple data sources (externally/externally developed, formative and summative) to explain results to a variety of audiences.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify patterns and trends in student achievement (e.g., misconceptions, common errors, success on different types of test questions, longitudinal data)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the impact of cut scores on results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• understand the reliability, validity, and potential bias of data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• establish a specific purpose for examining data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify gaps in instruction and learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify the type of questions on which students perform better and are struggling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify connections between multiple sources of data (externally/externally developed, formative, summative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• interpret provincial and other large-scale assessments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• summarize results so they are meaningful and contextualized</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 4 – Responding to data and transferring data into action</td>
<td>Not yet</td>
<td>Developing</td>
<td>Confident</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
<td>--------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Focus on responding to data: I can…</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Before teaching</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• formulate questions that can be answered using data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• select teaching strategies and approaches to address student needs (e.g., pacing, reteaching, scaffolding, implementing accommodations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• identify similar learning needs among students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• create groups to target teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• change the order of teaching outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ensure classroom assessments are aligned with curricular outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• use data to set measurable goals for student achievement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>During teaching</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• use diagnostic, formative, and summative data to modify teaching practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• implement ongoing formative assessments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• differentiate instruction based on student needs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• use continuous monitoring to make decisions on what to teach and the amount of time needed to enable students to master a skill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After teaching</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• allocate resources to better meet needs of students, class, and school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• provide targeted informative feedback for students or groups of students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• communicate conclusions derived from data</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Focus on reflection and evaluating use of data: I can…

**Evaluate data use**
- collaborate with teachers and other educators
- pose new questions about learning needs based on assessment results
- show how data supported interventions
- evaluate the effectiveness of teaching strategies and other instructional decisions (e.g., time on task, order of presenting the teaching outcomes)
- identify gaps in instruction based on summative data
- select targeted instructional planning based on summative data

**Reflect on my professional learning about using data**
- reflect on selected teaching practices
- reflect on the choice of assessments and their frequency
- reflect on the quality of classroom assessments
- state how using data changed classroom practices
- identify professional development needs (e.g. content material, teaching strategies, developing assessments)
- contribute to a Professional Learning Community (PLC)
- mentor a peer or intern in using data to improve learning
Appendix G - Introduction to Study

Introduction: My name is Norma St. Croix and I am a UNB PhD candidate working under the supervision of Dr. Elizabeth Sloat, a Faculty of Education professor with expertise in reading, writing, and speaking development, teaching methods, and language and literacy instruction. I am a former K-6 educator, Mathematics curriculum and Administration Guides writer, Evaluation consultant, and Numeracy and Literacy curriculum implementation lead. I have experience conducting professional development sessions with teachers in the areas of Mathematics and Literacy in the primary and elementary grades. As a doctoral candidate, I work part-time with the Canadian Research Institute for Social Policy (UNB-CRISP) on an ongoing “Confident Learners” research project where I write and deliver literacy-based professional development, curricula, and assessments for First Nations schools in Saskatchewan and Ontario.

Purpose of the Research: The focus of my research is to determine, through discussions with teachers and administrators, what issues, barriers, and challenges schools face while moving to a Response to Intervention (RtI) teaching and learning approach, in keeping with the RtI initiative currently being implemented in New Brunswick schools. RtI requires educators to work with student assessment information based on classroom reports teachers receive showing each child’s results on a number of literacy skills. The challenge then is to diagnose each child’s learning needs and select teaching approaches that target those needs. Through RtI, educators and administrators are also asked to work collaboratively to determine what the assessment results reports say about learning needs and instructional directions at the classroom, grade, and whole school levels.

Assessments: Together, educators and I will work primarily with individual child assessments aimed at increasing student achievement levels. With input from teachers, I will design and implement a grade-appropriate assessment-based language, literacy, reading skill, and reading comprehension monitoring system so that assessment results reports will be generated for teachers to use as part of our collaborative process. Students in Grades K-5 will be assessed approximately three times during the school year using a literacy and reading skills screener, with struggling students monitored and assessed more often, as necessary.

Professional Development: I will work with educators in their classrooms from September to May of the 2017-2018 school year as we work collaboratively through the process of reading, analyzing, and interpreting assessment reports for deciding how we might best target learning needs at the individual child, small group, and whole class levels. We’ll monitor the process and evaluate whether instructional choices and decisions are working, and implement different pedagogical approaches if need be. Throughout this process, I will work collaboratively in the classroom with each educator where I will also collect interview and observational research data to document what’s happening and what is needed to ensure assessment report reading and response success.

Benefits: We will develop collaboratively a comprehensive set of research-based teaching strategies that target a wide range of emergent, early, beginning, and
conventional reading challenges children encounter across the K-to-5 spectrum. I will show, model, demonstrate, and work with teachers in their classrooms to provide ongoing professional learning experiences about integrating assessment results into day-to-day instructional practice. We will institute a Tier 1, Tier 2, Tier 3 reading and literacy response framework for students, with Tier 1 composed of regular and ongoing class-wide teaching; Tier 2 designed to target children experiencing some degree of reading difficulty; and Tier 3 designed to target the learning needs of children experiencing significant reading challenges. Our aim will be to ensure children in the school are on track for their age and grade with their reading ability by the end of the school year, which is also a departmental and government goal. Through our collaboration process, you would be one of the few schools, perhaps the only school, where all educators have the professional knowledge and capabilities to use assessment results in a Response to Intervention (RtI) teaching and learning approach addressing student learning needs in their day-to-day teaching.

**Results of Study:** The results from this study will provide information about how teachers use assessment reports to inform their daily planning and instruction. This study will also identify factors teachers believe best support, and those that most inhibit, their use of assessment results. Most importantly, the study will help identify the professional learning opportunities teachers need to use assessment results systematically in their teaching. My dissertation writing will not be negative or critical or identify a specific person. In my dissertation, educators will be given pseudonyms, and the school will not be identified. Teachers and administrators will be welcome to read results before they are published so any concerns can be addressed prior to the dissertation’s completion.
Appendix H - Director Consent Letter

Dear Director,

My name is Norma St. Croix and I am a doctoral candidate with UNB’s Faculty of Education. I am requesting permission to partner with Anthony Primary School principal, teachers, and students in a collaborative research partnership between October 2017 and May 2018. Principal Barry Thomas and the teachers have expressed interest in this collaborative research designed to pilot test a five-stage professional learning model I have developed that facilitates moving progressively to a school-wide Response to Intervention (RtI) teaching and learning approach, in keeping with the DEECD’s current RtI initiative. As such, the study consists of two equal and complementary goals: 1) to conduct research aimed at identifying and tracking, on an ongoing basis, the issues, challenges, barriers, and successes educators encounter while moving to an RtI instructional approach; and 2) for me to provide ongoing professional learning and support to educators throughout the year as we move collaboratively to implement RtI in all grades. As such, through this letter I am seeking formal district consent allowing me to partner with KCS to conduct this ongoing research and professional learning collaboration.

The study consists of six data collection methods with data collected ongoing throughout the school year. The first consists of a self-complete educator questionnaire for collecting information on teaching background, demographics, and perceptions about assessment data use in guiding instruction. The questionnaire will take about 10 to 15 minutes to complete. The second method consists of ongoing individual and group semi-structured interviews throughout the year to discuss collaboratively teachers’ successes, limitations, and barriers with moving to an RtI strategy, and to problem-solve next steps. These meetings will vary in length, and last anywhere from 10 to 60 minutes. Method three focuses on observations of teacher practices during periodic class visits. Field notes during observations of classroom practice, meetings, and discussions with individual and groups, method four, will document learning process to further inform whether the piloted professional learning model requires changes. The fifth method is constituted by the range of curricular, information sources, and assessment materials educators use to inform curriculum content and pedagogical decisions on an ongoing basis. Finally, the sixth data collection strategy includes administering the Dynamic Indicators of Early Literacy Skills (DIBELS) assessment to all children three times during the year to monitor individual student performance on the emergent literacy, early reading, and conventional reading skills from grades K to 5. For children requiring
a more detailed diagnostic literacy assessment, the Phonological Awareness Literacy Screener (PALS) will be used to provide a more comprehensive assessment that better isolates specific early literacy learning problem areas for emergent and early reading development and to ascertain whether ongoing targeted instructional decisions work. These literacy assessments will take 10 to 15 minutes per child and conducted only with those children for whom parental consent is given.

Participation in this work will be completely voluntary for you and all study participants. Should you grant permission to allow me to work with KCS, you or the school can elect to withdraw from the project, or withdraw any data you wish, at any time. Be assured that the school, educators, and students will not be identified either directly by name or indirectly through my dissertation or any documents and publication papers I write. If names are used at all, then pseudonyms will be used, and comments and materials will be presented in a way that does not reveal anyone’s identity. Teachers and administration can review findings and provide input if they wish before the dissertation is finalized.

Please read the attached purpose and design of the study, and if you are okay with proceeding I will need you to sign and return the statement of consent to me by mail, by email, in person, or by fax (1-506-455-8869). You can also reply to my email indicating your consent if you wish. I also ask for your contact details should you wish to receive a summary report of my findings. Do not hesitate to let me know if you have any questions or require additional information on any aspects of this work. I can be reached at norma.stcroix @unb.ca or you may contact my supervisor, Dr. Elizabeth Sloat, at esloat@unb.ca or (506) 453-3502. Dr. Ellen Rose, Interim Associate Dean of Graduate Studies, can also be reached at erose@unb.ca or (506) 447-3294 should you wish to speak with another faculty member not directly involved in the study about this project.

Thank you for considering my request, and please see the following page 3.

______________________________
Norma St. Croix, PhD Candidate,
Faculty of Education, UNB
**Research Focus:** This study will pilot-test and refine, as necessary, a five-stage data literacy professional learning model (PLM) by conducting an applied and collaborative investigation with educators in one school aimed at increasing educators’ data literacy knowledge and skills. While working through the professional learning stages, this study will implement an assessment-led, data-based approach to differentiating instruction targeting the early skills students need to succeed in school, in particular for learning to read.

**Data Sources and Participation:** The study with all educators and students with KCS consists of six data collection methods since data will be collected ongoing throughout the school year: 1) a self-complete educator questionnaire; 2) ongoing individual and group semi-structured interviews; 3) observations of teacher practices; 4) field notes during observations of classroom practice, meetings, and discussions with individual and groups; 5) documentary analysis of the range of curricular, information sources, and assessment materials educators use to inform curriculum content and pedagogical decisions; and 6) the Dynamic Indicators of Early Literacy Skills (DIBELS) assessment administered to all children three times during the year. Literacy assessments will only be conducted with those children for whom parental consent is given. All materials will be kept in a locked cabinet in my office and destroyed within two years following project completion, as per Social Sciences and Humanities Research Council policy.

**Benefits:** A comprehensive set of research-based teaching strategies that target a wide range of emergent, early, beginning, and conventional reading challenges children encounter across the K-to-5 spectrum will be developed. Educators will receive, in their classrooms and during meetings, ongoing professional learning experiences about integrating assessment results into day-to-day instructional practice. Through the systematic use of data and appropriate interventions, the aim will be to ensure children in the school are on-track for their age and grade with their reading ability by the end of the school year. Most importantly, the study will help identify and address the professional learning opportunities teachers need to use assessment results systematically in their teaching.

**Participant Signature:** Your signature indicates that you voluntarily agree to allow Anthony Primary to participate in this study, that the study has been explained to you and that any questions have been satisfactorily answered. It has been made clear that your participation is completely voluntary and that you may withdraw, or withdraw any data you wish, from the project at any time. No personal identifying information will be reported at any time to ensure your privacy and confidentiality throughout and beyond the life of the project.

Participant’s Name (printed) __________________________________________

__________________________________________________________ (Participant’s Signature)  (Date)
**Researcher’s Statement:** I certify that the participant has had adequate time to read and learn about the study and all questions have been answered. The participant understands the purpose, risks, benefits and procedures to be followed in this study and voluntarily agrees to participate.

(Norma St. Croix) ________________________ (Date) ________________________

**Summary of Findings:** If you would like to receive a summary report of the findings from this project please include your name and email or mailing address below.

(Name and email address) ________________________
(mailing address) ________________________

*This project has been reviewed by the Research Ethics Board of the University of New Brunswick and is on file as REB 2017-132.*
Appendix I - Administrator Consent Letter

Dear Administrator,

My name is Norma St. Croix and I am a doctoral candidate with UNB’s Faculty of Education. I am requesting permission to partner with you, your teachers, and your students in a collaborative research partnership between October 2017, and May 2018. This collaborative research study is designed to pilot test a five-stage professional learning model I have developed that facilitates moving progressively to a school-wide Response to Intervention (RtI) teaching and learning approach, in keeping with the DEECD’s current RtI initiative. As such, the study consists of two equal and complementary goals: 1) to conduct research aimed at identifying and tracking, on an ongoing basis, the issues, challenges, barriers, and successes educators encounter while moving to an RtI instructional approach; and 2) for me to provide ongoing professional learning and support to educators throughout the year as we move collaboratively to implement RtI in all grades. As such, through this letter I am seeking formal consent allowing me to partner with you at Anthony Primary to conduct this ongoing research and professional learning collaboration.

The study consists of six data collection methods with data collected ongoing throughout the school year. The first consists of a self-complete educator questionnaire for collecting information on teaching background, demographics, and perceptions about assessment data use in guiding instruction. The questionnaire will take about 10 to 15 minutes to complete. The second method consists of ongoing individual and group semi-structured interviews throughout the year to discuss collaboratively teachers’ successes, limitations, and barriers with moving to an RtI strategy, and to problem-solve next steps. These meetings will vary in length, and last anywhere from 10 to 60 minutes. Method three focuses on observations of teacher practices during periodic class visits. Field notes during observations of classroom practice, meetings, and discussions with individual and groups, method four, will document learning process to further inform whether the piloted professional learning model requires changes. The fifth method is constituted by the range of curricular, information sources, and assessment materials educators use to inform curriculum content and pedagogical decisions on an ongoing basis. Finally, the sixth data collection strategy includes administering the Dynamic Indicators of Early Literacy Skills (DIBELS) assessment to all children three times during the year to monitor individual student performance on the emergent literacy, early reading, and conventional reading skills from grades K to 5. For children requiring a more detailed diagnostic literacy assessment, the Phonological Awareness Literacy
Screener (PALS) will be used to provide a more comprehensive diagnostic assessment that better isolates specific early literacy learning problem areas for emergent and early reading development. These literacy assessments will take 10 to 15 minutes per child and conducted only with those children for whom parental consent is given.

The collaborative partnership will provide the framework for my doctoral research study while developing with you a comprehensive school-wide Response to Intervention (RtI) approach to teaching and learning. My research interest is in understanding what, in very real and detailed terms, is required of schools to implement an RtI approach based on using student-level assessment data in an ongoing manner to target the learning needs of individual students. At the same time, we will aim to have children in your school on-track in their language, literacy, and reading development by the end of the school year. We will identify targeted interventions based on assessment results, and monitor the process, evaluate whether instructional choices and decisions are working, and implement different pedagogical approaches as needed.

Participation in this work will be completely voluntary for you and all study participants. Should you grant permission to allow me to work with you and your school, you or the school can elect to withdraw from the project, or withdraw any data you wish, at any time. Be assured that your school, educators, and students will not be identified either directly by name or indirectly through my dissertation or any documents and publication papers I write. If names are used at all, then pseudonyms will be used, and comments and materials will be presented in a way that does not reveal anyone’s identity. Your teachers can review findings and provide input if they wish before the dissertation is finalized.

Please read the attached purpose and design of the study, and if you are okay with proceeding I will need you to sign and return the statement of consent to me by mail, by email, in person, or by fax (1-506-455-8869). You can also reply to my email indicating your consent if you wish. I also ask for your contact details should you wish to receive a summary report of my findings. Do not hesitate to let me know if you have any questions or require additional information on any aspects of this work. I can be reached at norma.stcroix @unb.ca or you may contact my supervisor, Dr. Elizabeth Sloat, at esloat@unb.ca or (506) 453-3502. Dr. Ellen Rose, Interim Associate Dean of Graduate Studies, can also be reached at erose@unb.ca or (506) 447-3294 should you wish to speak with another faculty member not directly involved in the study about this project.

Thank you for considering my request, and please see the following page 3.

Norma St. Croix, PhD Candidate,
Faculty of Education, UNB
Research Focus: This study will pilot-test and refine, as necessary, a five-stage data literacy professional learning model (PLM) by conducting an applied and collaborative investigation with educators in one school aimed at increasing educators’ data literacy knowledge and skills. While working through the professional learning stages, this study will implement an assessment-led, data-based approach to differentiating instruction targeting the early skills students need to succeed in school, in particular for learning to read.

Data Sources and Participation: The study with all educators and students with KCS consists of six data collection methods since data will be collected ongoing throughout the school year: 1) a self-complete educator questionnaire; 2) ongoing individual and group semi-structured interviews; 3) observations of teacher practices; 4) field notes during observations of classroom practice, meetings, and discussions with individual and groups; 5) documentary analysis of the range of curricular, information sources, and assessment materials educators use to inform curriculum content and pedagogical decisions; and 6) the Dynamic Indicators of Early Literacy Skills (DIBELS) assessment administered to all children three times during the year. Literacy assessments will only be conducted with those children for whom parental consent is given. All materials will be kept in a locked cabinet in my office and destroyed within two years following project completion, as per Social Sciences and Humanities Research Council policy.

Benefits: A comprehensive set of research-based teaching strategies that target a wide range of emergent, early, beginning, and conventional reading challenges children encounter across the K-to-5 spectrum will be developed. Educators will receive, in their classrooms and during meetings, ongoing professional learning experiences about integrating assessment results into day-to-day instructional practice. Through the systematic use of data and appropriate interventions, the aim will be to ensure children in the school are on-track for their age and grade with their reading ability by the end of the school year. Most importantly, the study will help identify and address the professional learning opportunities teachers need to use assessment results systematically in their teaching.

Participant Signature: Your signature indicates that you voluntarily agree to allow Anthony Primary School to participate in this study, that the study has been explained to you and that any questions have been satisfactorily answered. It has been made clear that your participation is completely voluntary and that you may withdraw, or withdraw any data you wish, from the project at any time. No personal identifying information will be reported at any time to ensure your privacy and confidentiality throughout and beyond the life of the project.

Participant’s Name (printed) 

(Participant’s Signature) (Date)
**Researcher’s Statement:** I certify that the participant has had adequate time to read and learn about the study and all questions have been answered. The participant understands the purpose, risks, benefits and procedures to be followed in this study and voluntarily agrees to participate.

(Norma St. Croix)  
(Date)

**Summary of Findings:** If you would like to receive a summary report of the findings from this project please include your name and email or mailing address below.

(Name and email address)  
(mailing address)

This project has been reviewed by the Research Ethics Board of the University of New Brunswick and is on file as REB 2017-132.
Appendix J - Teacher Consent Letter

Dear Teacher,

My name is Norma St. Croix and I am a doctoral candidate at UNB in the faculty of Education. This letter is requesting your participation in my research study aimed at piloting a professional learning model supporting the use of data to assist in addressing identified student literacy needs. The study I would like you to be a part of consists of working together using results from various assessments to identify and address student learning needs. This will be a collaboration between you and I as we work together with the data to make informed decisions on the interventions needed to increase student learning.

The study consists of six data collection methods with data collected ongoing throughout the school year. The first consists of a self-complete educator questionnaire for collecting information on your teaching background, demographics, and perceptions about assessment data use in guiding instruction. The questionnaire will take about 10 to 15 minutes to complete. The second method consists of ongoing semi-structured interviews with you individually and also with other teachers as a group throughout the year to discuss collaboratively your successes, limitations, and barriers with moving to an RtI strategy, and to problem-solve next steps. These meetings will vary in length, and last anywhere from 10 to 60 minutes. Method three focuses on observations of instructional practices during periodic class visits. Field notes during observations of classroom practice, meetings, and discussions with you and other teachers, method four, will document learning process to further inform whether the piloted professional learning model requires changes. The fifth method is constituted by the range of curricular, information sources, and assessment materials you use to inform curriculum content and pedagogical decisions on an ongoing basis. Finally, the sixth data collection strategy includes administering the Dynamic Indicators of Early Literacy Skills (DIBELS) assessment to all children in your class three times during the year to monitor individual student performance on the emergent literacy, early reading, and conventional reading skills from grades K-to-5. These literacy assessments will take 10 to 15 minutes per child and conducted only with those children for whom parental consent is given.

The collaborative partnership will provide the framework for my doctoral research study while developing with you a comprehensive school-wide Response to Intervention (RtI) approach to teaching and learning. My research interest is in understanding what, in very
real and detailed terms, is required of schools to implement an RtI approach based on using student-level assessment data in an ongoing manner to target the learning needs of individual students. At the same time, we will aim to have children in your class on-track in their language, literacy, and reading development by the end of the school year. We will identify targeted interventions based on assessment results, and monitor the process, evaluate whether instructional choices and decisions are working, and implement different pedagogical approaches as needed.

Your participation in this work is completely voluntary. Should you decide to participate, you can elect to withdraw from the project at any time you wish, and you can withdraw any or all materials and information you provide at any time. Be assured as well that you will not be identified either directly by name or indirectly through your work in any documents and publication papers I write. If names are used at all, then pseudonyms will be used instead of any actual names, and comments and materials will be presented in a way that do not reveal your identity. You can review findings and provide input if you wish before my dissertation is finished.

Please read the attached purpose and design of the study, and if you are okay with proceeding as a participant I will need you to sign and return to me the statement of consent either by faculty mail, in person, or by fax (1-506-455-8869). I also ask for your contact details should you wish to receive a summary report of the findings from my work. Do not hesitate to let me know if you have any questions or require any additional information on any aspects of this work. I can be reached at norma.stcroix@unb.ca or you may contact my supervisor, Dr. Elizabeth Sloat, at esloat@unb.ca or (506) 453-3502. Dr. Ellen Rose, Interim Associate Dean of Graduate Studies, can also be reached at erose@unb.ca or (506) 447-3294 should you wish to speak with another faculty member not directly involved in the study about this project.

Thank you for considering my request, and please see the following page 3.

Norma St. Croix, PhD Candidate,
Faculty of Education, UNB
**Research Focus:** The purposes of this study are to conduct an applied and collaborative investigation with educators to pilot-test a five-stage data literacy professional learning model and to implement, refine, and assess the effects of an assessment-led, data-based approach to differentiating instruction targeting the early skills students need to succeed in school, in particular for learning to read.

**Benefits of research:** An assessment-based literacy, reading skill, and reading comprehension monitoring system will be implemented so data would be generated to inform instruction. A comprehensive set of research-based teaching strategies that target a wide range of emergent, early, beginning, and conventional reading challenges children encounter across the K-to-5 spectrum will be developed with teachers. Educators will receive ongoing, classroom based professional development on using assessment results to inform instructional decisions aimed at increasing student learning.

**Data Sources and Participation:** The study with you and your students with Anthony Primary consists of six data collection methods since data will be collected ongoing throughout the school year: 1) a self-complete questionnaire; 2) ongoing individual and group semi-structured interviews; 3) observations of instructional practices; 4) field notes during observations of classroom practice, meetings, and discussions with individual and groups; 5) documentary analysis of the range of curricular, information sources, and assessment materials educators use to inform curriculum content and pedagogical decisions; and 6) the Dynamic Indicators of Early Literacy Skills (DIBELS) assessment administered to your children three times during the year to assess basic early literacy skills. Literacy assessments will only be conducted with those children for whom parental consent is given. All materials will be kept in a locked cabinet in my office and destroyed within two years following project completion, as per Social Sciences and Humanities Research Council policy.

You will be asked to participate in semi-structured interviews at the beginning and the conclusion of the study to discuss your experiences using data. You will then be asked to work with me two-three times a week for 30 weeks (one to two hours in the classroom working with your students, one - two hours analyzing data meetings each week and one - two hours planning interventions to meet the needs of your students, classes and school). Assessment results from Dynamic Indicators of Basic Early Literacy Skills (DIBELS) will be optional to use and assessments you create and use to identify student needs will be used during the study.

**Participant Signature:** Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you and that any questions have been satisfactorily answered. It has been made clear that your participation is completely voluntary and that you may withdraw from the project at any time. No personal identifying information will be reported at any time to ensure your privacy and confidentiality throughout and beyond the life of the project.

Participant’s Name (printed) __________________________________________________________

(Participant’s Signature) ____________________________________________________________ (Date)

**Researcher's Statement:** I certify that the participant has had adequate time to read and learn about the study and all questions have been answered. The participant understands
the purpose, risks, benefits and procedures to be followed in this study and voluntarily agrees to participate.

(Norma St. Croix) (Date)

Summary of Findings: If you would like to receive a summary report of the findings from this project please include your name and email or mailing address below.

(Name and email address)

(mailing address)

This project has been reviewed by the Research Ethics Board of the University of New Brunswick and is on file as REB 2017-132.
Appendix K - Parent Consent Letter

Dear Parent(s) and Guardian(s),

My name is Norma St. Croix, and I am a doctoral candidate at UNB’s Faculty of Education. I will be working with your child’s school from October 2017 to June 2018 on a research project where I will work with your child’s teachers to identify your child’s reading learning needs and select teaching approaches that target the skills your child needs to succeed in school, in particular for learning to read. I am writing this letter asking for your consent to include your child as part of my study.

The purpose of my research is to work collaboratively with all teachers and the principal in Anthony Primary to enhance the school’s assessment-based approach to teaching reading. I will use information about the steps teachers go through while working with the assessments for my doctoral study.

The purpose of your child’s involvement is to complete a short 10-to-15-minute reading assessment so that, together, your child’s teacher and I can use the results to make decisions about your child’s individual instructional needs and learning goals. The assessment will be administered 3 times during the year, in October, January, and May, so we can monitor reading progress and adjust teaching as needed to better target your child’s ongoing learning using the teaching tools and strategies that work the best.

The tools I will use to assess your child’s reading skills are well-known, widely used, and child-friendly. For example, in assessing your child’s phonological awareness, I will show a picture and say the name of that picture (for example, ‘ball’), and then ask your child to say what sound the beginning letter of the word makes – a /b/ sound for the letter ‘b’. The reading knowledge assessment tools are instructional at the same time since they teach children about how reading works. I will also work with assessments your child’s teacher is currently using in class.

If you are okay with allowing me to work with your child, I need your signature on the consent form on page 2 of this letter. I want to assure you that your participation and your child’s participation are completely voluntary. If, after giving consent, you later decide you want to stop your child’s participation you only need to let the school know. I will stop working with your child and destroy any reading information I may have collected. Your child’s name will never appear in any written materials that come out of my study, and no one will be able to identify any child based on how I write about the study. Confidentiality will be respected at all times. My project will follow all Department of Education and Early Childhood Development policies, and the project has been approved by UNB’s research ethics board and is on file as REB 2017-132.
If you would like additional information about this project, you can contact your child’s teacher or the school principal, or my supervisor, Elizabeth Sloat, who can be reached at esloat@unb.ca or 453-3502 (this phone line also has voicemail). If you wish to speak to someone else at UNB about my project you can contact Dr. Ellen Rose, the Acting Associate Dean of Graduate Programs in the Faculty of Education, at 447-3294 or ellenrose@unb.ca.

Please indicate below whether you are willing to have your child participate in this study. The form can then be returned to your child’s teacher in the envelope provided.

Yours very truly,

__________________
Norma St. Croix, PhD Candidate,
Classroom Teacher
Faculty of Education, UNB

PARTICIPANT SIGNATURE

Please check one:

______ My child can participate
______ My child cannot participate

Your signature indicates that you voluntarily agree to have your child participate in this study, that the study has been explained to you and that any questions have been satisfactorily answered. It has been made clear that your child’s participation in this study is completely voluntary and that you may withdraw your child from the project at any time. No personal identifying information will be reported at any time to ensure your child’s privacy and confidentiality throughout and beyond the life of the project.

Child’s Name ____________________________________________
(Please Print)

__________________  ____________________________
(Signature of Parent or Guardian)   (Date)

SUMMARY OF FINDINGS

If you would like to receive a summary report of my study findings from this collaborative research project, please include your name and email or mailing address below.

__________________
(Name)

__________________
(Address)
## Appendix L - Materials and resources used for interventions and instruction

<table>
<thead>
<tr>
<th>Resources Used</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIBELS – Vport support</td>
<td>Recommended interventions and groups by Vport</td>
</tr>
<tr>
<td>Various Games</td>
<td>e.g. Boggle, Scrabble Junior, Word for Word Game: Phonics Word Building, Big Box of Word Chunks</td>
</tr>
</tbody>
</table>
Government documents used during the study to plan instruction and interventions

The listed resources can be found on the New Brunswick Education and Early Childhood Development Anglophone Kindergarten to Grade 12 website at:

https://www2.gnb.ca/content/gnb/en/departments/education/k12/content/anglophone_sector/curriculum_anglophone.html

- New Brunswick K-5 Language Arts Curriculum Document
- Reading and Writing Achievement Standards: A Component of Atlantic Canada English Language Arts Curriculum (Entry – Grade 9)
- Reading Achievement Standards for Grades K-5 (see sample below)
- Writing Achievement Standards for Grades K-5
- Speaking and Listening Achievement Standards for Grades K-2
Text Complexity

Appropriate Achievement

Students select and read independently a variety of fiction and nonfiction texts. These include:

- Popular genres that are widely recognized and enjoyed by children (e.g., science fiction, adventure)
- Complex texts that are set in different time periods and places (e.g., historical fiction)
- Works that feature diverse characters and themes (e.g., multicultural literature)
- Nonfiction texts that cover a variety of topics (e.g., science, social studies)

These texts are designed to challenge students and encourage critical thinking and analysis.

Reading Strategies and Behaviours

Appropriate Achievement

Students demonstrate strong reading strategies and behaviors, such as:

- Comprehension: Students read with purpose and make connections to prior knowledge.
- Fluency: Students read with ease and confidence, with a smooth prosody.
- Vocabulary: Students use a wide range of vocabulary words in their reading and writing.
- Metacognition: Students monitor their own understanding and adjust their strategies accordingly.

Reading Achievement Standards

End of Grade 2

Students read independently a variety of fiction and nonfiction texts. These include:

- Popular genres that are widely recognized and enjoyed by children (e.g., science fiction, adventure)
- Complex texts that are set in different time periods and places (e.g., historical fiction)
- Works that feature diverse characters and themes (e.g., multicultural literature)
- Nonfiction texts that cover a variety of topics (e.g., science, social studies)

These texts are designed to challenge students and encourage critical thinking and analysis.

Reading Strategies and Behaviours

Appropriate Achievement

Students demonstrate strong reading strategies and behaviors, such as:

- Comprehension: Students read with purpose and make connections to prior knowledge.
- Fluency: Students read with ease and confidence, with a smooth prosody.
- Vocabulary: Students use a wide range of vocabulary words in their reading and writing.
- Metacognition: Students monitor their own understanding and adjust their strategies accordingly.

Students who demonstrate strong achievement apply strategies and exhibit behaviors that align with the appropriate level in an increasingly efficient and independent manner.

- Students who demonstrate strong achievement are able to:
  - Read a variety of high-frequency words, even in isolation.
  - Read familiar passages fluently with appropriate phrasing and expression.
  - Read a variety of high-frequency words, even in isolation.
  - Read familiar passages fluently with appropriate phrasing and expression.

Reading Strategies and Behaviours

Strong Achievement

Students who demonstrate strong achievement apply strategies and exhibit behaviors that align with the appropriate level in an increasingly efficient and independent manner.

- Students who demonstrate strong achievement are able to:
  - Read a variety of high-frequency words, even in isolation.
  - Read familiar passages fluently with appropriate phrasing and expression.
  - Read a variety of high-frequency words, even in isolation.
  - Read familiar passages fluently with appropriate phrasing and expression.

Students who demonstrate strong achievement apply strategies and exhibit behaviors that align with the appropriate level in an increasingly efficient and independent manner.

- Students who demonstrate strong achievement are able to:
  - Read a variety of high-frequency words, even in isolation.
  - Read familiar passages fluently with appropriate phrasing and expression.
  - Read a variety of high-frequency words, even in isolation.
  - Read familiar passages fluently with appropriate phrasing and expression.
Curriculum Vitæ

Norma Mary St. Croix

Biography

Norma’s varied professional experience demonstrates strong leadership skills, proven organization, communication, leadership, and problem-solving skills. She is currently contracted as a literacy assessment specialist responsible for developing assessments for Confident Learners—a whole-school and whole community program in early literacy in First Nations Band Schools in Canada. Norma is also leading the professional development and the implementation of Confident Learners in several First Nations schools across Canada.

Norma has over 30 years of successful education experience as a teacher, a mentor, an administrator, and a consultant in rural and urban schools in English and French Immersion programs in Newfoundland and Labrador. She has taught all grades from Kindergarten to Grade six and worked collaboratively with other professionals to increase student learning in public and private schools. She facilitated professional development sessions training new teachers to implement an Intensive Core French programme and chaired many committees to positively impact student achievement.

Provincially, Norma played a key role in the implementation of the Grade 4, 5 and 6 Mathematics Program through the creation of training DVDs, online videos and implementation training to large groups of teachers. She led professional development sessions for teachers and administrators on using data to inform instruction, developing valid and reliable assessments, teaching strategies, and creating and using rubrics to inform instruction. She created literacy and numeracy profiles for Grades Kindergarten and grade 1 to monitor student learning.

Nationally, Norma was a Leader for 2013 Pan Canadian Assessment Programme (PCAP) Science Assessments and was on a committee to create contextual questionnaires for students, teachers and administrators for 2013 PCAP assessment. She scored the 2010 PCAP Mathematics assessments in French and was a member of the Standard Setting Committee for the 2010 PCAP Mathematics assessment.
Education

September 2016-present  University of New Brunswick, Fredericton, NB
PhD Candidate (Education Studies)

September 2014-2016  University of New Brunswick, Fredericton, NB
PhD Student (Interdisciplinary Studies)

September 2004-August 2006  Mount Saint Vincent University
Masters in Education (Literacy)

July 1989-December 1990  Laval University, Quebec, QC
Certificate in French Second Language

May 1984-August 1987  Memorial University of Newfoundland Labrador,
St. John’s, NL
Bachelor of Arts (Major: English, Minor Psychology)

September 1980-April 1984  Memorial University of Newfoundland Labrador,
St. John’s, NL
Bachelor of Arts (Primary-Elementary Education)

Professional Experience

November 2013-present  NMSTC Education Consulting Inc. - President

April 2015-present  The Learning Bar - (Professional Development Consultant)
- Develop and deliver one-week, in-school Professional development for teachers in First Nations schools in Ontario, Saskatchewan, Alberta and New Brunswick
- Provide sustained professional development support to teachers and schools following implementation of Confident Learners Literacy program

April 2015-present  The Learning Bar – (Assessment Consultant)
- Develop direct assessments for specific code-related and language literacy skills
- Developed placement tests to identify specific code-related and language literacy skills that students have achieved
November 2013-March 2015  **Canadian Research Institute for Social Policy (CRISP)**  
**University of New Brunswick** (Confident Learners Assessment Consultant)  
- Created scoring rubrics to assess early literacy skills  
- Developed direct assessments for specific literacy skills  
- Developed placement tests for an early literacy intervention program  

September 2013-June 2014  **Newfoundland and Labrador English School District**  
(Assistant Principal at Holy Cross Elementary)  
- Worked with teachers on effective teaching and assessment practices  
- Interpersonal and strong communication and problem-solving skills  

September 2009-August 2013  **Department of Education, Newfoundland and Labrador**  
(Evaluation Consultant K-9 Mathematics and Science)  
- Lead the development, and administration of provincial mathematics assessments in Grades 3, 6 and 9  
- Led the scoring and analysis of data of the provincial assessments for Mathematics curriculum in Grades 3, 6 and 9  
- Created Scoring Guides to assess mathematical processes  
- Developed a technology-based approach to assess mental mathematics skills.  

March 2009-August 2009  **Mathematics Curriculum Development Specialist**  
Department of Education, Newfoundland and Labrador  
- developed curriculum for Grades 2 and 5.  
- Created online multi-media learning sessions for Mathematics implementation  

February 2007-March 2009  **Numeracy Support Teacher**  
Eastern School District, St. John’s, NL  
- Worked with administrators and classroom teachers on increasing student achievement in mathematics  
- Led professional development for teachers in the creation and use of classroom assessments, differentiated instruction, using flexible grouping, teaching strategies and developing cross curricular connections.
January 2002-January 2006  Classroom teacher  
Eastern School District, St. John’s, NL

September 1992-June 1999  French Immersion Teacher  
Burin Peninsula School Board, Marystown, NL

September 1984-June 1992  Classroom teacher and Student Support teacher  
Christ the King School, Rushoon, NL

Awards and Bursaries

2019  UNB Graduate Studies Research Assistant Grant

2017-2018  New Brunswick Innovation Foundation Award

2016-2017  UNB Graduate Studies Research Assistant Grant

2014-2015  UNB Graduate Research Assistantship for Interdisciplinary Studies

Curriculum and Assessment Development and Implementation


Presentations and Workshops


Department of Education of Newfoundland and Labrador 2010, May and 2011, September. *Curriculum implementation lead for grades 4, 5 and 6 mathematics.* St. John’s, Newfoundland.