Studies in Educational Leadership 17

Kim Schildkamp
Mei Kuin Lai
Lorna Earl *Editors*

Data-based Decision Making in Education

Challenges and Opportunities

Springer

Data-based Decision Making in Education

STUDIES IN EDUCATIONAL LEADERSHIP

VOLUME 17

SCOPE OF THE SERIES

Leadership we know makes all the difference in success or failures of organizations. This series will bring together in a highly readable way the most recent insights in successful leadership. Emphasis will be placed on research focused on pre-collegiate educational organizations. Volumes should address issues related to leadership at all levels of the educational system and be written in a style accessible to scholars, educational practitioners and policy makers throughout the world.

The volumes – monographs and edited volumes – should represent work from different parts in the world.

For further volumes:
http://www.springer.com/series/6543

Kim Schildkamp · Mei Kuin Lai · Lorna Earl
Editors

Data-based Decision Making in Education

Challenges and Opportunities

Springer

Editors
Kim Schildkamp
Faculty of Behavioural Sciences
University of Twente
Enschede
The Netherlands

Lorna Earl
Aporia Consulting Ltd.
Toronto, ON
Canada

Mei Kuin Lai
Woolf Fisher Research Centre
School of Curriculum and Pedagogy
The University of Auckland
Auckland
New Zealand

ISBN 978-94-007-4815-6 ISBN 978-94-007-4816-3 (eBook)
DOI 10.1007/978-94-007-4816-3
Springer Dordrecht Heidelberg London New York

Library of Congress Control Number: 2012947059

Contents

About the Authors

Elizabeth Archer PhD is currently a specialist in Institutional Research at the University of South Africa. Elizabeth was previously employed as a researcher and project coordinator at the Centre for Evaluation and Assessment at the University of Pretoria. She is a qualified Educational Psychologist with a PhD in Assessment and Quality Assurance. She has spent a number of years conducting research in Primary and Secondary education with School Performance Feedback Systems. Elizabeth's research focussed on designing and developing a feedback system that facilitates appropriate data use in the South African context. She has published and presented papers relating to data use in South Africa, New Zealand, The Netherlands, Mauritius, Cyprus and Malaysia.

Christopher Downey is a Lecturer in Education at the University of Southampton. Chris graduated in Chemistry from the University of London and, after working in the chemical industry for a few years, trained as a secondary science teacher. He taught science in secondary schools in the South of England for 12 years gaining experience of school leadership as a Head of Department and as an Assistant Head teacher. His current research interests span fields related to educational improvement and effectiveness, particularly the area of data use in and for schools. He recently co-authored a book on using effectiveness data for school improvement (Routledge) with Anthony Kelly.

Robert Dunn has been a Superintendent of Schools for the past 10 years, responsible for schools from Kindergarten to grade 12. In that work, he has supported in the establishment of effective Learning Networks among schools as well as in building the capacity of school administrators to create an evidence-informed improvement process which includes a significant monitoring component. For 4 years, he was the chair of the Toronto Region Professional Network Centre as well as being the Lead for the implementation of the Managing Information for Student Achievement for the York Region District School Board. He is also a principal of Compass for Success, an innovative application designed to manage data and to engage schools in using data for creating School Improvement Plans. The platform is an interactive one which houses all of the school board and provincial data on students. It also has a significant capacity building element with training modules on using data to impact

student achievement. This application has been adopted by over 24 school districts and First Nations bands in Ontario, Canada.

Melanie Ehren PhD is an assistant professor, working on research into effects and unintended consequences of standards-based school reform, accountability systems and school inspections on school improvement and teaching and learning in schools. Her research started with a Ph.D. on effects of school inspections. In this research, she used novel techniques, such as a policy theory evaluation, to reconstruct the assumptions on effects of school inspections. Her paper on 'The Relationship between School Inspections, School Characteristics and School Improvement', co-authored by Adrie Visscher, was placed on the 2010 highest cited article list of the British Journal of Educational Studies. Melanie Ehren participated in the International Project for the Study of Educational Accountability Systems (IPEA) and has studied the effectiveness of accountability systems and external evaluations on school improvement in many different countries and contexts. She was part of the OECD expert team reviewing the Evaluation and Assessment in Education in Luxembourg; she studied the effects of different types of accountability measures (e.g. quality reviews) in New York City as part of a visiting scholarship at Columbia University. She has worked as a visiting scholar at Harvard University (sponsored by the Spencer foundation) and also coordinates a 3-year EU-project on the impact of school inspections on school improvement in eight European countries.

Sarah Howie PhD is the Director of the Centre for Evaluation and Assessment and Full Professor in the Department of Science, Mathematics and Technology Education at the University of Pretoria. She has been working in the field of evaluation and assessment in education for nearly 20 years, during this time she has published widely internationally and has worked across Africa, Asia and Europe, conducting research and development projects and activities related to educational research in evaluation and assessment. She serves as a national research coordinator for a number of international comparative studies of student achievement including TIMSS 1995 and 1999, PIRLS 2006 and 2011. She also serves as a member of the International Association for the Evaluation of Educational Achievement's questionnaire development group for PIRLS 2011 and a member of the Progress in International Student Assessment's (PISA 2015) extended expert group.

Sonia Ben Jaafar PhD is the director of EduEval Educational Services, a professional services company in the United Arab Emirates serving the Middle East, North Africa and Asia to promote sustainable successful student learning. She integrates applied research and evaluation for educational improvement and effectiveness at all levels in the system. Sonia's international work in the private, public and NGO sectors focus on using evidence-informed decision-making from the classroom to the boardroom. Her clients include Promethean, The Nielsen Company, the Knowledge and Human Development Authority in Dubai and the Aga Khan Foundation. Sonia holds a PhD in Education Administration and an MA in Curriculum, Teaching and Learning from the University of Toronto. She also holds a BEd specialized in Science Education and a BSc in Biochemistry from the University of British Columbia.

Steven Katz PhD is a director with the research and evaluation firm Aporia Consulting Ltd and a permanent faculty member in Human Development and Applied Psychology at the Ontario Institute for Studies in Education of the University of Toronto, where he is the coordinator of the Psychology of Learning and Development teacher education program component. Dr. Katz has a doctorate in human development and applied psychology, with a specialization in applied cognitive science. His areas of expertise include cognition and learning, teacher education, networked learning communities and the design of data-driven systems for organizational accountability, planning and improvement. He has received the Governor General's medal for excellence in his field, and has been involved in research and evaluation, professional development and consulting with a host of educational organizations around the world.

Anthony Kelly PhD is a Professor of Education at the University of Southampton, researching in the areas of policy and improvement/effectiveness theory, innovative practice in educational management, governance and policy analysis, adapting capability and game theoretic concepts to education and developing innovative quantitative approaches. His most recent books are on the use of game theory in decision-making (Cambridge University Press), conceptualising a theory of intellectual capital for use in schools (Kluwer) and adapting Sen's capability theory to school choice (Palgrave Macmillan).

Karen Seashore Louis PhD is a Regents Professor and the Robert H. Beck Chair at the University of Minnesota. She has also served as the Director of the Center for Applied Research and Educational Improvement at the University of Minnesota, Department Chair and Associate Dean of the College of Education and Human Development. Her research focuses on school improvement and reform, leadership in school settings, and the politics of knowledge use in education. Recent books include *Organizing for School Change* (2006), *Aligning Student Support with Achievement Goals: The Secondary School Principal's Guide* (with Molly Gordon 2006), *Professional Learning Communities: Divergence, Depth and Dilemmas* (with Louise Stoll 2007), *Building strong school cultures: A guide to leading change* (with Sharon Kruse 2009), *Linking Leadership to Student Learning* (with Kenneth Leithwood, in press) and *Educational Policy: Political Culture and Its Effects* (in preparation). She is a Fellow of the American Educational Research Association, where she also served as the President of Division A (Educational Administration). In 2007, she received the lifetime Contributions to Staff Development award from the National Staff Development Association, and was the recipient of the Campbell Lifetime Achievement Award from the University Council for Educational Administration in 2009.

Stuart McNaughton PhD, ONZM is Professor of Education and Director of the Woolf Fisher Research Centre at The University of Auckland. His research interests are in literacy and language development, the design of effective educational programmes for culturally and linguistically diverse populations and cultural processes in development. His publications incorporate research on children's development through family and school literacy practices, interventions in early childhood and

schools' settings and research and development models in large scale interventions with schools. He has chaired national groups providing advice to the New Zealand Government on literacy goals and has contributed to the development of national educational assessments and resources. He consults on the design of curricula and educational interventions nationally and internationally.

Vanessa Scherman PhD joined the University of Pretoria in 2002 and is currently working in the Department of Educational Psychology as well as the Centre for Evaluation and Assessment. She has been involved in a number of projects within the Centre, such as Secondary Education in Africa funded by the World Bank, investigating inequalities in three primary schools funded by UNICEF and conducting secondary analysis of the Trends in Mathematics and Science Study (TIMSS) 1999 and 2003 data. She coordinates the South Africa Netherlands Research Programme on Alternatives in Development funded value-added assessment programme, and is involved in international projects such as the Second Information Technology in Education Study as well as the Progress in International Reading Literacy Study (PIRLS). She has published in National and International journals in the areas of school effectiveness and psychometrics.

Daniel Spikes is a fourth-year doctoral student in the Educational Policy and Planning Program in the Department of Educational Administration at The University of Texas at Austin. Prior to pursuing his doctoral degree, he was a seventh-grade Language Arts teacher and a high school assistant principal. Since entering the program, he has served as a graduate research assistant and now works full time for Pre-College Academic Readiness Programs in the Division of Diversity and Community Engagement at The University of Texas at Austin.

Prof. Dr. Martin Valcke is head of the Department of Educational Studies at Ghent University, Belgium. His research field is the innovation of higher education and performance indicator studies.

Jan Vanhoof PhD is partly as an assistant professor and partly as a post-doctoral researcher on the staff of the Institute of Education and Information of the University of Antwerp. His current research activities focus on school policy and quality care, in general, and on school self-evaluation and data use in schools, in particular.

Prof. Dr. Peter Van Petegem is full professor at the Institute of Education and Information Sciences of the University of Antwerp, Belgium. His research interests are education and school policies and environmental education.

Goedele Verhaeghe PhD has completed her PhD at the Department of Educational Studies at the Ghent University (Belgium). Her dissertation research concerns design and implementation issues of School Performance Feedback Systems.

Michael R. Volonnino is a doctoral candidate at The University of Texas at Austin in Education Policy and Planning. His current research focuses on human capital policies to develop and support teachers, the use of technology in K-12 education,

and higher education productivity. To his research projects, he brings his experience as a former public high school teacher in New Jersey.

Jeffrey C. Wayman PhD is an assistant professor at The University of Texas at Austin. His teaching and research interests focus on the effective use of data for school improvement. Dr. Wayman's research on data-based decision-making includes efficient structures for creating data-informed school districts, software that delivers student data to educators, effective leadership for data use, and systemic supports that enable widespread teacher use of student data. Dr. Wayman's current research project is a 3-year study funded by The Spencer Foundation titled 'The Data-Informed District: Implementation and Effects of a District-Wide Data Initiative'. In this project, Dr. Wayman and his research team are working with three districts to help them become 'Data-Informed Districts'.

In 2008, Dr. Wayman received the Jack A. Culbertson award from the University Council for Educational Administration. This award is given to a junior professor for significant contributions to the field of educational administration. Prior to joining the UT faculty, Dr. Wayman worked at Johns Hopkins University with the Center for Social Organization of Schools, at Colorado State University in the area of prevention research, and as a junior high math teacher in Kansas City and Salt Lake City.

About the Editors

Lorna Earl PhD is a Director, Aporia Consulting Ltd and the current President of the International Congress of School Effectiveness and School Improvement. She recently retired from a position as Associate Professor in the Theory and Policy Studies Department and as Head of the International Centre for Educational Change at the Ontario Institute for Studies in Education/UT, and is currently a part-time Professor at The University of Auckland. Lorna has worked for over 30 years in schools, school boards, ministries of education and universities. As a leader in the field of assessment and evaluation, she has been involved in consultation, research, evaluation and staff development with teachers' organizations, ministries of education, school boards and charitable foundations in Canada, England, Australia, New Zealand, Europe and the United States. She is a prolific author and has written books, chapters and articles about assessment, using data for decision-making, evaluation methods, knowledge mobilization, educational change and networking for school improvement. Throughout her career, she has concentrated her efforts on issues related to evaluation of large-scale reform and assessment (large-scale and classroom) in many venues around the world.

Mei Kuin Lai PhD is Associate Director of the Woolf Fisher Research Centre (The University of Auckland), a research centre recognised as one of New Zealand's most successful in improving educational results for children from diverse communities. Mei's research over the last decade has focused on using data as part of research and development interventions to improve teaching and school practices and raise student achievement. Mei has extensive experience as a leader of research and development projects. Most recently, she co-led a national evaluation into schools' capability to evaluate their own functioning. She has also led or co-led several large-scale projects on improving and sustaining student's literacy achievement across a variety of contexts, from high poverty multi-cultural schools to rural primary and high schools. Over the last decade, she has worked with schools, boards of trustees, Ministry of Education, and teacher's organizations to support them use data. She has also been a consultant for the New Zealand Ministry of Education, most recently, consulting on the implementation of the New Zealand National Standards in Reading, Writing and Mathematics. Her co-authored book 'Practitioner Research For Educators' was

nominated for the prestigious 'American Association of Colleges for Teacher Education' Outstanding Book Award for books that make a significant contribution to the knowledge base of teacher education or of teaching and learning with implications for teacher education. The book was also a bestseller (Top 10 in 2006).

Kim Schildkamp PhD is an associate professor at the Faculty of Behavioural Sciences at the University of Twente. In 2007, she obtained her PhD on school self-evaluation. She is the recipient of several awards, including an American Educational Research Association (AERA) award and a Fulbright scholarship. She used the latter to conduct a study into 'The utilization and impact of a school performance feedback system used in Louisiana', at the Louisiana State University, in cooperation with the Louisiana Department of Education (LDE). Kim's research, in the Netherlands but also in other countries, focuses on 'data-based decision making for teacher, curriculum and school development'. For example, she participates in the EU Comenius project 'Using data for improving school and student performance', a collaborative project between The Netherlands, Poland, Lithuania, Germany and the UK. She has been invited as a guest lecturer and keynote speaker at several conferences and universities, including AERA, the University of Pretoria in South Africa and The University of Auckland in New Zealand. She is a board member of the International Congress for School Effectiveness and Improvement (ICSEI) and founder and chair of the ICSEI data-use network. She published several articles on the use of data, such as the use of school self-evaluation results, the use of performance feedback and the use of data in data teams.

Chapter 1
Introduction

Kim Schildkamp and Mei Kuin Lai

1.1 Introduction

Everyday, teachers and school leaders make decisions that impact student learning.

- What should I do with Jessica who is continually behind everyone else in Maths?
- Should I purchase this expensive resource, which is supposed to help increase test scores?
- What professional learning do my teachers need to implement the new curriculum?
- What policy changes are required to support school improvement?

How are these decisions made? Decisions are often not based on data (e.g., data-based decision making). By data-based decision making, we mean that schools make decisions about students, about instruction, and about school and system functioning based on a broad range of evidence, such as scores on students' assessments and observations of classroom teaching. Some school leaders are disarmingly candid about how decisions in their schools are made:

> I think a lot of schools make huge decisions about class sizes, about reading programs, about everything, based on somebody's view in the "top corridor" ... there are reasons for that, it's not all cynicism. It's just the way schools run really. Managers are put in place to make decisions, and often they have to make them quickly.

In our experience and through our research (Earl and Katz 2006; Robinson and Lai 2006; Schildkamp and Teddlie 2008; Schildkamp and Visscher 2010; Schildkamp and Kuiper 2010), we found this view to be prevalent in many schools. Teachers and school leaders have multiple decisions to make and very little time in which to make

K. Schildkamp (✉)
Faculty of Behavioural Sciences, University of Twente,
Enschede, The Netherlands
e-mail: k.schildkamp@utwente.nl

M. K. Lai
Woolf Fisher Research Centre, University of Auckland, Auckland, New Zealand
e-mail: mei.lai@auckland.ac.nz

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_1, © Springer Science+Business Media Dordrecht 2013

them. Sometimes they do not have the necessary data readily available for them to make an informed decision, and sometimes they do not have the skills to interpret the data that they do have. Other times they think that they do not need data to make these decisions. As some teachers said, "We don't need data, years of experience are enough," and "If you have a good functioning curriculum, you do not need data" (Schildkamp and Kuiper 2010).

This reality seems contrary to the increasing international emphasis on teachers and school leaders making educational decisions based on data. In recent years, schools have been held more and more accountable for the education they provide and schools and policymakers are often required to provide evidence for the effectiveness of educational programs. Some policy makers even argue that the only way to increase student achievement levels is for school staff to base their decisions on data (such as assessment results and student data; Honig and Coburn 2008).

Data can help remove politics and ideology from decisions, and help focus on teaching and learning (Honig and Coburn 2008). But what counts as "data"? What counts as having "used data" for decision making? Why should teachers and schools use data? Are the recent accountability pressures a good enough reason for placing so much emphasis on using data? Many governments and schools have committed significant resources to developing and maintaining systems to collect data, and to professional development to analyze and use data. But are such commitments warranted? Are the benefits to student outcomes from using data possible in schools when there is no intense professional development? What are the conditions for optimal data use? These are all issues we will try to address in this book.

In this volume, we bring together scholars from several countries to examine data-based decision making in schools. Over the past years, these scholars have been conducting research into the use of data by school leaders and teachers. Our research suggests that when school leaders and teachers base their decisions on data, this can lead to powerful learning and sustainable improvement. Although we believe that a significant purpose in using data is to improve student learning and this is the focus of the book, we also acknowledge the importance of other aspects of student learning that schools provide, such as learning social rules and conventions through interactions with other students.

1.2 How Will This Book Help You?

Our intention in writing this book is to support policymakers, consultants, researchers, and other educators working with or in schools in the use of data, by bringing together the research conducted on data use across multiple countries into a single volume so that it will be easier for practitioners, researchers, and policymakers to access the latest research information, and compare and contrast the ways that data are being used in a wide range of contexts. Some of these studies are "best practice" studies, where effective data use has led to improvements in student learning. Others provide insight into challenges in both policy and practice environments. Each study has been carefully chosen to represent an important aspect of data use and/or

to highlight how particular country policies influence the use of data. Each draws on research and literature in the field.

In the chapters, the authors use research they have been involved in to provide practical and theoretical examples of what using data "looks like" when school leaders and teachers include data into their decision-making process. They identify factors that promote and hinder the use of data, including the characteristics of the data itself (e.g., perceived relevance of the data), personal characteristics of the users (e.g., attitude towards data), and school organizational characteristics (e.g., school leader support for data use).

What is unique about this book is that the examples of how data are used are based on seven different countries around the world. There are no international comparisons that we know of focussing on how teachers and school leaders use data. Yet, there is much to be learned by comparing data use in different countries. Different countries have different educational systems and policies that can influence how data are collected and used, including what types of data are available to schools, and what types of support are available to support schools' use of data.

For example, in the Netherlands, most primary schools use a pupil monitoring system developed by Cito (the Dutch Testing and Measurement Institute). Cito developed a pupil monitoring system called LVS (in Dutch: Leerling Volg Systeem), to monitor pupils' achievement in primary schools (age 4–12) over time. The LVS includes three interrelated portfolios for most subject areas and focuses on basic skills. Students are tested twice a year: in January and at the end of each school year, in June. The test results can be represented in one measure, and therefore progress of an individual pupil can be followed systematically during his or her primary school career—see www.citogroep.nl.

In Ontario, Canada, the schools can also choose a student data management system from an approved list but the Ministry of Education has set the parameters for what the vendors must provide in their system, and to remain a vendor they must all be able to upload data in a common format to a provincial data system. Provincial testing data make up one module in the student data system that can be linked with additional data.

By comparing the two countries, we learn that policy decisions and technology tools influence what data are accessed and used (Chen et al. 2005), provide important contextual information on what school leaders and teachers can do (or not do) in particular countries, and provides evidence that there needs to be coherent national (or province-wide) systems to ensure the availability of technology tools that provide teachers and school leaders with timely access to the data they need to make decisions. Comparisons across countries will also help teachers and school leaders reflect more critically on what is happening in their own schools in their own countries. Oftentimes, seeing data use from a different perspective helps to identify local strengths and weaknesses.

This book is ambitiously targeted at a large audience: school practitioners, people working with schools, students at university, researchers, and policymakers. Thus, it may appear that some chapters are more relevant to some audiences than others. For example, in some chapters, the use of data in schools is presented in the foreground,

while the policies of the country are in the background; but in other chapters, the authors have deliberately positioned the policies in the foreground to highlight the aspects of policy which support and hinder data use. Thus, some chapters may appear to be more relevant to policymakers than those working with schools. However, all the chapters are worth reading by all audiences, as there is something to learn from each chapter. For example, although Chaps. 8 and 9 are more about policy, practitioners need to think about how policy affects what they are doing in their schools, and in turn, how they might be able to influence policy. Researchers are also affected by policy and might want to consider how policy influences the type of research they are conducting (e.g., what questions are they investigating and through which lens they are looking at their results).

This book focuses on the strengths and weaknesses of various forms of data, the use and misuse of data in practice, and the responsibility of policymakers and educators to gather and use data wisely. We do not focus on the politicized discourse that is actually going to be encountered by policymakers and practitioners using data. While we acknowledge that the politics around using data will no doubt influence their use, we feel that focusing on politics will detract from our original intentions for writing the book. We would also like to stress that although comparing data use in different contexts can be very enlightening, this does not mean that what works in one country will also work in other countries. For example, the use of data in South Africa is so contextually shaped that there are limitations to how much we can apply what we have learned from this setting in another setting. It is, for example, not likely that the top-down approach of data use, which seems to work very well in some South African schools, will work in Dutch or New Zealand schools. In fact, we suggest that what works in one country be adapted (using data) to the context of another country, and that the book generates dialogue about how data use is shaped by a country's context.

1.3 Organization of Chapters

The book is divided in three parts. The first part, Chap. 2, provides an overview of the key concepts in data-based decision making as there are many different ideas of what it means to use data for decision making. This chapter outlines our definitions of data and data use; the importance of data use (e.g., why should schools use data); the process of data use and the different ways (desirable and less desirable) of using data.

Part 2 of the book (Chaps. 3–9) examines data use in seven different countries. Policy background information is provided in each of the chapters, and the chapters address different aspects of data use (e.g., how data are being used in schools, what enables or hinders data use, and effects of data use). Each chapter ends with reflection questions for practitioners, policymakers, and researchers, to help reflect on what they have just read, and as a starting point for discussion. These reflection questions are designed to help readers make the links between the data use in different countries and their own context. These questions can also be used for discussion starters with university classes, and as part of professional development for teachers.

Section 2 of this book starts with the most important reason for schools to use data, namely, to improve student learning and achievement. The New Zealand chapter (Chap. 3) describes how data discussions in professional learning communities played an important part of research and development interventions in schools, which significantly improved student achievement over 3 years. These achievement gains were sustained after the interventions. A central feature of data use was understanding classroom instruction in relation to student achievement patterns. The importance of interdependence between schools and external experts, greater pedagogical content knowledge to link classroom instruction to achievement results, and the creation and use of school artifacts (e.g., data analysis reports) to facilitate effective data use are discussed.

The next chapter describes two examples of data use in the Netherlands (Chap. 4): how data are being used (or rather are not used) and how data should be used. This chapter talks about the benefits of using data in data teams. A data team is a team consisting of teachers, and, for example, data experts and school leaders, often facilitated by a researcher, who work together to solve a certain educational problem, following a structured approach: defining the problem, coming up with hypotheses concerning what causes the problem, collecting data to test the hypotheses, analyzing and interpreting data, drawing conclusions, and implementing measures to improve education. Data teams can try to solve different kinds of problems, for example, classroom-level problems such as low mathematic achievement and school-level problems such as a high percentage of grade repeaters.

From the Netherlands, we cross the ocean to England. This chapter (Chap. 5) presents findings from a nationwide survey of English secondary school teachers on their use of, and attitudes toward, student and school-level attainment and progress data. The use of data in English schools is discussed, as well as the attitude teachers have toward the use of data. This chapter also stresses the importance of data use training to improve the understanding of data. The amount of training is positively related to the amount of data use in schools.

At the other side of the world, in an entirely different context, we discover how schools in South Africa are trying to use data to improve education. Chapter 6 describes the attempts of schools to use data from the South African Monitoring system for Primary schools. This chapter talks about distinct approaches to data use that appeared to be appropriate for their specific contexts: from teams collaboratively using data to a very top-down approach to data use (e.g., school leaders tell teachers what to do based on data). Although, from research, we know that a top-down approach often fails (Fullan 2001), in some contexts a top-down approach may be most suitable. This chapter, for example, describes a school, where the school leader was the only one in the school who actually had the knowledge and skills to use data (teachers in this school were still working on their teaching skills). In this school, the school leader needed to tell the teachers what to do based on data, and in this specific (school) culture this worked.

From South Africa, we go back to Europe, to Belgium. The Flanders chapter (Chap. 7) focuses on how primary school principals perceived the different types of support they received to use data about their pupils' performance that they received

as part of a large scale School Feedback Project. Different types of supports were provided to increase the data literacy capacities for the participating schools and their principals: a help desk (for all the schools), external training by researchers, internal training by researchers, internal training by a pedagogical advisor, and peer consultation. Overall, this study showed that initiatives aimed at developing data use competencies and having access to support can make a contribution toward improving data literacy competencies. The authors notice that different types of support show different results. For example, training by researchers led to an increase in knowledge and skills with regard to data analyses and interpretation but training by pedagogical advisors helped schools to actually use the data in their own context.

The final two chapters of this book focus on how policy can influence data use in schools. The US chapter (Chap. 8) talks about the influence of the No Child Left Behind Act (NCLB) on data use in schools. This policy mandated improved student achievement for all, in part, through a more widespread and sophisticated use of student data. The law placed strong incentives for districts to parse individual and collective student performance and use it to improve instruction. Despite the law's intention and expectation, districts were still struggling with transforming its data-based promises into reality. This struggle derived largely from the fact that, although NCLB set high expectations regarding data use, it offered the districts a little guidance as to how they should actually use data. Furthermore, other than the test scores, disaggregated by race, socioeconomic status, and limited English proficiency, the policy was very vague about what data are to be used to improve instruction. This chapter illustrates that accountability and pressure may be important to encourage schools to use data, but that pressure should be combined with support to build data use capacity.

That there should be a balance between pressure and support is also illustrated in the Canadian chapter (Chap. 9). In Canada, policymakers also put pressure on schools to use data, but here pressure is combined with support. The Canadian chapter describes how the province of Ontario structured a large scale initiative to ensure that all schools in the province had access to high-quality data and to develop a culture of inquiry, in which there was widespread capacity to work with data and where using data became a routine part of the operation of the educational system at all levels. This initiative—the Managing Information for Student Achievement/Professional Network Centers (MISA/PNC)—was created to support development in school districts to establish data systems and build capacity for using data. The chapter traces the influence of this policy initiative from ministry policy through its implementation at one regional MISA/PNC and into one of the school districts in the PNC to exemplify its influence at the district and school level.

Finally, Part 3 of the book summarizes the findings and discusses the question "Where to from here?" In Chap. 10, Kim Schildkamp and Mei Lai summarize the main results and conclusion of each country and present a data use framework, which includes data use, the enablers and barriers to data use, and the effects data use can have. The final Chap. 11 written by Karen Seashore Louis and Lorna Earl asks the important question "Where to from here?" This chapter will discuss the directions forward for researchers, policymakers, and schools, in particular how different educators can support school leaders and teachers in the use of data.

References

Chen, E., Heritage, M., & Lee, J. (2005). Identifying and monitoring students' learning needs with technology. *Journal of Education for Students Placed at Risk*, *10*(3), 309–332.

Earl, L. M., & Katz, S. (2006). *Leading schools in a data-rich world. Harnessing data for school improvement.* California: Thousand Oaks Corwin.

Fullan, M. (2001). *The new meaning of educational change*. London: Routledge Falmer.

Honig, M. I., & Coburn, C. (2008). Evidence-based decision making in school district central offices: toward a policy and research agenda. *Educational Policy, 22*(4), 578–608.

Robinson, V. M. J, & Lai, M. K. (2006). *Practitioner research for educators: a guide to improving classrooms and schools*. California: Thousand Oaks Corwin.

Schildkamp, K., & Kuiper, W. (2010). Data-informed curriculum reform: which data, what purposes, and promoting and hindering factors. *Teaching and Teacher Education, 26,* 482–496.

Schildkamp, K., & Teddlie, C. (2008). School performance feedback systems in the USA and in the Netherlands: a comparison. *Educational Research and Evaluation, 14*(3), 255–282.

Schildkamp, K. & Visscher, A. J. (2010). The utilization of a school self-evaluation instrument. *Educational Studies, 36*(4), 371–389.

Chapter 2
Data-based Decision Making: An Overview

Mei Kuin Lai and Kim Schildkamp

2.1 Introduction

School leaders and teachers are increasingly required to use data as the basis for their decisions. This requirement is part of a growing international focus on holding schools more and more accountable for the education they provide, and on promising evidence that data-based decision-making can result in improvements in student achievement (Carlson et al. 2011).

But what does "using data" mean? What counts as "data"? Perhaps more fundamentally, are current accountability pressures good enough reasons for emphasizing the use of data? In this chapter, we address what we mean by the word "data" and what kinds of data are available and needed. The latter should overlap, but sometimes the available data are not needed, and sometimes needed data are not available. In this chapter, we also discuss why teachers and school leaders should use data. Our position is that schools should use data, not just because accountability policies pressurize them into doing so, but because evidence shows that data use can improve student learning and achievement (Campbell and Levin 2009; Carlson et al. 2011; Cawelti and Protheroe 2001; Lai et al. 2009a). Finally, we describe the process of using data and the different ways data can and should be used.

2.2 Broadening Our Understanding of Data

Collecting and/or using data has become a pervasive part of society: commercial organizations collect data on people's habits, such as phoning habits, the cars they drive, and the food they eat; teachers collect data on student learning; policy-makers

M. K. Lai (✉)
Woolf Fisher Research Centre, The University of Auckland, Auckland, New Zealand
e-mail: mei.lai@auckland.ac.nz

K. Schildkamp
Faculty of Behavioural Sciences, University of Twente, Enschede, The Netherlands
e-mail: k.schildkamp@utwente.nl

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_2, © Springer Science+Business Media Dordrecht 2013

collect data on schools and student achievement across the district, state, or country; and educational researchers collect data on aspects of schooling they are interested in understanding. It is very likely that when you ask all these people what data are, they will give you different definitions. Commercial organizations might, for example, talk about the percentage of people that are likely to buy a new car or phone. Teachers might talk about what individuals in their classroom are learning or the latest results on assessments. Researchers often talk about data in terms of the qualitative (e.g., interviews, observations) and/or quantitative (e.g., survey results or student achievement results) data that they collect to answer their research questions. Policy-makers talk about district, state, or national assessment data they use to evaluate the performance of schools in their jurisdiction. There are many different definitions of data, so it is essential to come to a common understanding about the meaning of "data" in the context of schools.

Our definition of "data" in the context of schools is *information that is collected and organized to represent some aspect of schools.* This could include information such as how students perform on a test, observations of classroom teaching, or surveys of whether parents want a new school uniform. Our definition of data is deliberately broad to include any relevant information about students, parents, schools, and teachers derived from qualitative and quantitative methods of analysis. A simple thumb rule is that quantitative analysis methods produce data in numeric form such as statistics and graphs of student achievement results and the results of a student survey, while qualitative analysis methods produce data in textual forms such as interview transcripts, observation notes, and student essays (Robinson and Lai 2006).

Our definition of data challenges some existing conceptions about what counts as "data" in schools. Our experience and our reading of the literature indicate that in some schools, particularly where there is high-stakes testing, "data" becomes narrowly defined as test data, particularly data from standardized assessments or national tests that are quantifiable (i.e., only data that can be counted counts!) (Hamilton et al. 2009). This view is reinforced by some policy-makers and researchers who focus on aggregated standardized test results as the primary source of data about schools (particularly when there are national standards), and disregard other forms of data such as the quality of instruction in classrooms, other valued student outcomes, or school characteristics. This view has led to negative uses and understandings about data such as by focusing solely on assessments, teaching to the test, and narrowing of the curriculum to only those aspects that are assessed on the test (e.g., Booher-Jennings 2005). Moreover, only focusing on test data ignores valuable data that are crucial to improve student learning and achievement. For example, test data can help teachers and school leaders identify how well their students are achieving, but will not provide sufficient information for them to know what teaching and management practices to change to improve student achievement. Teachers and school leaders will need additional information to make those changes, such as information about their teaching, the school curriculum, and/or leadership practices. Thus, our position is that it is crucial for schools to collect and analyze data on student learning and achievement, but such data cannot and should not be the only definition of data in a school.

Our definition of data also challenges those who view test data with suspicion, and who prefer to only use their own anecdotal observations of students and/or their intuition and experience for decision-making. In our experience and in our reading of the literature, we have seen negative effects for students when data from standardized and national assessments are viewed with suspicion and not used, or used in narrow ways by schools. In these instances, teachers ignore a valuable source of information about students (e.g., how students are performing against national expectations and national curriculum levels). For example, Timperley and Phillips (2003) found that when teachers relied on their own assessments of students' knowledge (rather than use nationally normed standardized tests), they underestimated what students could do and as such, were targeting their instruction at lower levels than what students were capable of achieving.

What we are advocating is a definition of data that encompasses the multiple sources of data that teachers and school leaders need for wise decision-making. These multiple sources include *context* data such as policy and resources; *input* data such as the demographics of the student population; *process* data such as data on the quality of instruction; and *outcome* data such as student test scores and student well-being (Stufflebeam 1983; Ikemoto and Marsh 2007). A useful overview of data using Ikemoto and Marsh's (2007) categories can be found below (some sources of data might fit more than one category as data on the process might also form the context of the school):

- Input data
  - Data on student characteristic such as data on truancy, intake, transfer and school leavers, home language, ethnicity, and socioeconomic status.
  - Data on teacher characteristics, such as data on teacher qualifications and length of teaching.
- Outcome data
  - Data on student achievement such as assessment results, written and oral exams, portfolios, and report cards.
  - Data on student well-being such as well-being surveys.
- Process data
  - Data on instruction and types of assessment such as observations and documents on instruction and learning strategies, instruction time, organization of instruction, classroom management, and organization of assessment.
- Context data
  - Data on school culture such as survey or focus group results on the opinions of students and teachers on the school's atmosphere, climate, and discipline.
  - Data on the curriculum such as subject descriptions, rosters, year guides, and special programs.
  - Data on building and materials such as data on how many times certain rooms and equipment are used and the availability of computers.

What we are also advocating is for teachers and school leaders to use these multiple sources for decision-making, much like a doctor uses multiple sources of data to come to an accurate diagnosis of a patient. For example, a teacher who wants to make effective instructional changes to her reading program to better cater for the boys in her class could use the following data:

- Data on student characteristics such as absenteeism rates for boys (input data).
- Analysis of student performance on reading tests (outcome data).
- Discussions with the boys about their strengths and weaknesses in reading and their love of reading (process data).
- Examination of the school curriculum such as whether the reading texts are engaging for boys (context data).

A Principal who wants to find out whether parents understand the new school report cards could use the following data:

- Data on parent characteristics such as home language (input data).
- Analysis of parent understanding of the reports through discussions and surveys with parents (outcome data).
- Examination of the report cards to see if there are features of the report that aid or hinder parent understanding, for example, whether the comments written in the report card use educational jargon that would be difficult for parents to understand (context data).

The previous examples show two other important aspects of using multiple sources of data. Firstly, it is often useful to use more than one source of data for each category. For example, researchers are generally in agreement about the importance of basing judgments of student achievement (outcome data) on more than a single test (Kean 1996; Rothman 2010). Secondly, it may not be necessary to use all four types of data for every decision, as only data relevant to the decision should be considered. In Sect. 2.4, we will expand on how to select what sources of data to use.

2.3 Why Data?

In the preface of the book, we argued that one important purpose of using data is to improve student learning and achievement, and that this is the emphasis of the book. Our position is that teachers and school leaders are, together with students, responsible for student learning and that both teachers and school leaders need to use data in order to learn how best to improve student learning. We have not come to this point of view without considerable evidence to support our position. Instead, we have been convinced by research and our own experiences. There is a growing body of evidence that effective teaching and school leadership, by nature, is based on high-quality data and that using data results in improving student learning and achievement.

2.3.1 The Nature of Effective Teaching and School Leadership

Perhaps the most compelling argument for using data lies in the nature of effective teaching and school leadership. We argue that both should be reflective and based on high-quality data, rather than on untested assumptions about what teachers and school leaders need to learn to support students' learning and achievement (Robinson and Lai 2006). Consider the following scenario:

> Merryvale School has recently implemented an antibullying program to eliminate bullying in classrooms. After a rocky start, teachers are finally noticing a drop in bullying, and everyone is pleased at how well the program is working. One day, during recess, Estelle, a new teacher in the school, notices a couple of boys taunting a girl and reducing her to tears. This incident leads Estelle to wonder whether bullying has really decreased. Perhaps bullying has merely shifted from the classrooms to the playground? She raises her concerns with the Deputy Principal in charge of the antibullying program and suggests that he might want to adapt the program to target bullying incidences during recess as well. How should the Deputy Principal respond to Estelle's ideas?

It would be easy for the Deputy Principal to dismiss Estelle's idea. After all, she is new to the school and does not fully understand how the program works. But what are Estelle's views based on? Is the one-off incident sufficient grounds for adapting an existing program which many believe to be effective? What are the Deputy Principal's views based on? Is he ignoring a potentially important source of information about the school's program? Both the Deputy Principal and Estelle might be genuinely convinced about how the program can be most effective for students, but is it good enough for them to base important decisions that affect student well-being on untested convictions?

We argue in this book that good teaching and good decisions need to be based on data that is carefully considered and provides a basis for thoughtful and defensible decisions. In this case, what data does the school have on incidences of bullying during recess? (e.g., how much bullying occurs? Who is bullying whom—is there a pattern? Where does this bullying happen?). Are there sufficient data to back up Estelle's claim? If Estelle and the Deputy Principal gather data on incidences of bullying during recess, they can reflect on their assumptions about when and how much bullying occurs. Consequently, they are more likely to come up with a deeper understanding of whether bullying is a problem during recess, and if so, are more likely to be able to devise a solution that will benefit student well-being.

While many school leaders and teachers agree that it is important for school leaders to use data, some believe that a teacher can be effective without having to use data. As one of the teachers from our studies stated: "*Data use is a task for school leaders, and not teachers. My job is to teach and to take care of the children in my classroom.*" We have previously argued that good teaching is reflective and based on high-quality data (Robinson and Lai 2006). By this definition (and using our broader definitions about what constitutes data), many effective teachers gather and use data without realizing it. Consider the following scenario:

Jared, a high school Science teacher, is dissatisfied with his lesson on viruses. Prior to the lesson, he asked the class to write what they know about viruses to find out their prior knowledge about the subject. This exercise made him realize that students have very little prior knowledge and many misconceptions. So it is important for him to teach this lesson well if students are to understand what viruses are and how they spread. To check his own teaching, Jared decides to record his observations about the lesson in his teaching journal using a set structure. His journal entry shows that students did not appear interested in the lesson—some students were texting under the table, and many were shifting around in their seats. Jared reviews the reading material on viruses that his department uses, and realizes that the way the material is presented is not very interesting. Perhaps this has contributed to the lack of student interest in the lesson? From his journal notes, he also realizes that not once did he check whether students had understood what he was trying to teach. It is therefore unclear what students now know about viruses.

Jared decides to change his teaching approach and to bring in supplementary materials to engage students. He decides to revisit the lesson on viruses and make it more interesting by looking for short movie clips on the internet. He also decides to implement a version of the "traffic light" formative feedback technique (Black 2004) where students indicate at key points during the lesson whether he needs to stop and explain the material again (red light), slow down and check with particular students (orange light), or keep going (green light). Finally, he decides to check their knowledge by asking them to write down what they now know about viruses.

Jared implements the lesson as planned. Students loved the clip he found on the internet—he notices that no one is texting and students are asking questions about viruses. The traffic light method has led him to stop his lesson twice to explain the material again, and his last check of student knowledge (writing down what they now know) has shown that almost all students have grasped the key ideas.

Jared may not label what he is doing as "data-based," but he is, in fact, basing important instructional and curriculum changes on data. His reflections used data (observations of students, formative assessment in the classroom) to reflect on his instruction and the curriculum, and as a result has made changes, which have supported student learning.

2.3.2 Evidence of Improvements in Student Learning and Achievement

There is growing evidence that using data can lead to improvements in important school and classroom goals, in particular student learning and achievement. In the past, many studies on teachers' and school leaders' use of data have been small-scale studies or opinion pieces and did not link achievement outcomes to the use of data. However, recent research shows promising evidence of improvements in student outcomes based on larger-scale projects (e.g., national projects) using more rigorous research designs (e.g., randomized experimental and quasi-experimental designs), albeit most studies were in the context of research interventions and other forms of professional learning (Campbell and Levin 2009; Carlson et al. 2011; Cawelti and Protheroe 2001; Lai et al. 2009a; Timperley and Parr 2009). Carlson et al. (2011), for

example, analyzed mathematics and reading achievement outcomes from over 500 schools in 59 school districts using a rigorous randomized experimental design, and found that the district data-driven reform initiative resulted in statistically significant district-wide improvements in mathematics and positive effects for reading, albeit below the conventional levels of statistical significance. Similarly, a synthesis of the literature on professional learning that makes a difference to student achievement found that schools that used data to inquire into the effectiveness of their teaching and school practices made significant improvements in achievement (Timperley et al. 2007). There is also promising evidence that the improvements in achievement made through intensive interventions can be sustained by using data (Lai et al. 2009b).

Using data to improve student learning has also been implicated in large-scale reforms. A recent report identified and studied school systems internationally that have achieved significant, sustained, and widespread gains in student outcomes on international and national assessments from 1980 onwards (Mourshed et al. 2010). The Ontario province in Canada, where the use of data for decision-making was central to the reform (Campbell and Levin 2009), was identified as a system that has seen 5 years or more of consistent rises in student performance spanning multiple data points and subjects. Therefore, if school leaders and teachers are serious about improving the learning and achievement of their students, then using data can be an effective way of reaching that goal.

But why should using data lead to improved outcomes for students? A key reason is because by using data, school leaders and teachers can set appropriate student learning goals; can monitor and check to see if students are reaching their goals; and can support students in developing the ability to monitor and check their own goal attainment (Herman and Winter 2011; Earl and Katz 2006; Love 2008; Bernhardt 2003). If students are not reaching their goals, teachers can then make decisions, for example, with regard to what school organizational, curricular, and /or instructional changes are needed. In short, data become part of a cycle of reflective inquiry where teachers and school leaders continually monitor the impact of their practices on student learning, and adjust these practices when shown (by data) to be less effective than desired (Timperley et al. 2007). This means that data enable teachers and school leaders to tailor their teaching, school practices, and curriculum to address student learning needs. For example, in an intervention to raise the achievement of indigenous and ethnic minorities, researchers analyzed data on classroom instruction and student learning, and found that teaching, in general, was adequate (Lai et al. 2009a). However, small adjustments needed to be made to some aspects of teaching practice. These adjustments were associated with improvements in achievement of 1 year in addition to expected progress for cohorts followed longitudinally over 3 years.

2.4 The Process of Using Data

Data are rarely used in the form in which they are presented (Cousins and Leithwood 1993) as data on their own provide no judgment or interpretation and no basis for action. Merely having data on how well students perform on a test, for example,

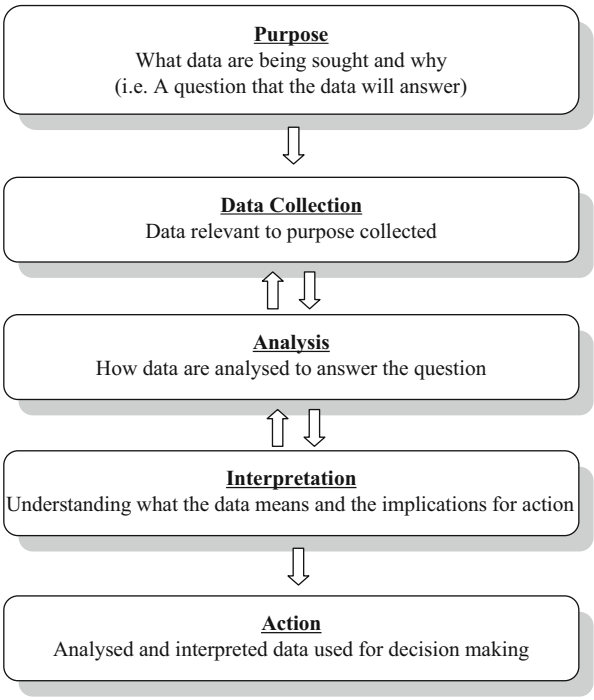

Fig. 2.1 Process of data use

will not tell us whether that performance is "good" or "bad" (i.e., data provide no judgment), the reason for the performance (i.e., data provide no interpretation) nor what to do next to support the students (i.e., data provide no basis for action). Data need to be collected, transformed via analysis and interpretation in order for it to be meaningful and relevant to those using them (e.g., taking action based on data).

There are many studies that list the steps to collecting and transforming data. These steps are very similar, albeit they called different names such as the goal-focused implementation process (Carlson et al. 2011; planning an assessment cycle (Lai 2002); models for data use (Earl and Katz 2006); the data team procedure (Schildkamp and Handelzalts 2011); and the datawise improvement process (Boudett et al. 2007). We have summarized the key steps for transforming the data for decision-making in Fig. 2.1.

The process of transforming the data begins with a clear *purpose* of what data are being sought and why. Usually, this is because the person wanting the data has a question that the data will help answer. For example, a teacher might want to know how well her students are reading compared to the national curriculum expectations. Without a clear purpose, it is easy to collect a lot of data that are not useful for decision-making. In fact, in many schools, there are a lot of assessment data collected that are rarely used for decision-making even though a lot of time is spent collecting and analyzing the data (Robinson et al. 2002). This is a waste of time and resources and can lead to "information overload." It would have been better to have collected less data, but use them more.

Once there is a clear purpose, it is easier to know what data should be *collected* from the range of possible data sources. For example, a teacher wanting to know how her students are performing in relation to the national curriculum would focus her data collection only on assessments that tell her how her students are performing against the curriculum.

Next, *analyzing* the data consists of contextualizing, categorizing, calculating, connecting, and/or summarizing the data in a way that meets the purpose (Davenport and Prusak 1998). For example, the teacher wanting to know how well her students are reading could run some simple statistics on the data from her class reading test to see how well her students are performing in relation to curriculum expectations. She could also categorize the descriptions of students' strengths and weaknesses in reading that she noticed in her class (e.g., categorizing the strengths as fluent and accurate decoding and the weaknesses as insufficient knowledge of technical words such as "magma" or "microorganism").

The next step is to *interpret* the data. By interpret, we mean the sense-making process of trying to understand what the data mean and their implications for future action. For example, the data might indicate that students seem to perform poorly on the reading test in relation to curriculum expectations, and that vocabulary is a particular weakness. However, the teachers' observations of students reading in class might suggest that they actually have a wide and appropriate vocabulary. So in the interpretation step of the process, the teacher has to understand the differences between the two pieces of data before she knows what to do with the information. It may be, for example, that the students have sufficient vocabulary to read fiction, but lack knowledge of the technical words to understand the nonfiction text in the test, which requires a reasonable number of technical words (e.g., text on photosynthesis). Sometimes, the process of interpreting the data might mean that more data have to be collected and analyzed. For example, the teacher might realize that she does not know enough about students' knowledge and understanding of technical words and that she might need to collect and analyze additional data to help her interpret the information coming from the tests and her observations from the class.

It is only once the "message" from the data is clear, that we can take appropriate *action* based on data. For example, knowing that students do not have sufficient technical words might mean that the teacher introduces these words in a meaningful way through her existing classroom lessons. Teachers' knowledge, skills, and experiences are also important here. Data can tell a teacher that students do not have sufficient technical words, but the teacher needs to decide how to address this learning need in the classroom, what kind of instruction to apply, what kind of materials to use, what knowledge the teacher needs to have, and so on.

The process of using data applies generically to anyone wanting to use data such as school leaders, researchers, students and policy-makers, and to all kind of problems where data are needed to make a good decision. Previously, we have used an example of how a teacher engages in the process of using data to illustrate the process. When a school leader uses data, they are likely to be more interested in such things as the effectiveness of programs (e.g., an antibullying program) or in how groups of students are performing. To evaluate the effectiveness of an antibullying program,

the purpose for collecting data is to examine the success of the antibullying program (Purpose). The ambitious school target is to eliminate bullying entirely. The school leader collects data on the incidences of bullying in his school, analyzes these data, and discovers that some students are still being bullied (Analysis). He then works with his teachers to find out why some students are still being bullied by talking to these students. He realizes that students are being bullied during recess and not during class time (Interpretation), which results in the school's antibullying program focusing more strongly on what happens during recess (Action).

2.5 How Data Can be Used

Not all ways of using data are desirable and it is important for us to be explicit about what we consider to be desirable (conceptual and instrumental data use; Schildkamp and Visscher 2010) and less desirable (misuse and abuse; Ehren and Swanborn 2012). This is particularly important in the context of schools where there is high-stakes testing, as strong external accountability demands have been shown to result in data use that has improved test scores, but not student learning, such as by teaching to the test or by narrowing the curriculum to only teach what is on the test (Hamilton et al. 2009).

An undesirable type of data use is *misuse* of data. This occurs when educators analyze and interpret data incorrectly and, as a result, focus on improving the wrong things (Ehren and Swanborn 2012). For example, Buly and Valencia (2002) found that when an intervention was based on inaccurate assumptions of what students needed to learn, the intervention did not address the students' learning needs, and did not improve students' reading achievement as intended. Data can also be misused when it is used to "teach to the test." By this we mean that teachers narrow their curriculum to only what is assessed and might even teach test items so that students can pass these items. For example, knowing what vocabulary is being assessed in the coming vocabulary test, the teacher might teach only the vocabulary items that are being assessed to ensure that all students achieve in that vocabulary test. This approach is different from the strategy of using data to diagnose student learning needs in that teaching is focused only on passing the test with little focus on actual learning.

Educators can also *abuse* data (Booher-Jennings 2005). In this study, some teachers tried to improve test scores by using a collection of "educational triage " practices. These practices involved teachers dividing their students into three groups: safe cases, suitable cases for treatment, and hopeless cases. They focused their teaching solely on bubble kids (those on the threshold of passing the test), targeted resources to the "accountables " (those included in the school's accountability rating), and decreased the size of the group that would count in the accountable rating by referring more students for special education (e.g., referring the lowest scoring students to special education so that their scores are not counted and the achievement results go up). Another form of abusing data is cheating on the tests such as changing students' answers.

What we are specifically looking for in schools is the more desirable types of data use, such as conceptual and instrumental data use, which can actually lead to long-term and "genuine" improvements in student learning. The type of data use that we mostly look for in schools and that we advocate is the *instrumental* use of data. Instrumental use of data involves analyzing and interpreting and data as well taking actions to improve based on the analysis and interpretation (Weiss 1998; Rossi et al. 1999). For example, teachers might use data to identify students' strengths and weaknesses in writing, to identify aspects of their programs that have contributed to the pattern of strengths and weaknesses, and to design a writing program to capitalize on students' strengths and address their weaknesses.

However, instrumental data use is often difficult to achieve and might take some time. Usually, *conceptual* use of data happens first. The conceptual use of data refers to a more indirect type of data use where data are analyzed and interpreted, but do not directly lead to action. Rather, the data influence the teachers' and/or school leaders' ideas about their functioning and the functioning of the school. This may, in the long run, influence their actions in important ways (Weiss 1998). For example, before examining the data, teachers might believe that the low rates of high school graduations were because students were influenced by their friends to drop out. However, after examining the student survey data, they realize that their original assumptions were incorrect—the majority of students want to stay in school and their peers encourage them to do so. While teachers have yet to take any action to address the rates of high school graduation, their ideas about students have changed and this change in thinking is more likely to lead them to take action at a later stage.

2.6 Reflection Questions

Researchers and Policy-Makers

1. The chapter presents a broad definition of what counts as data. What is the current definition of data in your research and policy context, and should this definition be modified?
2. Are there research emphases and policies that are unintentionally causing teachers and school leaders to use data in undesirable ways? If so, what can you do to support schools use data in desirable ways?
3. The chapter presents research where use of data has improved student learning and achievement. How might you evaluate the impact of using data on student learning and achievement in your context?

Practitioners

1. What is your (or your school's) definition of "data"? Has your definition changed after reading this chapter, and if so, how has it changed?

2. In this chapter, we described the process of using data (purpose, collection, analysis, interpretation, and action). Are there steps in the process that are missing when you analyze data? (e.g., jump from analysis to action without interpreting the data). How might you ensure that the missing steps are undertaken?
3. In this chapter, we describe desirable and undesirable types of data use: misuse, abuse, conceptual use, and instrumental use. Which type(s) of data use are present in your school? How can data be used in desirable ways in your context?

References

Bernhardt, V. (2003). Using data to improve student achievement. *Educational Leadership, 60*(5), 26–30.

Black, P. (2004). The nature and value of formative assessment for learning. Kings College. http://access.kcl.clientarea.net/content/1/c4/73/57/formative.pdf. Accessed 2 Aug 2012.

Booher-Jennings, J. (2005). Below the bubble: "Educational triage" and the Texas accountability system. *American Educational Research Journal, 42*(2), 231–268.

Boudett, K. P., City, E. A. & Murnane, R. J. (2007). *Data wise. A step-by-step guide to using assessment results to improve teaching and learning*. Cambridge: Harvard Education.

Buly, M. R., & Valencia, S. W. (2002). Below the bar: Profiles of students who fail state reading assessments. *Education and Evaluation and Policy Analysis, 24*(3), 219–239.

Campbell, C., & Levin, B. (2009). Using data to support educational improvement. *Educational Assessment, Evaluation and Accountability, 21*(1), 47–65.

Carlson, D., Borman, G., & Robinson, M. (2011). A multistate district-level cluster randomized trial of the impact of data-driven reform on reading and mathematics achievement. *Educational Evaluation and Policy Analysis, 33*(3), 378–398.

Cawelti, G., & Protheroe, N. (2001). *High student achievement: How six school districts changed into high-performance systems*. Arlington: Educational Research Service.

Cousins, B. J., & Leithwood, K. A. (1993). Enhancing knowledge utilization as a strategy for school improvement. *Knowledge: Creation, Diffusion, Utilization, 14*(3), 305–333.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge. How organizations manage what they know*. Boston: Harvard Business School.

Earl, L., & Katz, S. (2006). *Leading in a data rich world*. California: Thousand Oaks Corwin.

Ehren, M. C. M., & Swanborn, M. L. (2012). *Strategic data use in accountability systems.* School Effectiveness and School Improvement, *23*(2), 257–280.

Hamilton, L. S., Stecher, B. M., & Yuan, K. (2009). *Standards-based reform in the United States: History, research, and future directions*. Santa Monica: RAND Corporation. Retrieved from http://www.rand.org/pubs/reprints/RP1384.

Herman, J., & Winter, L. (2011). *The turn around toolkit: Managing rapid, sustainable school improvement*. California: Thousand Oakes Corwin.

Ikemoto, G. S., & Marsh, J. A. (2007). Cutting through the data-driven mantra: Different conceptions of data-driven decision making. In P. A. Moss (Ed.), *Evidence and decision making*. USA: Wiley-Blackwell.

Kean, M. (1996). Multiple measures: The common-sense approach to education assessment. *School Administrator, 53*(11), 14–16.

Lai, M. K. (2002). *Planning an assessment cycle. Training module for the Mangere AUSAD schooling improvement initiaitve.* Auckland: Mangere AUSAD Schooling Improvement Initiative.

Lai, M. K., McNaughton, S., Amituanai-Toloa, M., Turner, R., & Hsiao, S. (2009a). Sustained acceleration of achievement in reading comprehension: The New Zealand experience. *Reading Research Quarterly, 44*(1), 30–56.

Lai, M. K., McNaughton, S., Timperley, H., & Hsiao, S. (2009b). Sustaining continued acceleration in reading comprehension achievement following an intervention. *Educational Assessment, Evaluation and Accountability, 21*(1), 81–100.

Love, N. (2008). Using data to improve learning for all: *A collaborative inquiry approach*. California:Thousand Oakes Corwin.

Mourshed, M., Chijioke, C., & Barber, M. (2010). *How the world's most improved school systems keep getting better*. London: McKinsey & Company.

Robinson, V. M. J., & Lai, M. K. (2006). *Practitioner research for educators: A guide to improving classrooms and schools*. California: Thousand Oaks Corwin.

Robinson, V. M. J., Phillips, G., & Timperley, H. (2002). Using achievement data for school-based curriculum review: A bridge too far? *Leadership and Policy in Schools, 1*(1), 3–29.

Rossi, P. H., Freeman, H. E., & Lipsey, M. W. (1999). *Evaluation: A systematic approach*. California: Thousand Oaks Sage.

Rothman, R. (2010). Principles for a comprehensive assessment system. Policy brief alliance for excellent education. http://www.all4ed.org/publication_material/Accountability. Accessed 10 Feb 2011.

Schildkamp, K., & Handelzalts, A. (2011, April). *Data teams for school improvement*. Paper presented at the American Educational Research Association Conference, New Orleans, USA.

Schildkamp, K., & Visscher, A. J. (2010). The utilization of a school self-evaluation instrument. *Educational Studies, 36*(4), 371–389.

Stufflebeam, D. L. (1983). The CIPP model for program evaluation. In F. G. Madaus, M. Scriven, D. L. Stufflebeam (Eds.), *Evaluation models: Viewpoints on educational and human services evaluation*. Boston and Hingham: Kluwer-Nijhoff.

Timperley, H., & Phillips, G. (2003). Changing and sustaining teachers' expectations through professional development in literacy. *Journal of Teaching and Teacher Education, 19,* 627–641.

Timperley, H., & Parr, J. (2009). Chain of influence from policy to practice in the New Zealand literacy strategy. *Research Papers in Education: Policy and Practice, 24*(2), 135–154.

Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). *Best evidence synthesis iterations (BES) on professional learning and development*. Wellington: Ministry of Education.

Weiss, C. H. (1998). Have we learned anything new about the use of evaluation? *American Journal of Evaluation, 19*(1), 21–33.

Chapter 3
Analysis and Discussion of Classroom and Achievement Data to Raise Student Achievement

Mei Kuin Lai and Stuart McNaughton

> It was a typical data discussion session at Rosebank[1] Primary School. Joseph, the Principal, handed each teacher a set of graphs showing their school and classroom achievement in reading comprehension. Teachers could tell straight away how well their students were performing in relation to national expectations and how their students were performing on different comprehension tasks. Jared, one of the teachers in the school, looked at the graphs for a few minutes and then said what the other teachers were thinking, "I'm not sure how this will help me teach more effectively. It's clear that students are weak in reading comprehension. But I already teach comprehension every day, that's our school's policy. What specifically do I need to do differently to help my students?" Another teacher, Lee Anne, added, "In my classroom programme, I try to anticipate what words students do not understand and directly teach those words. Yet my students still do poorly in the vocabulary tests. I'm not sure what else to do".

Jared's and Lee Anne's questions are what many teachers in New Zealand feel is lacking from discussions about achievement data—there is often no direct and specific connection between what they do in the classroom and the data on how their students are achieving. Yet teachers want to know, "What do I personally need to do differently to change the achievement patterns in my class? What aspect of my instruction is working effectively or not working effectively?" Answering these questions requires knowing specifically what students need to learn (as opposed to knowing generically what students need to learn), and knowing exactly what teachers need to do differently. This level of precision is not self-evident in achievement data analyses, which are often in the form of graphs, figures or tables (with commentary) aggregated across the school or district. An expert teacher might be able to infer from the achievement data what he or she needs to do more effectively in the classroom, but a less expert teacher might struggle. As one teacher in a project in which we were involved said, *"If you don't know how to improve your teaching, then inquiring ten*

[1] A fictional school.

M. K. Lai (✉) · S. McNaughton
Woolf Fisher Research Centre, Faculty of Education, The University of Auckland,
Auckland, New Zealand
e-mail: mei.lai@auckland.ac.nz

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_3,

more times is not going to help you come up with a more effective teaching practice" (Lai and McNaughton 2010).

In this chapter, we describe the processes for analysing and using data that were an important part of research and development interventions in three clusters of schools ($n = 48$ schools), focusing on a central feature of data use, understanding classroom instruction in relation to student achievement patterns. These interventions significantly improved student achievement over 3 years, and these achievement gains were sustained after the interventions (Lai et al. 2009a, b; McNaughton and Lai 2010). The importance of inter-dependence between schools and external experts, greater pedagogical content knowledge to link classroom instruction to achievement results and the creation and use of school artefacts (e.g., data analysis reports) to facilitate effective data use are discussed.

3.1 Introduction: Context Description

In New Zealand, there are no layers of local or state government administration between central government (Ministry of Education) and schools. Schools since 1989 are governed by Boards of Trustees appointed by the school's parent community and carry the full legal responsibilities for governance including compliance with the law, the employment of the principal and staff, and curriculum delivery. The shift to self-governing schools from the previous system of ten regional education boards was based on the belief that parents, communities and schools are better able to tailor education to local needs and priorities (Fancy 2007). Responsibility for a national curriculum and industrial relations, however, is still located with the central government.

There is a national assessment system at secondary schools (years 9–13), the National Certificate of Educational Achievement. It is a modular system that has different units of learning that are assessed against standards defined by the government in consultation with representatives of the education sector (Fancy 2007). Detailed data on achievement in each unit of learning are available to individual students and schools via a secured web site, while the general public has access to aggregated information on learning in different units on a public web site. Reports can be generated for individual schools, groups of schools and nationally. Also, assessments at one school or group of schools can be compared against another school or group of schools, and relative performances of groups of students compared with different demographic characteristics, e.g., boys and girls; comparing data across years (longitudinal analyses). More information is available at http://www.nzqa.govt.nz/.

By contrast, there is no national assessment in primary and intermediate schools (years 1–8). Rather, schools can choose from a range of nationally available standardised and non-standardised assessments and/or can design their own assessment to assess their students' achievement. Each school (as determined by the Boards of Trustees) can assess and report on their achievement data to suit the local school's needs, insofar it meets the national guidelines set by central government (e.g., a

priority focus on literacy and numeracy). While schools tend to use similar standardised tests particularly in literacy and numeracy, the range of assessments means diverse data available to schools depending on what assessment is used, and also diverse means for analysing the data. For example, if schools choose the asTTle assessment, the assessment package is able to provide, for example, analyses of achievement relative to national norms, curriculum levels and schools that have similar socio-economic status; relative performances of groups of students compared with different demographic characteristics, e.g., boys and girls; and summaries of students' profiles of learning. (More information on asTTle is available at http://e-asttle.tki.org.nz/.)

If schools choose the Supplementary Tests of Achievement in Reading (STAR) (Elley 2001), they can compare the results to national norms (but not curriculum levels), and comparisons cannot be made to schools with similar socio-economic status. Moreover, the results have to be manually entered into another computer package for analysis. But once the STAR data are entered, relative performances of groups of students compared with different demographic characteristics, e.g., boys and girls; and summaries of students' profiles of learning can be analysed. However, not all the analyses that primary and intermediate schools would like to use to inform their practices (e.g., longitudinal analyses) are easily available on computer information management packages that schools currently use. In 2010, the newly elected government introduced national standards in reading, writing and mathematics, which standardised how schools report and assess their students in these three curriculum areas. Schools can still choose from a range of assessments, but they will need to use the assessments and other information to designate students to particular standards.

Quality assurance of schools is through the Education Review Office (ERO). ERO visits schools in three-yearly cycles (or longer if the school receives a positive ERO report). The central review question for ERO is "How effectively does this school's curriculum promote student learning—engagement, progress and achievement?" (ERO 2009). To answer this central question, ERO gathers data from the school (e.g., school documents) to evaluate how well the school uses self-review to improve teaching and learning; how well teaching is managed; the use made of assessment tools and data to improve students' achievement; and how the school complies with the law. ERO uses the data gathered as evidence for its evaluation, discusses the evidence for their evaluation with schools and provides recommendations for improvement. Reports on schools are available publically on the ERO web site.

The self-governing schools' model and the focus on using evidence for self-review by ERO creates a nation-wide expectation that schools regularly use some form of data to inform their teaching and management practices. (By use, we mean the broad range of uses such as creating groups within class, reviewing individual progress, identifying areas of need and targeting resources, developing professional development and the like.) Indeed, there have been positive changes in how schools analyse, use and discuss data to inform teaching practices. In the late 1990s, research on schools involved in Ministry of Education projects indicate that there were a sizeable proportion of schools that did not analyse and use achievement data to

improve their practices, but recent research indicated that most schools now regularly use data to inform their practices (Lai and McNaughton 2010). The current model of using data that is promoted by central government suggests that data be used for reflecting on teaching practices, management and leadership practices as part of a cycle of inquiry (Timperley and Parr 2010). Using a broad range of data is recommended, including data from assessments, observation of students in class, homework and 'student voice' (e.g., student questionnaires).

3.2 Why Decision-Making Using Data Requires Linking Achievement Patterns to Classroom Practices

In recent years, there has been an increased emphasis on using data for decision-making based in part on evidence from best practice local and international studies, which implicate the use of data in improved student achievement outcomes (Campbell and Levin 2009; Cawelti and Protheroe 2001; Timperley and Parr 2010). The central premise is that if teachers examine student achievement information to diagnose student needs, they will be able to use that information to develop more effective teaching practices. However, the literature indicates that focusing primarily on achievement information, such as on national standards or high-stakes assessment, has failed to improve students' literacy achievement (and by implication, failed to improve teachers' practices), at least in the United States (Fuller et al. 2007). We argue that this is, in part, because using achievement information to improve teaching practices requires systematically collecting data on both teachers' practices and students' learning needs, and linking the data on what students know to the data on teaching practices to target instruction to specific student needs.

Analysing achievement data in isolation of classroom practices is problematic because meanings and implications from any data source are not self-evident and there are multiple interpretations and/or inferences that can be made (Coburn et al. 2009). Therefore, it is not always evident what teaching practices to change given the student achievement patterns. Let us consider, for example, the domain of reading comprehension. If a student obtains a poor score in a reading comprehension test, there could be a variety of reasons for the poor performance on the test. According to Block and Pressley (2002), to comprehend written text, a reader needs to be able to decode accurately and fluently and to have a wide and appropriate vocabulary, appropriate and expanding topic and world knowledge, active comprehension strategies and active monitoring and fix-up strategies. In addition, the poor score could be due to student self-efficacy and more general motivation and engagement (Wang and Guthrie 2004). It could be one or several of these issues that is the cause of the poor score, and teachers need to know how to put together a teaching programme that can address these issues.

It is also possible to make inaccurate assumptions about teaching or learning needs from achievement data alone. Buly and Valencia (2002) provided a good example from a policy perspective on the importance of basing any intervention on

specific profiles of teaching and learning needs, rather than on assumptions about what children need (and what instruction should look like). In that study, a policy mandating phonics instruction for all students in the state of Washington who fell below literacy proficiency levels was shown to have missed the needs of the majority of students, whose decoding was strong but who struggled with comprehension or language requirements for the tests.

Similarly, it is problematic to use data collected about classroom practice (e.g., observations of a reading lesson, surveys of teaching practice) to change teaching practices without examining achievement data. Given the myriad of teaching activities undertaken by a teacher, it would be difficult to know which activities should be addressed without knowing the students' learning needs. It is also easy to draw inaccurate assumptions from observations or surveys of teaching practice, particularly when the observer or person analysing the survey has an ideological preference for certain teaching practices over others. For example, in the field of reading comprehension there are a range of teaching frames and instructional moves that teachers might use. Wilkinson and Son (2010) recently reviewed what they call four waves of research on teaching strategies in reading comprehension. There has been a tendency in at least the first three to either assume or to find in classroom practice that ongoing and direct explicit instruction in single or multiple reading comprehension strategies is necessary. Yet what students need to learn is near automatic flexibility and adaptiveness in the use of reading strategies (i.e., having the flexibility to use different reading strategies appropriately based on what is being read, and being able to do so automatically). Without examining student data, it would be unclear what strategies students might need to learn. It might also be unclear whether students have focused on the mechanical use of strategies to the detriment of flexibility (Lai et al. 2009a; Wilkinson and Son 2010). For example, students have only one way of finding the meaning of an unfamiliar word (check the dictionary) and they consistently use that method regardless of whether it helps them read (they do not understand the meaning in the dictionary, but do not know how to use other methods for finding the meaning of the word such as inferring the meaning from the context of the paragraph).

For all these reasons, we argue that connecting achievement patterns to teaching patterns is essential if teachers are to draw the appropriate inferences from the achievement information to develop more effective teaching practices.

Connecting achievement to teaching practices is not straightforward; it requires identifying salient combinations of instructional practices from a range of possible practices. As such, this process can be conceptualised as the solving of 'ill-structured' problems (Robinson 1993). Problems are viewed here as gaps between existing and desired states of affairs (Robinson 1993). A problem is described as ill-structured when there are no obvious criteria for how to solve the problem, no definable procedures for reaching a solution and uncertainty about the information required to solve the problem. Most educational problems, such as the vast majority of real-world problems, are of the ill-structured variety (Frederiksen 1984). One of these intractable and ill-structured historical problems is the under-achievement of indigenous and ethnic minorities. In these instances, while there have been some recent successes (Borman 2005), there is still much we do not know about the teaching

practices associated with achievement patterns. Moreover, as described previously, there are multiple competing instructional and non-instructional explanations for the achievement patterns with no one-size-fits-all solution about how to solve the achievement gap.

So, solving the ill-structured problem of linking teaching practices to student achievement is an iterative process of repeated cycles of developing, testing and revising hypotheses about what combinations of instructional events best address students' learning needs (Robinson 1993). This requires openness in rethinking and revising initial hypotheses of teaching practices, where ambiguity is tolerated and judgment reserved until there is more evidence to gain clarity about the hypotheses (Earl and Timperley 2008). Revising initial hypotheses involves gathering and analysing data to confirm/disconfirm emerging hypotheses, which can be undertaken collectively by groups of teachers, researchers and/or other educators.

In this chapter, we will illustrate how to analyse classroom and achievement data as part of literacy research and development interventions in New Zealand which significantly improved reading achievement. Of course, the improved student outcomes cannot be attributed solely to the process of linking achievement data with classroom observations, but the process was integral to the overall intervention and therefore contributed significantly to the improved achievement results.

3.3 The Overall Intervention Model in Three Clusters

The process of linking teaching practices to student achievement data was an integral part of a literacy research and development intervention tested and replicated with three clusters of schools in New Zealand. The intervention, the Learning Schools Model, was designed to improve reading comprehension in year levels 4–9 (9–13 years old students). In a given year, a total of 48 schools, approximately 240 teachers and approximately 5,000 students participated. Two of the clusters served similar urban communities of primarily indigenous (Māori) and ethnic minority students from Pacific nations (Samoan, Cook Island and Tongan) whose achievement levels were lower than national averages. The third cluster comprised rural and small town communities of primarily New Zealand European students whose achievement levels were at or higher than national averages. The participants were teachers and school leaders in the schools, researchers and Ministry of Education representatives.

The literacy intervention was undertaken in three phases. All phases involved analysing, discussing and using data to uncover and address teaching and learning needs; however, this was the emphasis in phase I. The second phase added targeted workshops on fine-tuning teaching practices to the ongoing analysis of teaching and learning needs, and the third phase focused on how to sustain the intervention through professional learning communities and the integration of the intervention into school's normal routines (see Lai et al. 2009a for details of the intervention).

Data on reading comprehension were collected using two commonly used national assessments, the revised Progressive Achievement Tests (PAT) in Reading (reading

comprehension section only; Reid and Elley 1991) and the Supplementary Tests of Achievement in Reading (STAR; Elley 2001). Achievement in both tests was measured in stanines, which are normalised test scores converted into a 9-point scale based on national norms. The average stanine is 5, with stanines 1–3 being below average, 4–6 being the average band and 7–9 being the above average band. More details of the observation are provided later on in this paper but in general in each cluster there was an initial set of observations early in the first year, followed by two more at the beginning and end of the second year.

In each cluster, we examined achievement 1 year after the end of the intervention. In two clusters, we conducted further detailed analyses of how schools analysed and used data 2 years after the intervention, including examining a sample of school-led discussions about data. As the purpose of this chapter is to show how to analyse achievement data in relation to classroom observations, we have not elaborated on the statistical modelling used to examine the impact of the interventions on student achievement. These have been described elsewhere (Lai et al. 2009a, b).

3.4 Gains in Achievement

The achievement data indicated that interventions in each cluster improved student achievement beyond expected progress (gains of up to 1 year beyond expected progress over a 3-year period) with cumulative gains every year (Lai et al. 2009a; McNaughton, Lai and Hsiao, 2012). Using hierarchical linear modelling (HLM) with repeated measures, as implemented by the MIXED procedure in SAS®[2], we found the rate of gain per year to be 0.43 stanine (estimated range of gain between 0.34 and 0.52 stanine) with the drop in achievement over summer of −0.22 stanine (estimated range of drop between 0.11 and 0.32 stanine; McNaughton et al. 2012). This means that on average the students gained about 4 months more than the expected progress for the year but lost about 2 months worth of their gains over the summer holidays. The gains in achievement, when measured using the statistical test of effect sizes, were comparable or higher than those reported internationally (Lai et al. 2009a, Borman 2005). Borman (2005) found, for example, that national reforms of schools to boost the achievement of children in low-performing schools serving the poorest communities have produced small gains in the short term, with effect sizes in the order of less than 0.20. For those few schools that sustained reforms over a longer period of around 7 years, the effects increased (estimated effect sizes in the order of about 0.50). Estimated effect sizes in our interventions were closer to 0.60 for short-term interventions focused on indigenous and ethnic minority students.

One year after the interventions, gains in achievement were sustained, in that students continued to make yearly gains that were comparable to those made

[2] In our publications, we use several statistical models of varying complexities depending on the manuscript focus. The models used here takes into account growth over the summer holidays as well as during the academic years (see Lai et al. 2009a, for a description of the statistical model).

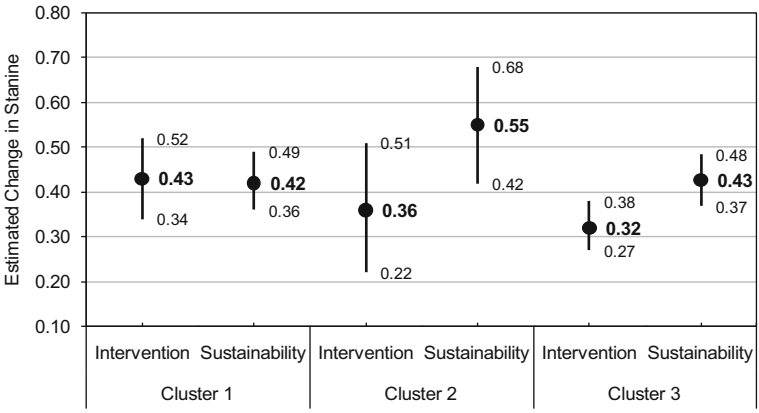

Fig. 3.1 Comparison of achievement per year during the intervention (intervention) and after the intervention (sustainability) using hierarchical linear modelling

during the interventions. Figure 3.1 shows the yearly gain in achievement during the interventions compared to 1 year after the interventions using HLM with repeated measures, as implemented by the MIXED procedure in SAS®. The figure shows that cluster 1 made about 4 months worth of progress in addition to expected yearly progress during and after the intervention; cluster 2 made about 3 months worth of progress in addition to expected yearly progress during the intervention and about 5 months worth of progress after the intervention; and cluster 3 made about 3 months worth of progress in addition to expected yearly progress during the intervention and about 4 months worth of progress after the intervention. This means that clusters were able to continue improving the achievement of new cohorts of students that had not experienced the intervention as well as the achievement of students that had experienced the intervention.

3.5 Analysis and Discussion of Data

The process of analysing and using data followed a similar structured pattern in all clusters. Firstly, achievement data from the two standardised assessments used in the intervention and other school assessments were collected, analysed and collectively discussed; then observation data on teaching practices were collected, analysed and discussed collectively and finally observation data were discussed along with the achievement patterns discussed in previous sessions. In each phase of the intervention, data were discussed by researchers and school leaders twice a year. The beginning of year session examined data collected at the start of the school year and the achievement pattern over the summer holidays; the end of year session examined the achievement gains from the beginning to the end of year and in some cases, patterns of achievement over several years. In the first year, an additional data

session was held for the teachers in every school to discuss data alongside the researchers. Additional meetings with the researchers to discuss data based on cluster needs were also held. Schools conducted their own data analysis sessions in small groups as part of their normal school routine.

We now describe the data use process in detail.

3.5.1 General Process of Analysing and Discussing Achievement Data

The process of analysing and discussing data were the same in each cluster. Cluster-wide data were collated from the schools using the reading comprehension tests PAT and STAR. Data were analysed firstly against the national norms to examine what the local student achievement patterns looked like in relation to national expectations in the form of national norms. Two main comparisons were made—firstly, the average school scores were compared to the national average and secondly, the distribution of achievement was compared to the national distribution (i.e., bar graphs of students in each stanine band compared to the nationally expected percentage in each stanine band). The latter was important because the goal is not just for particular groups that have been under-achieving to come to function at average bands. Rather, in the ideal case, the distribution of students needs to approximate an expected distribution—in the case of New Zealand students, the New Zealand national distribution (Lai et al. 2009a). Further analyses were done to investigate groups of students below, at or above expected national norms or curriculum levels (e.g., by gender), to identify the amount of variance from the national expectations and any patterns in the data (e.g., large numbers below expectations, outliers, wide/small spread). Similar analyses were conducted to examine gains in achievement over the year, by comparing the gain the schools made against expected gain; by examining the change in distribution of scores over the year and by examining the gains made by different subgroups.

The second step in analysing achievement data was to conduct a diagnosis of the achievement patterns to find areas of strengths and weaknesses in students' reading. This varied according to the type of assessment used. In the PAT, the test showed how students scored on factual and inferential questions, and how students scored on each passage to identify any potentially problematic passages for students and to examine the reasons for that (e.g., students scores on questions where the information was aggregated across multiple passages). In STAR, this involved analysing subtest scores (each subtest measured a different aspect of reading) and qualitatively coding the types of errors students made on the close passage according to the types of errors reported in the STAR manual (Elley 2001). Examples of such analysis are contained in Lai et al. (2009a). Similar analyses were used to examine gains in different aspects of reading over the year, such as by comparing the subtest scores from the beginning of the year to the next to examine the gains in different aspects of students' reading.

The first author developed artefacts to support teachers to analyse and discuss the data in the ways we described. (We used Halverson's (2003) notion of artefacts as

measures to shape organisational practices such as polices, programmes and procedures). This was in the form of the PowerPoints of graphs and tables sometimes with commentary, which served as templates for schools to analyse their own data and as frameworks for leaders to develop their own systems for inquiring into data. A typical PowerPoint at the beginning of a school year would contain the following displayed as graphs or figures:

1. The achievement of students in the school compared to national and cluster averages. This included both comparisons to the national and cluster mean and to the national and cluster distribution of achievement. The latter showed how many students in the school performed in the below average, average and above average bands compared to students in the cluster and students nationally.
2. The relative performances of groups of students compared with different demographic characteristics, typically boys and girls, different year levels, students of different ethnicities and students with different starting achievement levels. Where possible, comparisons were made to similar groups in the cluster or similar groups nationally. These comparisons enabled the school to not only see trends in achievement but also the variability between different groups of students. This would help schools to target their teaching and resources more effectively to meet the needs of different groups. Examining differences between groups is important because it is possible for one group to be significantly below the school average and to require a different type and level of support than the other groups in the school.
3. A diagnostic of students' strengths and weaknesses, including which aspect of reading comprehension students performed better or worse as compared to the national and cluster norms and expectations.
4. The examination of achievement drops over the summer holidays. This is important because research consistently shows a drop over the summer holidays between academic years (Borman 2000), and schools need to be constantly monitoring whether achievement has dropped and perhaps more importantly over time, whether students can compensate for the drop over summer by accelerating their rate of achievement during the academic year.

Data discussions were held with schools around these artefacts to uncover students' achievement in relation to national expectations and to uncover specific learning needs from the achievement data such as vocabulary knowledge.

The first author further modelled how to discuss the data in syndicate[3] or school meetings providing further support for leaders to learn how to lead data discussions. The underlying premise was that data were to be analysed to improve teaching, rather than analysed for other purposes such as to 'blame' the student's family circumstances (i.e., what we call 'Learning talk'), and that the conversations around data needed to be respectful yet challenging using the principles of learning conversations. (For more details and examples of conversations, see Annan et al. 2001; Lai and McNaughton 2008; Robinson and Lai 2006).

[3] Syndicate teams comprise teachers and leaders that teach 2–3 year levels in the school (e.g. teachers of year levels 4–6 in the school).

3.5.2 General Process of Analysing and Discussing Observation Data

In each cluster, there was an initial set of classroom observations early in the first year, followed by two more at the beginning and end of the second year. In the first cluster, we were developing our procedures for observations and in situ running records were used at the beginning of the first year. Thereafter, and in the subsequent two clusters, video records were collected at each time point and subsequently transcribed and analysed by the researchers. In each cluster, around 20 % of the classrooms were observed once at each time point. The typical reading comprehension lesson was recorded for the full duration of the lesson (around 60 minutes).

In each cluster, the initial set of observations were summarised by the research team into a set of hypotheses. The hypotheses were based on the research literature relating to reading comprehension and instruction, for example, vocabulary instruction and strategy (e.g., Block and Pressley 2002) and incorporating students' cultural backgrounds, an important feature of effective teaching with culturally and linguistically diverse students (McNaughton 2002) . A critical feature of the focus in each hypothesis was the assumption that the general instructional approaches such as guided reading and strategy instruction would provide a platform for more effective instruction. What was needed was fine-tuning the areas of teaching indicated by the hypotheses. The common groups of hypotheses across the clusters discussed with teachers were:

1. *Vocabulary instruction:* This is how teachers teach vocabulary, for example, how they identify and elaborate potentially new or unfamiliar vocabulary.
2. *Reading comprehension strategies supported by checking and evaluating threats to meaning:* This is the deliberate reference to teaching of and use of comprehension strategies in classrooms such as the use of some form of Reciprocal Teaching (Palincsar and Brown 1984).
3. *Increased incorporation and awareness:* This is awareness of students' cultural backgrounds and how teachers incorporate their knowledge of children's backgrounds into the classroom teaching. For example, capitalising on students' knowledge and interests by selecting and matching texts to students' background and interests and using culturally based forms of teaching and learning. Complementing this process is instruction that increases students' awareness of the relevance of their skills and knowledge and relationships with the goals and formats of classroom activities.
4. *Increased exposure to texts and planned variation across texts:* This is where teachers increased students' exposure to many types and varieties of texts such as having plenty of reading material in the classroom and having reading material of different genres (e.g., science fiction stories, newspapers, biographies, comics).

There were differences in the observations across clusters. Not surprisingly, given the similarities between the first two clusters (they were in adjacent suburbs and served essentially the same low socio-economic multi-ethnic communities with low

academic achievement), the hypotheses developed from the evidence about more effective instruction were similar. The hypotheses in the third cluster (involving rural and small town schools comprised mostly of New Zealand European and Māori students) was similar in general respects. But the achievement 'problem' was raising levels beyond national average levels to contribute to the regional plan for economic development. The observations in the first year suggested this would require several changes to the existing instruction. One was a focus on extending readers through developing communities of text users in classrooms and by making inter-textual connections with writing (and adding a major writing component to the professional development of writing assessment and writing instruction). Second was greater emphasis on explanation and feedback to provide students with rationales for learning (approaches that were generally more in place in the first two clusters).

Following the first set of observations, the second author developed artefacts for teachers in the form of a written summary and PowerPoint presentations. This was fed back to and systematically discussed and checked with the leaders at a workshop. The school leaders took the report and the resources (PowerPoints) to their staff and these were used as a basis for data discussion meetings in the schools.

As we highlighted earlier in the chapter, the process of analysing and using data is iterative in nature, a process of repeated cycles of developing, testing and revising hypotheses about the most effective teaching practices. Thus, the initial observations in each cluster were refined based on the initial discussion with teachers, and used as the basis for the more formal systematic analyses of the following set of observations. In these observations, the basic unit of analysis was an exchange defined as an utterance followed by a set of interactions on the same topic, involving comments, questions, directions, explanations or feedback between teacher/child, teacher/group, child/child or child/group. A minimal exchange would be one turn by a teacher or student. A change in topic during interactions or a return to text reading or a new activity signalled the end of an exchange. Each exchange was coded by the research team as a specific type of instruction based on the theory and classroom evidence relating to both reading comprehension and instruction, for example, vocabulary instruction and strategy (e.g., Block and Pressley 2002). As such, each type represented an aspect of reading comprehension teaching that could impact on how students learnt to read, and their subsequent reading comprehension test scores. Frequencies of types of exchanges coded from the transcripts were used to plot changes in teaching practice over time. The types were:

1. *Text-related exchanges:* Text-related exchanges were exchanges that referred directly to a text being read. Non-text-related exchanges on the other hand, were exchanges that were not related to the text typically occurring only before or after reading.
2. *Vocabulary instruction:* Exchanges that elaborated vocabulary in the text were coded into three (non-mutually exclusive) types. These were elaborations initiated by questions by either the teacher or a child seeking an elaboration of meaning (T: "Do you know what 'snuggling' means?"); elaboration of vocabulary often in the form of a comment by the teacher (T: (snuggling means) "I would lie close to

you. Okay?"); and elaboration by looking up meanings of word in a dictionary, which occurred so infrequently in the observations it is not reported further here.

3. *Extended talk:* Exchanges that involved conversations sustained over several turns on a topic that allowed the teacher or child to develop further features of place, time, theme, concept were coded as extended talk. Two types of Extended Talk were coded: those exchanges in which the teacher's talk was extended and those in which extended talk by one or more children occurred, again these were not mutually exclusive.
4. *Checking and evaluating:* These were exchanges in which there was some explicit reference to checking and evaluating evidence from texts. The reference could involve questions, directions, prompts, feedback or comments. It could be initiated by the teacher, a child or a group. Two types were noted. "Teacher checking" where the teacher asked students to check the accuracy of their responses by going back to the text to search for confirmations (T: "Where did you get that answer from?" C: "From the heading".); "Child checking" where the child checked the accuracy of his/her response by going back to text to search for confirmation (C: "The paragraph says Te Aho was shivering and he doesn't want to look at the picture because he was too scared").
5. *Incorporation:* These were exchanges in which children's knowledge, skills and other expertise were explicitly connected with the text being read, in the form of questions or comments. It was a deliberate attempt by the teacher to make direct links between the text being read and the experiences of the student through an overt connection with topic events, and concepts that were familiar to the child. Incorporation was also coded when the language of the child was incorporated, either in the form of colloquial speech or, in the case of bilingual students, in their first language.
6. *Awareness:* Awareness exchanges focused on the student's awareness through teacher comments, questions, explanations or feedback, which explicitly drew attention to the relevance of the child's knowledge or reflection on knowledge, to the rules of participating in reading and to the purpose or ways of participating. Two types were coded: one specifically for awareness of strategies such as clarifying, predicting and summarising. The second type of exchange was any comment, question, explanation or feedback requiring reflection on any other aspect of the task or child's expertise other than specified comprehension strategies. For example: T: "First two knowledge questions so that I can know that you have followed what has happened in there. And, then we will jump into our comprehension question. The first knowledge question is, what happened to Nemo once he swam beyond the drop off zone? Think a little bit. I know you saw it only once. But I think you will remember".
7. *High informative feedback:* Exchanges defined as containing feedback were those with teacher responses that were contingent on a student action or verbal contribution. High (informative) feedback was any feedback that clarified, elaborated or added to the student's action or verbal response. It included teacher correction of a student's incorrect answer or teacher response to a student's utterance with a question.

The more formal development and the definitions of these types of exchanges took place over several training sessions and levels of inter-rater reliability calculated (see Lai et al. 2009a for details). The frequency of each type of exchange was coded and, in repeated observations, used to demonstrate changes over time. The research team developed artefacts (PowerPoints and written summaries with example transcripts), which were discussed with teachers. These artefacts were subsequently used by school leaders in data discussions with teachers.

3.5.3 Linking Student Achievement to Classroom Observations

The core step in analysing the achievement and observation data was to examine whether the patterns of student achievement could be explained by patterns of classroom teaching. As noted previously, the observations indicated hypothesised areas of classroom teaching, which could be related to the achievement patterns and in essence the combined hypotheses were then tested over the course of the intervention with the schools. In this chapter, to illustrate the link between achievement data and observations, we focus on vocabulary achievement and link that to three of the types of exchanges in classrooms, Vocabulary Instruction, Checking and Evaluating and Extended Talk.

When we (the researchers) examined the achievement data from the STAR assessment in the first two clusters, we noticed, for example, that on a subtest measuring the breadth of vocabulary, achievement was below nationally expected levels. This subtest indicated that students had difficulty finding synonyms for words in a sentence. Moreover, examinations of other components of the STAR and PAT assessments indicated that vocabulary knowledge, knowledge of the varieties of uses of vocabulary as well as familiarity itself was interfering with high-level comprehension in paragraphs and with the accuracy of answering both recall and inferential questions associated with passages. (Recall questions are those where the answer is stated explicitly in the text, and inferential questions are those where the answer needs to be inferred from the text). To illustrate, in one assessment task where students were to fill in the blank with an appropriate word, students would pick words that were ‘similar’ in meaning to the required word, but were incorrect, for example, stating that the giraffe ate ‘branches’ instead of ‘trees’.

The problems with vocabulary were corroborated by the classroom observations. Several examples occurred in the observations of children where they did not know exactly what the task was that they were required to perform. In one class, a group who was given the task, “Find the word in the story so you can give the appropriate meaning”, was unsure what an “appropriate meaning” was. Similarly, observations of another group working on extracting information on natural and artificial sources of light from a text on ‘Sources of light’, revealed that each student in the group had little or only limited understanding of what ‘source’ meant. In fact, one student thought that the task was about ‘sauces’ like tomato sauce or mayonnaise.

The classroom teaching observations helped clarify the questions we had about vocabulary instruction in the classrooms. Analysis of the observations showed that

on average only six to seven interactions around vocabulary occurred across the classrooms where the meaning of words was specifically identified or elaborated on. This rate and other aspects of the verbatim records suggested two issues. One was that the rate of these interactions occurring for any individual child may have been lower than what was needed. This hypothesis was suggested by a classroom record in which 25 interactions occurred in the course of a 20-minute session, averaging one interaction per student. The focus on any one particular word occurred once and there was little evidence of repeated opportunities to use or elaborate the word. As such, students would not be exposed to the word sufficiently to know how to use it appropriately across different contexts.

The second issue, made very obvious in the observations of strategy teaching, was the limited use of text evidence to detect confusions or threats to meaning, and to check and corroborate meanings; for example, there were few instances where the children were asked to provide evidence for their analyses, comments or elaborations (such as "How did you know?"). The meanings of words were also seldom checked in ways that elaborated specific connotations in context. Rather, many of the instances involved discussing students' ideas about what a word meant, often with the teacher accepting student contributions without critical appraisal.

This limited reference to texts to check understanding was especially noticeable with the use of predicting in the whole class and small group activities in which a text was shared or introduced for some form of guided reading and students were asked to predict aspects of the text such as the meaning of the word. In every such activity, observed ideas were generated with high engagement by students. However, explicit direction to check the evidence to see if what was predicted was supported in the text happened infrequently. There were only nine instances of checking for evidence in 16 hours of observations. Across all classes in all activities, predictions were often prompted and without exception accepted and supported ('Good prediction', 'That was clever', 'Could be'). Most of the dialogue observed was about generating ideas, not checking them, and the teachers' responses were to accept and reinforce predicting. In one classroom, in one observation session, some words (e.g., 'anchor', 'coastal', 'occasionally', 'thermos') took between 13 to 31 turns to get to the meaning acceptable to the teacher. Trying to teach vocabulary this way is problematic because students may still be uncertain what the word actually means after all the incorrect guesses, or worse still, adopt an incorrect meaning provided by one of their friends. Few of the instances involved explicit instruction and modelling of how to check meanings within texts or via a dictionary or a thesaurus.

These issues were fed back to the school leaders and lead teachers (a teacher leading the intervention in the school) in the form of hypotheses about the aspects of classroom practice that could be related to the achievement results. We proposed several ideas to change classroom practice which could improve achievement results (see Lai and McNaughton 2009). Here, we focus on one recommendation, namely that teachers needed to increase the rate of interactions between student and teacher, and reduce extended interactions with students that occurred without checking for evidence in the text. To achieve these twin goals, the researchers proposed extended talk around the use of background knowledge and analysis of text meanings.

Extended talk was defined as an exchange sustained over several turns on a topic developing features such as time, place, themes, concepts. It was not a synonym or brief comment. This was based on the language acquisition research, which has found that more extended talk is associated with higher rates of vocabulary development (Hart and Risley 1995), that teacher elaborations and feedback play an important role in increased word knowledge (e.g., Biemiller 2001).

In the discussions with teachers, we used positive instances and non-instances from transcripts to identify the features of hypothesised effective extended talk discussions. School leaders and teachers discussed the examples with us and each other, and subsequently used this information for further discussions within the school. The following example was used from a classroom with 12 and 13 years olds during a small group guided reading session to illustrate a positive instance where the discussion helped develop understanding both of specific vocabulary as well as the development of a character in the narrative text ('Finding Nemo') which is being analysed.

T: *"...Right now for the business part of the morning. Brain time. What have we learned so far about Dory's character? Now think about it a little bit. Think what you have seen..."*
C: *She's over reacted more than Marlin.*
T: *She over reacted towards Marlin. Why do you think she did that?*
C: *Marlin's scared of sharks but she just thinks it's a party.*
T: *Why do you think she's doing that? That's not even one of our questions* (questions for discussion have been identified on a white board), *but it's come up so we're discussing it. Why do you think she's, is not scared of the shark and she can't understand why Marlin is scared of the shark?* (looks at another child for answer)
C: *Because his baby got eaten by the shark.*
T: *Of course. He's petrified of the shark because can you remember what happened on Monday? What is 'petrified'? What is that word? What does it mean?* (looks at another child to answer)
C: *He was scared.*
T: *Very. Much more than scared. Extremely scared.*
C: (Another child) *Frightened.*
T: *Frightened.*

This is an example of effective extended talk because the teachers introduced a new word 'petrified' in the context of a word that students already know ('scared'), and in context of a story, which means that they are more likely to understand how the word 'petrified' might be used in the story they are currently reading. Furthermore, the teacher does not engage in guessing (i.e., she informs the students that petrified means more than scared), and the discussions elicits another synonym for petrified.

We contrasted this example with a same level class which had a teacher who often engaged in question and answer sequences. These also had sections of extended talk but the strings of guessing and turn taking indicated that the Extended Talk was undermined by the guessing routines and the pace of the lesson was compromised.

The following example from an informational text begins with a child nominated 'unfamiliar' word.

C: *Evaporate*
T: *Okay evaporate. Anyone know what 'evaporate' means? Okay where abouts is it, oh that's in that first sentence of that paragraph isn't it?*
C: (One child) *yes.*
T: *Okay lets have a listen to the sentence and you have a read of it while I read it to you and we will see if we can work out what it means. As the comet nears the sun some of it evaporates and becomes a strip of dust and vapour that looks like a huge tail. So as the comet nears the sun, some of it 'evaporates'.*
C: (Another child) *Gets longer?*
T: *No, that's a good guess though 'cos we learnt that it did get longer.*
C: (Another child) *Some of them starts to fall apart.*
T: *You are on the right track there.*
C: (Another child) *It changes.*
T: *Yeah it does change. Now when you put your clothes out on the clothes line, they're wet aren't they?*
C: (All) *Yes*
T: *Later on in the day, unless it's been raining, you go to bring them in, what are they like?*
C: (One child) *Wet.*
C: (Another child) *soaked.*
T: *If it hasn't been raining... you put them out and they're wet right? And it hasn't been raining all day and you go back to bring them in.*
C: (One child) *It's dry.*
T: *It's dry. Okay so where has the water gone?*
C: (One child) *Oh the sun absorbed it.*
T: *Okay that's evaporates okay? It turns into steam and it disappears off up into the clouds.*

In the first two clusters, the rates of teachers' Extended Talk significantly changed and there was more consistency between teachers in the overall (higher) rates. In both cases, repeated measures of the vocabulary test showed significant gains over years and in both clusters, we have evidence that teachers changed. Teachers increased their extended talk, which went beyond a simple comment or synonym to a sustained exchange over several turns that allowed the teacher to develop semantic features and nuances. Significant changes also occurred in the third cluster from relatively high but variable levels across teachers to more consistently high.

3.6 Enablers and Discussion

There are two inter-related enablers that we think are critical to the process of analysing and using data, namely the creation of artefacts to support teachers better understand their own classroom teaching and student achievement, and

inter-dependent partnerships with external experts both in the creation of these artefacts and in their use. Artefacts used in the interventions included PowerPoints of data analysis, resources on analysing data and conducing conversations about data (e.g., Annan et al. 2001) observation tools and excerpts from transcripts with commentary from the researchers. These artefacts were important components for schools data discussions because without these artefacts, teachers and school leaders would not have access to the important information they needed to effectively analyse their data and make changes to their teaching practice. The school infrastructure in New Zealand is such that a number of achievement analyses that schools in our research found useful in changing their practices (e.g., tracking the same student over time) are not easily available on existing school analyses software. If schools want to examine their data in these ways, they would have to do these analyses manually, which is highly time consuming. With the artefacts (data presentations) from the researchers, teachers had quick and timely access to these relevant data about how their students were achieving over time. Similarly, schools did not have easy access to observation tools specific to the teaching areas they were focusing on, or have easy access to detailed (as opposed to generic) analyses of their own teaching practices. Having these data from researchers helped them pinpoint specific classroom practices, which were linked to patterns of achievement. Critical aspects of these artefacts were that they were relevant to teachers' needs; were seen as useful in understanding student achievement and teachers' own teaching practices; were provided in a timely manner and contained sufficient precision for teachers to identify (with support) learning and teaching needs.

The analysis tools used in this research could be conceived as 'received artefacts' (artefacts provided to schools from an external source) as they were designed by the research team, albeit with schools, to serve as a catalyst for change and as a template for developing knowledge into data analysis (Halverson 2007). Halverson argues that such received artefacts can 'spark change from a distance' (p. 101) and can be an important way for researchers and/or those who support schools, for example, the government, to conceive of their role in supporting schools examine data. Such artefacts must be useful for, and be seen as useful by, teachers; provided in a timely manner and have sufficient precision to pinpoint teaching and learning needs.

However, Halverson (2007) argues that what is critical is how schools understand and use the received artefacts in terms of their school priorities as it is possible to have the artefacts available but choose not to use them. In this chapter, we discussed how the teachers used the artefacts about data to drive their discussions about data. Teachers' use of artefacts was not accidental, rather the result of the planned professional learning as part of the interventions. The teachers' understandings were developed through the collaboration with the researchers both on how to understand the artefacts and how to create procedures within the school to continue using such artefacts (This has been reported elsewhere; e.g., Lai and McNaughton 2008; Robinson and Lai 2006). This suggests the importance of support around artefacts through partnerships with other stakeholders, which brings us to our next important enabler, inter-dependent partnerships with researchers. By inter-dependent, we mean that schools form complementary and mutually informed relationships with outside

agencies with appropriate expertise, in this case relationships with the researchers (Timperley et al. 2010) .

Inter-dependent partnerships were critical in supporting teachers and school leaders analyse and use data for decision-making firstly because the partnerships enabled all parties to have access to a greater number and divergence of knowledge to use to change their practice. In fact, accessing diverse knowledge can be seen as one way communities of teachers and school leaders, policy-makers and researchers can accelerate their professional learning to improve student achievement (Annan 2007). In our research, neither researchers nor schools had all the required knowledge to make the changes necessary to improve achievement. For example, schools needed support to identify the precise teaching practices to change as they did not have the depth of literacy content knowledge as the researchers; but researchers lacked the practical knowledge of how to incorporate their proposed instructional practices into an authentic classroom lesson that is integrated with the school curriculum.

However, such partnerships are only effective if they are rigorous examinations of teaching and learning, not comfortable collaborations in which ideas are simply shared (Toole and Seashore-Louis 2002). The partnerships provide mutual critique of ideas and create new and innovative ways of improving practice. Early on in the interventions, teachers and researchers collectively tested several hypotheses for the low comprehension scores. Teachers argued that student decoding was not the reason for the low scores, so the researchers and teachers examined the decoding data in relation to the information about students' comprehension and found that, overall, the teachers were correct. Instead, the researchers and teachers found that students made lots of wild guesses without checking whether their guesses were supported by evidence from the texts they were reading. Therefore, the teachers changed their teaching practices to focus on supporting students find evidence from texts. Teachers also developed new teaching strategies to assist students' search for evidence including new ways of responding to and prompting students in class to think about the evidence for their guesses, and structured teaching programmes on finding evidence from texts (Robinson and Lai 2006).

It is important to ensure that these partnerships are truly inter-dependent to prevent either too much dependence or too little dependence on external experts. For example, too much dependence on external experts can create a cycle of dependency for the school, where the school is overly dependent on others to develop effective teaching practices, but with too little support from external partners, schools may not have sufficient expertise to examine and change its teaching practices quickly and effectively (Timperley et al. 2010). In our research and development interventions, we intentionally built in strategies for developing greater school independence over time through the structure of the interventions. For example, the third year of the interventions focused on how schools can sustain the core programme elements such as their use of data for decision-making. Follow-up studies with schools one year later showed that they continued to examine their data to improve practices, but that they sought expert support when necessary (Lai et al. 2009b).

The significant role of partnerships with external agents (researchers, other schools) in these interventions raises the issue of whether schools can analyse their

classroom and achievement data without any external partnerships. It is conceivable that schools can do so if members of the school set up professional learning communities (e.g., groups of teachers or teachers and school leaders) that have sufficient expertise to introduce new and divergent sources of knowledge, provide mutual critique of ideas and create new and innovative ways of improving practice. Members of the school might also be able to bring research expertise to the school community, albeit not at the level of an experienced researcher (e.g., in many New Zealand schools, there are teachers with University Masters degrees that have a strong research component). However, in our experience, many schools enjoy the collaboration with others outside the school. Moreover, schools facing longstanding educational problems such as the historical under-achievement of indigenous and ethnic minorities would benefit from external partners because the problems are pervasive and too complex for schools to solve on their own. In fact, Annan (2007) argues that one reason why the historical under-achievement problem in New Zealand persists is because there are insufficient partnerships formed between schools and external agents who have responsibility for solving these educational problems (e.g., Ministry of Education, researchers, community leaders).

However, are there sufficient external agents that have expertise in data to support all schools use data in the way we described here? One way of addressing this potential capacity issue is to train school leaders and teachers to take on the role of researchers in the study. For example, a large philanthropic organisation in New Zealand, the Woolf Fisher Trust, is currently funding up to four post-graduate scholarships a year to train school leaders and teachers to use data. Scholarship recipients are expected to bring that knowledge back to their schools and to the schools in their neighbourhood. However, a more systematic and wide-spread approach to training teachers and school leaders is to include a greater emphasis on data use in the curriculum of teachers training colleges.

Finally, we turn to the issue of pedagogical content knowledge (PCK) and its role in teachers' analyses, discussions and use of data for decision-making. PCK is the day-to-day knowledge of how students understand and misunderstand their subjects, how to diagnose and anticipate such misunderstandings and how to deal with them when they arise (Darling-Hammond and Bransford 2005). PCK is not about generic teaching skills, such as knowing about particular types of feedback or about the role of expectations in setting tasks. It is about the content-specific aspects of instruction such as anticipating and addressing the fact that older readers can become confused when considering the idea of audience in narratives that are very familiar, such as well-known soap operas (Lai and McNaughton 2010).

If teachers do not have sufficient PCK to know what to do next after analysing their data, then they can become frustrated having identified a problem to which they do not know the solution. Without extensive PCK, teachers may also nominate a range of strategies, which may or may not be effective, and other teachers whom they are discussing data with (who, similarly, may not have sufficient PCK) might not be able to evaluate whether the strategies proposed are more or less effective to address the student learning needs that have been identified (Lai and McNaughton 2010). This may result in the teachers applying strategies that are inappropriate to solve the

problem or, at worst, are detrimental to student learning. By contrast, greater PCK enhances understanding of how to examine data to change practices because teachers and school leaders are better able to pinpoint the teaching and school practices that might contribute to achievement patterns. Teachers with greater PCK also have the range of strategies to address the achievement patterns, which they can discuss and evaluate with other educators.

Our experience working with clusters of schools suggests that teachers initially need to learn to extract the relevant information from the achievement data (Lai and McNaughton 2010). Once they can identify general trends, over time, they learn how to identify specific issues in the achievement data, which they can address in their classrooms. However, we have yet to empirically test how teachers develop expertise in identifying issues in their own teaching and student learning from analysis of data. Nor have we empirically tested the role of PCK in this development. This could represent new directions of research in data discussions (for more information on the role of PCK in data discussions, including annotated transcripts and a continuum for developing PCK in data discussions, see Lai and McNaughton 2010).

3.7 Conclusions and Next Steps

This chapter shows promising evidence from a series of New Zealand studies that analysing, discussing and using achievement and classroom data as part of literacy interventions can lead to increased student achievement. A critical component of the data analysis process is linking the patterns in the achievement data with the patterns in classroom teaching. There has been recent emphasis on and training in using achievement data in New Zealand. However, there has been comparatively less emphasis and training in using data on classroom instruction, and even less emphasis on linking achievement data with data on classroom instruction. Therefore, a way forward for New Zealand schools would be learning how to gather data on classroom instruction and how to link that data with achievement data. Many schools in New Zealand already include teacher observations as part of mentoring programmes, staff professional development and/or performance reviews, so those observation processes could be refined by linking the patterns of classroom instruction to patterns of achievement. There will be a number of schools, however, that will need additional support in observing and analysing observations of classroom instruction, so resources would need to be created to train teachers, such as videos or transcripts of classroom lessons with commentary on effective and less effective teaching methods.

In our research, although the use of data was integral to the interventions' success, it cannot be isolated from the interventions' other components such as the increased professional knowledge through workshops. Thus, further studies using robust methodological designs over a longer period of time and in different educational contexts would be useful to confirm the effects of using data on student outcomes. In addition, it is important to study whether the impact of data use on

student outcomes is most effective within the context of interventions, or whether data use, if part of everyday teacher practice, is equally effective. Nonetheless, the findings suggest that if teachers are able to see the connections between patterns of student achievement and their classroom teaching, they can change their teaching practices in ways that have a positive and powerful impact on student learning.

3.8 Reflection Questions

For practitioners and people working with schools

1. Think about a recent assessment of student achievement that your class or school has completed (e.g., homework, test).
   a. What does the assessment tell you about how students are achieving in relation to agreed expectations (e.g., expectations can be national norms, curriculum levels and the like)?
   b. What does the assessment tell you about students' strengths and weaknesses?
   c. What aspects of teaching might help explain the patterns of students' strengths and weaknesses?
   d. How can you collect information about teaching practices to test your ideas about what might explain students' strengths and weaknesses? (e.g., what might teachers in your school observe in each other's classrooms to help them understand students' strengths and weaknesses?)

For policy-makers

1. The authors outlined three important enablers for data use that, if addressed, are associated with improvements in achievement.
   - Artefacts for using data that are relevant to teachers, provided in a timely manner, and contain sufficient precision to pinpoint teaching and learning needs.
   - Inter-dependent partnerships with external experts.
   - Development of teacher PCK.

   a. How can you foster the development of these enablers in your policy context?
   b. What are the implications of these enablers for developing and implementing policies in data use? (e.g., resources, support, development of artefacts, etc.).
2. The authors suggest that it is important to use data-based decision-making as part of interventions and to examine the impact of data-based decision-making on important student outcomes.
   a. If your country has policies on using data, how might you check their impact on student outcomes?
   b. How might you encourage/develop interventions that use data, and examine their impact?

For researchers

1. The authors argue that data-based decision-making can be a highly effective form of intervention to improve student achievement, if data on achievement and teaching practices are used with the 'appropriate' enablers (artefacts, inter-dependent partnerships and teacher PCK).
   a. How might you design, implement and evaluate interventions that incorporate data-based decision-making?
   b. How can you gather data on student learning strengths and needs, and data on teaching practice to tailor your interventions to address these needs?
   c. How can you effectively measure the level of teacher PCK to understand what support is required for teachers to effectively use data?
   d. How do you measure these interventions to check if they have a significant impact on important student outcomes?
2. The interventions described here utilise researchers with expertise in both using data and in the content area being analysed (in this case, expertise in literacy).
   a. How can you develop research teams that have the appropriate expertise to analyse the data in your context? (e.g., what type of expertise is required to solve the problem being analysed?).
   b. How can you develop teams that are able to support teachers and school leaders take action on the data? (e.g., what type of professional development expertise is required within the team?).

Acknowledgments We wish to acknowledge the support received through the New Zealand Council for Educational Research 'Teaching, Learning and Research Initiative' projects on sustainability and improving literacy, and the Ministry of Education.

References

Annan, B. (2007). *A theory for schooling improvement: Consistency and connectivity to improve instructional practice*. Unpublished thesis, University of Auckland, Auckland.

Annan, B., Lai, M. K., & Robinson, V. M. J. (2001). Teacher talk to improve teacher practices. *SET, 1,* 31–35.

Biemiller, A. (2001). Teaching vocabulary: Early, direct and sequential. *American Educator, 25*(1), 24–28 and 47.

Block, C. C., & Pressley, M. (Eds.). (2002). *Comprehension instruction: Research-based best practices*. New York: Guilford.

Borman, G. D. (2000). Making the most of summer school: A meta analytic and narrative review. In H. Cooper, K. Charlton, J. C. Valentine & L. Muhlenbruck (Eds.), *Monographs of the society for research in child development*. *260*(65), 119–127.

Borman, G. D. (2005). National efforts to bring reform to scale in high-poverty schools: Outcomes and implications. In L. Parker (Ed.), *Review of research in education*, (29, pp. 1–28). Washington: American Educational Research Association.

Buly, M. R., & Valencia, S. W. (2002). Below the bar: Profiles of students who fail state reading assessments. *Educational and Evaluation and Policy Analysis, 24*(3), 219–239.

Campbell, C., & Levin, B. (2009). Using data to support educational improvement. *Educational Assessment, Evaluation and Accountability, 21*(1), 47–65.

Cawelti, G., & Protheroe, N. (2001). *High student achievement: How six school districts changed into high-performance systems*. Arlington: Educational Research Service.

Coburn, C., Toure, J., & Yamashita, M. (2009). Evidence, interpretation and persuasion: Instructional decision making at the district central office. *Teachers College Record, 111*(4), 1115–1161.

Darling-Hammond, L., & Bransford, J. (2005). *Preparing teachers for a changing world: What teachers should be able to learn and be able to do*. San Francisco: Wiley.

Earl, L., & Timperley, H. (Eds.). (2008). *Evidence-based conversations to improve educational practices*. Netherlands: Kluwer/Springer Academic.

Education Review Office (2009). Getting the most out of your ERO review: Schools. Wellington, New Zealand: Education Review Office. http://www.ero.govt.nz/ Review-Process/For-Parents. Accessed 21 Jan 2010.

Elley, W. (2001). *STAR supplementary test of achievement in reading: Years 4–6. Wellington*. New Zealand: New Zealand Council for Educational Research.

Fancy, H. (2007). Schooling reform: Reflections on the New Zealand experience. In T. Townsend (Ed.), *International handbook of school effectiveness and improvement* (Vol. 1). Netherlands: Springer.

Frederiksen, N. (1984). The real test bias: Influences of testing on teaching and learning. *American Psychologist, 39,* 193–202.

Fuller, B., Wright, J., Gesicki, K., & Kang, E. (2007). Gauging growth: How to judge: No child left behind. *Educational Researcher, 36,* 268–278.

Halverson, R. (2003). Systems of practice: How leaders use artifacts to create professional community in schools. *Education Policy Analysis Archives, 11*(37). Retrieved from http://epaa.asu.edu/epaa/v11n37.

Halverson, R. (2007). How leaders use artifacts to structure professional community. In L. Stoll & K. Seashore-Louis (Eds.), *Professional learning communities: Divergence, depth and dilemmas* (pp. 93–105). New York: Open University Press.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: Paul H. Brookes.

Lai, M. K., & McNaughton, S. (2008). Raising student achievement in poor, urban communities through evidence-based conversations. In L. Earl & H. Timperley (Eds.), *Evidence-based conversations to improve educational practices* (pp. 13–27). Netherlands: Kluwer/Springer Academic.

Lai, M. K., & McNaughton, S. (2009). Not by achievement analysis alone: How inquiry needs to be informed by evidence from classrooms. *New Zealand Journal of Educational Studies, 44*(2), 93–108.

Lai, M. K., & McNaughton, S. (2010). Evidence-informed discussions: The role of pedagogical content knowledge. In H. Timperley & J. Parr (Eds.), *Weaving evidence, inquiry and standards to build better schools* (pp. 157–172). Wellington: New Zealand Council for Educational Research.

Lai, M. K., McNaughton, S., Amituanai-Toloa, M., Turner, R., & Hsiao, S. (2009a). Sustained acceleration of achievement in reading comprehension: The New Zealand experience. *Reading Research Quarterly, 44*(1), 30–56.

Lai, M. K., McNaughton, S., Timperley, H., & Hsiao, S. (2009b). Sustaining continued acceleration in reading comprehension achievement following an intervention. *Educational Assessment, Evaluation and Accountability, 21*(1), 81–100.

McNaughton, S. (2002). *Meeting of minds*. Wellington: Learning Media.

McNaughton, S., & Lai, M. K. (2010). The learning schools model of school change to raise achievement in reading comprehension for culturally and linguistically diverse students in New Zealand. In P. H. Johnston (Ed.), *RTI in literacy—responsive and comprehensive* (pp. 313–331). Newark: International Reading Association.

McNaughton, S., Lai, M.K. & Hsiao, S. (2012). Testing the effectiveness of an intervention model based on data use: A replication series across clusters of schools. *School effectiveness and School Improvement*, *23*(2), 203-228.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1*(2), 117–175.

Reid, N. A., & Elley, W. B. (1991). *Revised progressive achievement tests: Reading comprehension*. Wellington: New Zealand Council for Educational Research.

Robinson, V. M. J. (1993). *Problem-based methodology: Research for the improvement of practice*. Great Britain: Pergamon.

Robinson, V. M. J., & Lai, M. K. (2006). *Practitioner research for educators: A guide to improving classrooms and schools*. California: Thousand Oaks Corwin.

Timperley, H., & Parr, J. (2010). Evidence, inquiry and standards. In H. Timperley & J. Parr (Eds.), *Weaving evidence, inquiry and standards to build better schools*. Wellington: NZCER.

Timperley, H., McNaughton, S., Lai, M. K., Hohepa, M., Parr, J., & Dingle, R. (2010). Towards an optimal model for building better schools. In H. Timperley & J. Parr (Eds.), *Weaving evidence, inquiry and standards to build better schools* (pp. 25–49). Wellington: NZCER.

Toole, J. C., & Seashore-Louis, K. (2002). The role of professional learning communities in international education. In K. L. P. Hallinger (Ed.), *Second international handbook of educational leadership and administration* (pp. 245–279). Dordrecht: Kluwer Academic.

Wang, J., & Guthrie, J. T. (2004). Modeling the effects of intrinsic motivation, extrinsic motivation, amount of reading, and past reading achievement on text comprehension between US and Chinese students. *Reading Research Quarterly, 39*(2), 162–186.

Wilkinson, I., & Son, A. (2010). A dialogic turn in research on learning and teaching to comprehends. In M. L. Kamil, P. D. Pearson, E. B. Moje & P. Afflerbach (Eds.), *Handbook of reading research* (Vol. IV). New York: Routledge.

Chapter 4
From "Intuition"- to "Data"-based Decision Making in Dutch Secondary Schools?

Kim Schildkamp and Melanie Ehren

School leader Emma arrives at her school Monday morning at 8 a.m. She walks into the teachers' lounge and sees that two of her data teams are already engaged in their data-based decision-making meeting. At the school, school-level data teams are working on school-level issues, such as the problem of grade repetition in the third grade. At classroom level, data teams are working on classroom-level issues, such as low mathematic achievement in the second grade. Also, school-level data teams and classroom-level data teams cooperate frequently. The data teams are working on trying to find solutions for these problems in a structured manner. They generate hypotheses about what causes these problems, they collect data to determine whether to accept or reject these hypotheses. Based on confirmed hypotheses, they come up with solutions to solve the problem, they implement these solutions, and they evaluate these solutions.

4.1 Introduction: Context Description

Emma's school, as described briefly at the beginning of this chapter, can be described as a data-based decision-making school. Data-based decision making has become increasingly important in several countries around the world, including the Netherlands. Data can be defined as systematic information that schools collect and use for decision making (e.g., relevant information on students, schools, school leaders, and teachers, such as assessment results and teacher surveys).

Data use plays an important role in Dutch schools, as schools are responsible for their own quality and traditionally have had considerable autonomy in making choices related to their quality. They have always been free to choose the religious, ideological, and pedagogical principles on which they base curriculum and teaching, as well as how they choose to organize teaching activities (Ministerie van Onderwijs, Cultuur and Wetenschappen 1999). As a result of the decentralization of national

K. Schildkamp (✉) · M. Ehren
Faculty of Behavioural Sciences, University of Twente,
Enschede, The Netherlands
e-mail: k.schildkamp@utwente.nl

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_4, © Springer Science+Business Media Dordrecht 2013

policies, the autonomy of schools has increased; schools can make decisions with respect to administration and finances, curriculum and lesson tables, the choice of textbooks and instructional materials, and retention of students and promotion of students to subsequent grades (Eurydice 2009). To counterbalance this high level of autonomy, schools are required to monitor the quality of their education, to have a good quality care system in place, and to account for the quality of their school to relevant stakeholders, such as parents and students. Schools are obliged to publish a school prospectus every 4 years in which they describe their mission and goals; the types of lessons they provide and the results they have achieved. The school prospectus is a public record for parents and teachers. Schools are also expected to publish an annual policy plan, which is an integral policy document as well as an accountability document for the Inspectorate.

Another method to counterbalance the large autonomy of schools is regular monitoring by the Inspectorate of Education. The Inspectorate of Education inspects departments within secondary schools that offer different educational tracks (vmbo (prevocational secondary education), havo (senior general secondary education), vwo (preuniversity education), or learning support trajectory). Only departments that meet specific criteria[1] are scheduled for an inspection visit. Regardless of whether schools meet these criteria, they are inspected once every 4 years on the quality areas "student outcomes," "quality assurance," "student care," and "number of teaching hours." During an inspection visit, inspectors observe lessons, interview school leaders, teachers, students, and parents and analyze documents such as the school prospectus and the school guide. At the end of the inspection visit, school inspectors provide feedback to the school board (responsible for the departments) on the functioning of each department in relation to the quality areas in the inspection framework. This feedback is also written down in the inspection report that is sent to the school board approximately 5 weeks after the inspection visit and is published on the internet. The feedback covers an evaluation of each department on the quality aspects described in Table 4.1, using a 4-point scale (where 1 is 'underdeveloped' and 4 is 'well developed'), including aspects such as student achievement, quality of teaching, and the school climate. Schools can use this feedback in evaluating and improving their quality.

The legal requirements for schools to monitor their own quality and the regular school inspections result in a vast amount of data in schools (see Table 4.2). These data include *input* data, such as the demographics of the student population; *process* data, such as data on the quality of instruction; and *outcome* data, such as student test scores (Ikemoto and Marsh 2007) .

Schools can use these different types of data for evaluating their quality and for improving their functioning. Based on these different types of data, a school can assess

[1] Criteria are: insufficient student achievement results for 3 subsequent years, declining student achievement results, which are below average for the last 2 years, insufficient student achievement results in math, language, or in the final examinations, or above average number of drop outs or retentions.

Table 4.1 Inspectorate quality aspects and indicators

Quality aspect	Example of an indicator
The outcomes are at the level that may be expected on the basis of the characteristics of the student population	In the lower years, the students reach the educational level that may be expected
The curriculum is aimed at the broad development of students and at preparation for further education or the labor market and society	The curricula offered in the upper years cover the exam program
The students are allowed sufficient time to master the curriculum	There is limited cancellation of planned educational activities
The school climate is characterized by safety and respectful interaction	The parents are involved in the school through the activities the school organizes to that end
The teachers provide clear explanations, organize the educational activities efficiently, and keep the students involved in their tasks	The teachers provide a clear explanation of the subject matter
The teachers adapt the curriculum, instruction, time allowed for learning the subject matter, and teaching time to accommodate the developmental differences between pupils	The teachers adapt the instruction to accommodate developmental differences between the students
The teachers systematically monitor the progress made by the students	The school uses a coherent system of standardized instruments and procedures to monitor students' performance and development
Extra care is provided to students who are found to need it	On the basis of an analysis of the data collected, the school determines, in a timely fashion, what type of care is to be provided to students with special needs
The school systematically maintains and improves the quality of the education it provides	The school annually evaluates the results attained by the students

its strengths and weaknesses and work on maintaining its strengths and improving its weaknesses. Teachers can, for example, use data for instructional purposes, to move students between groups midyear, and to create and review intervention strategies for individuals (Young 2006). Data may also be used by teachers as well as school leaders to reflect on their own teaching or management practice (Breiter and Light 2006; Brunner et al. 2005). Moreover, school leaders can use data to identify areas of need and target resources (policy development and planning). They can, for example, identify grade, class, and school-wide strengths and weaknesses, which then can be used to make decisions about planning, for setting school and district priorities and goals, to plan test-preparation activities, and to make yearlong calendars (Breiter and Light 2006; Brunner et al. 2005; Coburn and Talbert 2006). Finally, decisions related to personnel (e.g., evaluating team performance and determining and refining topics for professional development) can be based on data (Kerr et al. 2006; Wayman and Stringfield 2006a, b).

Table 4.2 Data sources available in Dutch schools

Data source	Description
Input	
Data on prior achievement levels of students	Schools keep records on the intake of students (e.g., previous schools and achievement)
Student demographic data	Data on socioeconomic status, gender
Process	
School inspection reports	Periodic evaluation of the functioning of each department (offering an educational track) in the areas on the inspection framework
School self-evaluation results, including teacher and management questionnaires, student questionnaire data and focus groups, parent questionnaire data and focus groups	In the Netherlands, more than 70 different instruments for school self-evaluation are available (The Standing International Conference of Central and General Inspectorates of Education 2003). Schools use different types of school self-evaluation instruments, but most school self-evaluations include management and teacher questionnaires on the functioning of the school. Sometimes, school self-evaluation instruments also include student and parent questionnaires to gather information on the students' perception on the functioning of teachers, school leaders, and the school in general and to gather information on the parents' perception on the functioning of the school
Classroom observations	In some schools, data on classroom teaching is gathered by means of classroom observations; either school leaders conduct these observations (classroom consultation) or other teachers conduct these observations (peer review)
Absence registration	Schools keep records of absence of students due to, for example, sickness or truancy
Outcomes	
Data on transfer	Schools keep records on the transfer of students (e.g., grade repeaters) and school leavers (with or without a diploma)
Annual inspection card on student achievement results of each department (offering an educational track)	An overview is provided of the school's score on the following indicators: overall assessment of student achievement results, output of first three grades, output of higher grades, weighted average student achievement results on national examination, difference between student achievement results on national examination and final school examinations, average score of students on the national examination
Data on school leavers	Schools keep records on school leavers (with or without a diploma), for example, with regard to what they did after school (e.g., enter university, start working)
Final examination results	At the end of secondary education in the Netherlands, students have to pass a final examination, consisting of an internal school-based assessment and an external national assessment
Assessment results	Students in the Netherlands are assessed on a regular basis. Assessments include both oral and written assessments and are usually administered by teachers

4.2 Two Stories of Data-based Decision Making

In this section, we use the overview in Table 4.2 of available input, process, and output data to describe two hypothetical stories of how Dutch schools may, or may not, use data to improve. The two stories are based on our research in Dutch secondary schools and represent two extreme examples: one school using all types of data in an optimum and ideal manner, and another school not using or misusing available data. Both stories are loosely based on our experiences in working with schools in different projects (Ehren and Swanborn 2012; Schildkamp and Kuiper 2010; Schildkamp and Handelzalts 2011).

4.2.1 Data-based Decision Making in the Real World: School Level

School leader Alice arrives at her school. Throughout the school year, Alice is very busy with administrative, financial, and personnel tasks. Most of her time is spent on making sure that the daily operation of the school is running smoothly, such as making sure that lessons of sick teachers are taken over by other teachers, forms and protocols are filled out and sent to the Department of Education, and handling questions and complaints of students and parents. This week, she will have to focus on the results received by the Inspectorate and on the results of the national examination.

She just received the national examination results and, like every other year, she has to provide teachers with an overview of the scores of the students in their class. She sighs as she knows that some of the results are not so good. They are not reaching the threshold set by the Inspectorate. In a team meeting, Emma gives the news to her teachers. After the news has settled, teachers go into their classroom again and do their own teaching. Alice gave the teachers the news, but there is no structured or formal meeting to discuss the results and talk about any changes that they might consider. In this school, teachers choose their own strategies to teach students and primarily follow assignments and examples in the textbook. Teachers also do not value the overview of students’ scores on the national examination as a useful source of information, as they are not able to analyze which students are scoring low on which topics and how that is related to their teaching.

After the meeting, Alice has to send the test scores of students on the national examination and on the school assessments in the final grade to the Inspectorate of Education, which she has to do annually. The Inspectorate of Education also requests school records on the number of students who are promoted in the first three grades and the number of students that repeat each grade. Last year, it took her an entire week to gather this information as she had to ask each department head to collect this information from their teachers and teachers had to draw it from their written classroom records. She also had to summarize the information to fit it into the inspection forms. She has no automated system to manage and analyze these records.

Next, she has to prepare for a meeting she has with the school board about the inspection report. She remembers how anxious she was in preparing for the Inspection visit. She had to collect the results of their latest school self-evaluation surveys, but the system they use to conduct school self-evaluations was not working properly. She finally got the results from the teacher and management questionnaire out of the system, but had difficulties in analyzing the results. Then, she also had to analyze the results of the parent and student questionnaire. She really would have liked some help from the teachers, but some of the teachers said that they did not have the knowledge or skills to analyze data and one teacher even stated that "it was not his job to do this work; his responsibility is his classroom teaching and not the inspectorate or quality care." She also remembers overhearing one teacher complaining to another teacher about the self-evaluations as "the latest hobby of our school leader." However, all of that is over, the inspectorate received the data and visited their school, and they received the Inspectorate report 2 weeks ago.

In the report, the Inspectorate comments on the teaching and learning in the school. School inspectors evaluated the teaching in the school as underdeveloped as the lessons of most teachers mostly comprised very formal presentations to the entire group of students and discussion of assignments with the entire group of students. Students were not actively involved in the lessons and only participated in discussions when they were asked a direct question. She tried to talk to her teachers about this last week, but they responded to the assessment of the Inspectorate by saying that school inspectors did not observe their lessons (and the assessment therefore does not pertain to their lessons) or students reacted differently as they would in a normal noninspected lesson; the fact that the school inspector was present changed their behavior.

After her preparation for the school board meeting, Alice opens her mail and finds that the Inspectorate has also sent the annual inspection report card of the school in which an assessment is made of a number of indicators related to student achievement, which the school receives every year. Alice is startled as the indicator "output of the first three grades" is assessed to be failing. In the next report card meeting at the end of the school year (in which teachers discuss which students will be promoted to the next grade), Alice decides to instruct teachers in grade 1, 2, and 3 to promote students that score on the border of pass and fail to the next grade, instead of retaining them in their grade. Teachers will probably grumble a bit, but they will agree to do so as they know their school board and the parents of students also react towards any "red indicators" on the inspection report card and they don't want to be criticized by them.

4.2.2 Data-based Decision Making in the Real World: Classroom Level

At the same school, teacher Julie is talking to her colleague Tim about the bad examination results. Julie complains to Tim that she can never obtain good results

with a class such as hers, with students from only low socioeconomic status who are unmotivated. Julie is worried about facing Alice and knows that she will be coming down hard on her. Emily joins the conversation. She offers to look at the data with Julie. She promises that she will not use the data to blame Julie for the performance, but that they will look at the data together and see how they can use the data to improve Julie's teaching. This upsets Julie even more. She says: "so you don't believe I am a good teacher." Emily starts to explain that this is not what she meant, but Julie is getting very upset. Tim is trying to calm her down: "next year you will have another group of students, they will be different and maybe better." Julie is also worried about the reaction of the Science teachers in the school. They have the tendency to silently blame their colleague teachers who teach the same students in different subjects for not teaching students well. Tim is trying to reassure her: "Come on, you and I both know that we are good teachers, these data don't tell us anything. I don't believe in the whole data-based decision making mantra anyway. I have been a teacher for 20 years and data can not tell me anything I don't know already."

All in all, this is a school, which does not use data for school improvement purposes. School leader Alice is trying to use data at the level of the school, but receives almost no support from her teachers. There are only a few teachers in the school, such as Emily who think it is important to use data to improve education. At classroom level, therefore, almost no data use is taking place and some of the teachers don't feel a need to use data. This school does not use data or only, for example, to prevent being assessed by the Inspectorate as failing, and thereby ignoring important improvement opportunities.

4.2.3 Data-based Decision Making in a Perfect World: School Level

School leader Emma arrives at her school Monday morning at 8 a.m. She walks into the teachers' lounge and sees that her general school improvement data team and student counseling data team are already engaged in their data-based decision-making meeting, this time focusing on the results of the parent and student focus groups they organized last week.

Emma is really glad that her school adopted the Dutch data team procedure (Schildkamp and Handelzalts 2011 based on Earl and Katz 2006). Data teams are teams of teachers (4–6) and school leaders (1–2), who collaboratively use data to solve a certain educational problem within the school using a structured approach. The focus is on solving a problem and not on finding a problem. The process starts with questions teachers have (e.g., a teacher might want to know how to increase mathematic achievement in the lower grades of secondary education). School leaders are part of a data team as they often have a different perspective on the educational problem to be solved, and they can bring new hypotheses to the table. Furthermore, participation of a school leader will ensure implementation of the action plan at the

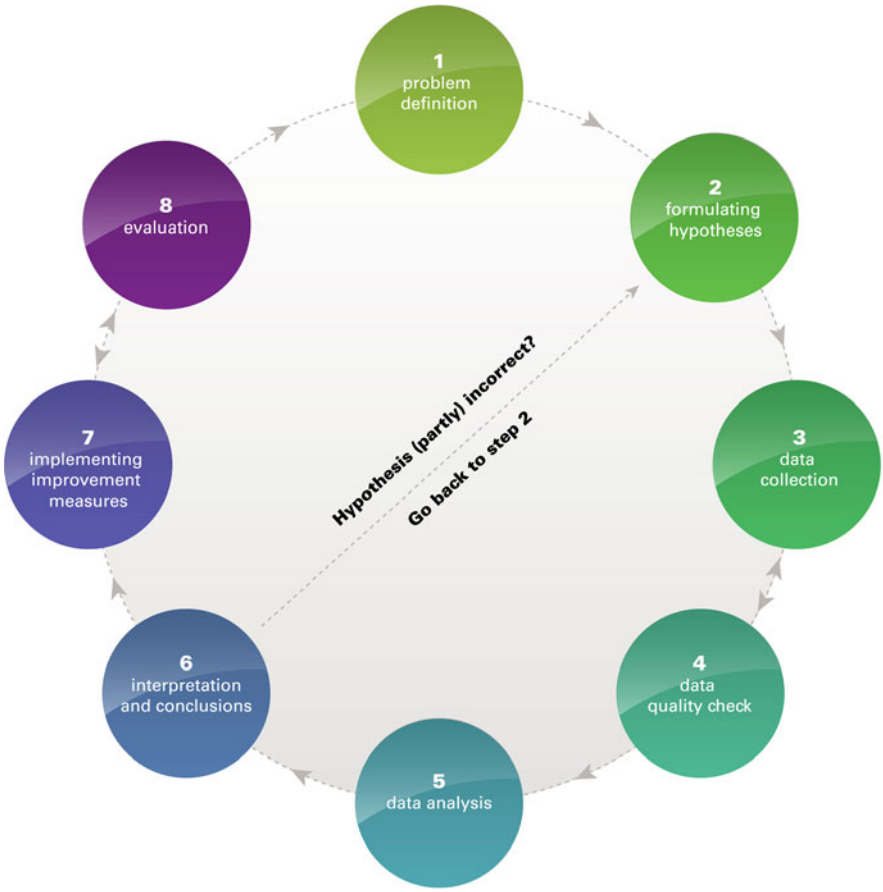

Fig. 4.1 The data team procedure. (Schildkamp and Handelzalts 2011)

end of the process. The team does not have to explain anymore what they have been doing and why they want to implement certain improvement measures.

School staff learn in a team how to systematically use data to solve certain problems within the schools in order to improve the functioning of the school. Data teams work according to an iterative and cyclic procedure (developed by Schildkamp, see Schildkamp and Handelzalts 2011), consisting of eight steps (see also Fig. 4.1 and the box below):

The Eight Steps of the Data Team Procedure

1. *Problem definition*: The team decides on which educational problem and goals they want to focus their efforts. For example, if the data team decides to focus on grade retention, the first thing the team has to do in this step

is collect data on grade retention (e.g., how many grade repeaters does the school have in each grade).
2. *Formulating hypotheses*: The team develops hypotheses (e.g., on what causes grade retention).
3. *Data collection*: The team collects data to either confirm or reject the hypotheses. Several types of data can be collected (e.g., assessment data, inspection reports, and examination results).
4. *Data quality check*: Are the collected data valid and reliable?
5. *Data analysis (e.g., summarizing, calculating, comparing)*: This can involve simple data analyses (e.g., descriptive analyses, summarizing interview data) as well as more sophisticated analyses (e.g., correlational and regression analyses). For example, a data team in one of our studies (Schildkamp and Handelzalts 2011) had the hypothesis that the policy of the school to still promote students with five insufficient marks on their report card to the next grade caused grade retention in the following grade. The data team collected report card data and retention data and found out that students who were promoted with five insufficient marks on their report card did not have to repeat the following grade. The hypotheses turned out to be false.
6. *Interpretation and conclusion*: If hypotheses turn out to be false, new hypotheses need to be investigated. The data team needs to collect additional data (back to step 2). If hypotheses are correct, the team draws conclusions based on the collected data.
7. *Implementing improvement measures*: The team describes the measures needed to solve the problem and the goals that go with these measures. The team makes team members responsible for implementing the actions and determines which resources are available for implementing the actions. The team also thinks of ways to monitor the implementation of the actions, sets deadlines, and determines which data are needed to establish the effectiveness of the implemented actions.
8. *Evaluation*: Are the actions effective? Are the goals met? Are the problems solved and is the team satisfied? To evaluate the actions, new data need to be collected. This process continues until the priorities are met and the goals are reached. Then, the team can go back to step 1 to work on a new problem and goals.

Emma really likes this eight-step procedure and she is very happy about the way data teams function in her school. At the school, school-level data teams are working on school-level issues and classroom-level data teams are working on classroom-level issues. Also, school-level data teams and classroom-level data teams cooperate frequently.

At school level, the school has several school-level data teams, consisting of school leaders, department heads, and teachers, which get together every other week

or monthly. After 2 years of data team training by researchers of the local university, teachers, department heads, and school leaders are now leading their own data teams in the school, using the artifacts (e.g., a manual and work sheets), developed by the University.

One school-level data team is, for example, working on the problem of grade repetition in the third grade. According to the school's goals, no more than 10 % of the students should have to repeat a grade, but last year 23 % of their students in the third grade (students age 14) had to repeat the grade. This data team is trying to find out what causes this problem. At the preliminary meetings, this data team focused on generating hypotheses, collecting data, and rejecting or accepting hypotheses. The problem proved to be very complex. One of the hypotheses of the team was that the transfer rules of the school were not strict enough. Students with four or five insufficient marks on their report card were still allowed to transfer from the second to the third grade. These students were not able to compensate for their disadvantage and had to repeat the third grade (instead of the second grade). Data from the report cards showed that this was true, but only for six students. Another hypothesis was that several students ignored their advice to continue secondary education at a lower level, and ran into problems in the third grade. The team had to reject this hypothesis. The students with the advice to continue at a lower level were doing fine in the third grade. Based on questionnaire results the hypothesis that students were not motivated enough, was rejected as well. The questionnaire results did show that students needed help in planning and needed more feedback from teachers on their planning activities. Currently, this data team is working on new hypotheses.

One of the other school-level data teams is responsible for quality care within the school. This team (on which the members rotate every year) comes together every 3 months to discuss the vision and goals of the school. They look at data, such as parent and student focus group data, inspection reports and inspection cards, and data on school leavers and final examination results, to determine whether the school is still reaching its goals, or that changes need to be made. If changes need to be made, they implement these changes and also evaluate these changes. Currently, the quality care data team is working on the parent and student focus group results, together with the student counseling data team. One of the issues addressed in these focus groups was truancy, a special request made by the third grade student (age 14) counselor Joe and his classroom-level data team. The team has noticed that the truancy rates have gone up and they want to know why and what to do about this. The focus group results show that several students complained about the timetable. On Monday, for example, they have a mathematic lesson from 10:00 to 10:50 a.m., then a History lesson from 10:50 to 11:40 a.m., and then a gym lesson at 2:40 p.m., but nothing in between. The parent focus group results show that parents complained that their children have too much homework after school. The team talks about implementing "homework" lessons under the guidance of a teacher in the free hours between 11:40 a.m. and 2:40 p.m.

Emma contemplates again how happy she is with this data team system in her school. She takes a cup of coffee and walks to her office. She turns on her computer and sees that her information management system has new information. The system

warns her that she has only 3 weeks left to provide the Inspectorate with the school prospectus and annual policy plan. She has almost all the documents together, but is still analyzing the last results of the school self-evaluation (the teacher and management questionnaire) together with her quality care data team, and the team is still working on the parent and student focus group results. She also wants to include these results in the annual policy plan. However, she is not worried. She knows she will get all the results by the end of the day. Then, her quality care data team will discuss it with all the teams not directly involved in analyzing the results tomorrow and Wednesday, and they will have the report ready by the end of this week.

She is very happy with the results, because she knows that compared with last year, the school has improved substantially in several areas, including language achievement. Last year, the analyses of the examination results showed that several students failed their final examination in Dutch language, History, and even Mathematics; because of language problems (e.g., they did not reach the threshold of 70 % set by the school). She is confident that this will not happen again this year. Moreover, she knows that once she has handed all the information in, the Inspectorate will use it to write a report on her school. She is eager to get her hands on this report to see how the Inspectorate thinks that they are doing, and of course her quality care data team will be using the results as well.

Next, she sees two red warning lights blinking in the system. The results of the internal final examinations are in, and the scores of the students of one of her mathematics teachers are considerably lower that the results of the students of the other mathematics teacher. From the socioeconomic status information of students, she knows that this teacher has several culturally and linguistically diverse students in her classroom, and decides to first take a look at the value-added achievement of these students (e.g., the progress students made, taking into account their background). She notices that these students made a lot of progress, but also that there seems to be some students "missing the boat." She has to talk to this teacher Jenny and the mathematic data team about what is going on here.

The other red light warns her that in the third grade truancy rates are too high compared to the standards set by the school. She is going to have to talk to the mentor Joe and the student counseling data team to find out what is going on. She also sees a green light burning, which informs her that the measures they took to improve the language skills of students are paying off. Last year, only 40 % passed their annual language assessment. This year, 65 % passed, which means that they have almost reached their goal of 70 %. She makes a note that she has to compliment the language data team for this achievement.

4.2.4 Data-based Decision Making in a Perfect World: Classroom Level

At classroom level, the school also has data teams. All the different departments (e.g., language, science, history) have data teams, which get together weekly or every

other week. In these teams, the teachers set trimester goals (based on the school's vision and yearly goals) for the education they provide and use different sources of data to determine if they are reaching their goals. For example, they analyze and interpret student achievement data (adjusted for data on prior achievement and student demographic data) to determine if all students are at the expected level. They keep track of the students who are struggling, but also the students that do exceptionally well. If problems occur (e.g., students are not reaching the expected achievement level), the team collects additional data to find out what might be causing these problems. For example, they conduct classroom observations or look at truancy data. If necessary, the data teams make changes in the curriculum or in their instruction to reach their goals.

In one of the data teams, teacher Jenny is talking to her mathematic colleagues in their weekly data team meeting. The team analyzed the internal final examination scores, and found out that the scores of Jenny's students on the internal final examination are lower than the scores of the students of her colleagues, and some students did not meet the 70% threshold. The data team is busy analyzing the data. Jenny is very happy that she is not on her own here. She has really supportive colleagues. She finds the use of data very important and finds that it can help her to become a better teacher. Moreover, data in her school are never used to shame and blame, but always in a supportive way to help each other improve education.

The data team establishes that Jenny's students started out with really low mathematic assessment scores, whereas her colleagues' students were higher performing in the beginning and several of their students are gifted in mathematics. They also look at the progress of individual students and are satisfied in general. However, they also notice that there is a group of Jenny's students that is not making as much progress as they would have expected. They also discover that these students seem to have problems with multistep problems in arithmetic. They need to investigate this further. The team decides that Matt will observe one of Jenny's lessons to see how she addresses the needs of her students in this area. Also, the team decides to look into truancy and absence data for this group of students.

At the next meeting, the truancy, absence, and observation data are collected and the team analyzes and interprets the data together. The data team discovers that they do not have a problem with truancy or absence. Next, Matt points out that he observed that Jenny spends a lot less time on multistep problems in arithmetic than is stated in her lesson plan. Also, she tries to explain how to solve multistep problems to her students, but some of the students don't seem to get it. The data team talks about other instructional strategies Jenny might try with these students. The meeting comes to an end and the team decides that in the next meeting they will decide on which strategies Jenny might implement and how they are going to evaluate the effectiveness of this change in the classroom.

All in all, Emma's school can be described as a data-based decision-making school. The school has set goals at school level and classroom level, and different data teams are collecting data (input, process as well as output data) to determine whether or not the school is reaching its goals and if necessary, the school will take action to improve the quality of education.

4.3 Supporting and Hindering Factors

If you compare the stories described above (which are, of course, both a bit exaggerated), you will notice several important differences in how data are used, and in the factors that promote and hinder the use of data. Schools differ in the extent to which they use data in a structured, proactive manner to continuously monitor and evaluate what they do and take action to improve the teaching and learning in the school. The exemplary school does this in a very structured manner, using regular meetings to discuss the available data, analyze data in an integral manner to detect potential causes for why preset targets were or were not met. The entire staff is involved in these actions and participate in taking actions to improve instruction and teaching. However, this ideal situation is not common as most schools react to data or data requests (e.g., the Inspectorate of Education) rather than seek it out. As a result, they fail to use data in a structured and comprehensive manner. A number of conditions seem to account for these variations in data use.

Firstly, a proper functioning *information management system* can promote data use (see also Wayman 2005; Wayman and Stringfield 2006b). Teachers and school leaders in the Netherlands often complain about the lack of access to the data they need. There are also a lot of irrelevant data available in schools and sometimes data are not accessible or they experience information overload or paralysis by analysis. Furthermore, school leaders sometimes need to combine information from as many as three different systems to get the information they need. Schools need to invest in a system that meets their (school leader and teacher) needs.

Most teachers and school leaders in the Netherlands do not possess the *knowledge and skills* needed to collect, analyze, interpret, and use data (Schildkamp and Kuiper 2010; Ledoux et al. 2009). Teachers in one of our previous studies (Schildkamp and Kuiper 2010) indicated that they found it difficult to analyze data to determine the causes of poor results. As one of the teachers put it: "Our examination results are really poor, I am not afraid to admit it. Mine are too. When your results are that poor, you first try to make adjustments in your assessments, and you try to motivate students to work harder. But it is just not concrete enough. It is still too abstract. If I knew what to change, I would have made those changes 5 years ago" (p. 493). We cannot expect school leaders and teachers to possess these knowledge and skills without training at out teacher training colleges or afterwards. Therefore, we need to invest in training.

School staff has to become data literate, they need to have certain expertise to engage in effective data-based decision making (Datnow et al. 2007; Earl and Katz 2006; Feldman and Tung 2001; Young 2006). School staff in Emma's school described above participated 2 years in a data team facilitated by researchers of a university (see Schildkamp and Handelzalts 2011), where they learned how to collect, analyze, interpret, and use data, before they were able to use data without this support. Training and facilitation by experienced researchers is crucial as also described in the New Zealand chapter (Chap. 3).

A positive attitude towards data use is a prerequisite for effective data-based decision making (Datnow et al. 2007; Feldman and Tung 2001; Kerr et al. 2006;

Wohlstetter et al. 2008). One of the barriers to implementing data-based decision making is the lack of buy-in to the process. School staff is sometimes resistant to change their practice and they do not see the need to look critically at data and reflect on their own functioning (Feldman and Tung 2001). Remember the statement made by our teacher Tim: "I have been a teacher for 20 years and data cannot tell me anything I don't know already."

A lack of *teacher collaboration* may also hinder effective data use. Teachers in the Netherlands sometimes are still "King of the castle" in their classroom. They do not collaborate with each other, let alone collaborate on using data. Other studies also show (see e.g., Black and Wiliam 1998) that assessment data, for example, are usually not shared between teachers within schools, nor are they critically reviewed in relation to what they actually assess. However, data use should not be an individual effort but should be a team effort, for example, a data team effort.

Furthermore, *clear vision and goals* are essential for effective data use (Datnow et al. 2007; Earl and Katz 2006; Feldman and Tung 2001; Kerr et al. 2006; Wayman and Stringfield 2006b; Wayman et al. 2007; Wohlstetter et al. 2008; Young 2006). In its vision, schools should state the goals of the school in a way that all personnel can use data in their daily practice to monitor their progress. Moreover, these data should not be used to blame and shame people, but should be used for improvement purposes. If a school has a clear vision and goals, data can be used, at school and classroom level, to determine whether or not the school is reaching its goals. Therefore, these goals should be specific and measurable at the system, school, classroom, and individual student level (e.g., 80 % of the students will be proficient in chemistry). Also, schools should develop goals not only pertaining to student progress, but also to school staffs' own professional responsibilities and learning (e.g., attend a data analyses class).

In addition, teachers seem to be more effective data users when they receive support and *encouragement from the school management* to use data, and when school leaders encourage teachers to use data to reflect on their own functioning. According to Young (2006), for example, school leaders should model data use, and plan and scaffold teachers' learning about using data. In a data team, school leaders and teachers can analyze, interpret, and use data together.

Finally, as stated by Lai and McNaughton (Chap. 3), the availability of *artifacts* seems to be important. Teachers in the data teams (Schildkamp and Handelzalts 2011) stated that having a (short) manual of the entire procedure, including work sheets, made a big difference. It gave them something to hold on to, a structure for using data, which they needed.

4.4 Possible Effects and Side Effects

We believe that effective data use can lead to school improvement in terms of increased student achievement. In some countries, these effects have been demonstrated. Research from New Zealand, for example, shows promising evidence of improvements in student outcomes associated with data use (Lai et al. 2009;

McNaughton et al. 2012). However, these effects have, to our knowledge, not been found in the Netherlands yet. This may partly be due to the fact that data use has not been rigorously studied yet. It probably is also caused by the fact that the use of data is limited in most schools. School staff mostly do not use data in their decisions. Some teachers, for example, disassociate their performance from that of their students, which can cause them to overlook important data. Teachers make most decisions based on what they see happening in their classroom and on their experience as a teacher (Schildkamp and Kuiper 2010; Ledoux et al. 2009).

Ledoux et al. (2009), for example, found that in primary education, most schools collect and register all kinds of data, but they do not use these data systematically to determine if they are reaching their goals, nor do they systematically interpret data and use these for making decisions. Most school leaders and teacher in secondary education in the study conducted by Schildkamp and Kuiper (2010) did not systematically analyze existing data sources within the school, nor apply outcomes of analyses to innovate teaching, curricula, and school performance. Data were mostly used to monitor progress, but outcomes of this monitoring were usually not applied to improve classroom practice.

However, in schools that are using data, several positive effects can be found, including an increased awareness of the quality of teaching one is providing and taking measures to improve the quality of teaching (Ledoux et al. 2009). It has to be investigated further if the use of data in the schools also leads to improved student achievement. Data-based decision making might lead to increased student achievement, but data are, under certain conditions, also used in undesirable ways, causing unintended consequences such as a decline in student achievement or unreliable and invalid information on the performance of the school (Ehren and Swanborn 2012). Schools that lack the skills to analyze and interpret data may use data incorrectly (e.g., interpreting student achievement data wrong when failing to take input characteristics of students into account) and make the wrong decisions on, for example, the provision of extra instruction to students.

4.5 Conclusion and Discussion

Most schools in the Netherlands have a long way to go before they become "data-based decision-making schools." However, some schools are taking important steps along this road. These schools are trying to use data in a structured manner. Collaboratively, with the support of the school management, school staff use data to determine whether or not they are reaching their goals, to determine their strengths and weaknesses, and base decisions on data with regard to how to maintain their strengths and address their weaknesses. We believe if schools continue on this road this eventually will lead to school improvement in terms of increased student achievement, as we have seen in other countries (Campbell and Levin 2009; Cawelti and Protheroe 2001; Lai et al. 2009; McNaughton et al. 2012).

One promising way to increase teacher involvement and collaboration as well as enhance the effectiveness of data-based decision making may be, as stated by (Wayman et al. 2006), setting up data teams within schools. These teams can consist of teachers and school leaders who analyze and use data to improve educational practice. Collaboration helps teachers to learn from each other how to use data, and allows for a fertile exchange of ideas and strategies (Wayman 2005; Wohlstetter et al. 2008).

Currently, we are conducting a study into these data teams. The results of the first pilot show that data teams can be effective in two different manners: (1) a data team uses data to solve a problem, thereby improving education and (2) data team members learn how to use data to improve their work (e.g., professional development; Schildkamp and Handelzalts 2011).

We need to invest in training in the collection, analysis, interpretation, and use of data, in order to make school staff more data literate. We also need to invest in information management systems that address the needs of the users (both school leaders and teachers). Moreover, schools need to become aware of the importance of having a clear vision and goals, the importance of collaboration in the use of data, and the importance of the role of the school leader in creating a "data-use culture" within schools, where data are used for continuous improvement and not for blaming and shaming. These are important steps to continue the journey on the data-based decision-making road.

4.6 Reflection Questions

Researchers and Students

1. What does data use look like in your country? Which types of data are available and which types of data are used by school leaders and teachers and what for?
2. Do the schools in your country have data teams or something similar to data teams? Describe the differences and commanalities.
3. This chapter addresses seven important factors that support data use—a properly functioning information management system (e.g., data availability), knowledge and skills (training), positive attitude towards data, teacher collaboration (data teams), clear vision and goals, encouragement from school management, and the availability of artifacts. Which of these conditions can you confirm from your or other research? Are there other conditions that might support data use, which are not described in this chapter?
4. How would you design and evaluate an intervention based on the seven factors described in this chapter (and based on your/other research)?

Practitioners

Answers the questions below for your school or the schools you are working with:

1. How do(es) your school(s) compare to the two scenarios presented in this chapter (data use in the perfect world and in the real world)? Is it or are they more similar the perfect or real world school? Why do you think that is the case?
2. There are seven important factors that support data use—a properly functioning information management system (e.g., data availability), knowledge and skills (training), positive attitude towards data, teacher collaboration (data teams), clear vision and goals, encouragement from school management, and the availability of artifacts. Thinking about your school(s): which of these conditions are present? Which of these conditions need to be developed further? How can you support your school(s) in developing these conditions?
3. Do you think the data team procedure could be helpful in your school(s)? Think about setting up a first data team in your school(s):

    a. Who should participate?
    b. What problem would you like to investigate? This could be a school-level problem (e.g., a grade retention problem) or a class room-level problem (e.g., low mathematic achievement).
    c. How often can this data team meet and where and when?
    d. Are there facilities available for the data team?

Policy Makers

1. Think of the educational system in your country? How can policy support data use and data teams in schools in your country?
2. There are seven important factors that support data use—a properly functioning information management system (e.g., data availability), knowledge and skills (training), positive attitude towards data, teacher collaboration (data teams), clear vision and goals, encouragement from school management, and the availability of artifacts. Which of these conditions can you influence with policy and how?

References

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan, 80*(2), 139–148.

Breiter, A., & Light, D. (2006). Data for school improvement: Factors for designing effective information systems to support decision-making in schools. *Educational Technology & Society, 9*(3), 206–217.

Brunner, C., Fasca, C., Heinze, J., Honey, M., Light, D., Mandinach, E. et al. (2005). Linking data and learning: The grow network study. *Journal of Education for Students Placed at Risk, 10*(3), 241–267.

Campbell, C., & Levin, B. (2009). Using data to support educational improvement. *Educational Assessment, Evaluation and Accountability, 21,* 47–65.

Cawelti, G., & Protheroe, N. (2001). *High student achievement: How six school districts changed into high-performance systems*. Arlington: Educational Research Service.

Coburn, C. E., & Talbert, J. E. (2006). Conceptions of evidence use in school districts: mapping the terrain. *American Journal of Education, 112,* 469–495.

Datnow, A., Park, V., & Wohlstetter, P. (2007). *Achieving with data. How-high performing school systems use data to improve instruction for elementary students.* San Francisco: Center on Educational Governance University of California.

Earl, L. M., & Katz, S. (2006). *Leading schools in a data-rich world. Harnessing data for school improvement*. Thousand Oaks: Corwin.

Ehren, M. C. M., & Swanborn, M.S.L. (2012). Strategic data use of schools in accountability systems. *School Effectiveness and School Improvement, 23*(2), 257–280.

Eurydice. (2009). *Organisation of the Education system in the Netherlands*. The Haugue: European Commission. Retrieved from http://eacea.ec.europa.eu/education/eurydice/eurybase_en.php#description. Accessed 15 Nov 2011.

Feldman, J., Tung, R. (April 10–14, 2001). *Whole school reform: How schools use the data-based inquiry and decision making process.* Paper presented at the American educational research association conference, Seattle.

Ikemoto, G. S., & Marsh, J. A. (2007). Cutting through the data-driven mantra: Different conceptions of data-driven decision making. In P. A. Moss (Ed.), *Evidence and decision making*. Malden: Wiley-Blackwell.

Kerr, K. A., Marsh, J. A., Ikemoto, G. S., Darilek, H., & Barney, H. (2006). Strategies to promote data use for instructional improvements: Actions, outcomes, and lessons from three urban districts. *American Journal of Education, 112*, 496–520.

Ledoux, G., Blok, H., Boogaard, M., & Krüger, M. (2009). *Opbrengstgericht werken. Over de waarde van meetgestuurd onderwijs* (*Data-driven decission making: the value of data-driven education*). Amsterdam: SCO-Kohnstamm Instituut.

Lai, M. K., McNaughton, S., Amituanai-Toloa, M., Turner, R., & Hsiao, S. (2009). Sustained acceleration of achievement in reading comprehension: The New Zealand experience. *Reading Research Quarterly, 44*(1), 30–56.

McNaughton, S., Lai, M. K. & Hsiao, S. (2012). Testing the effectiveness of an intervention model based on data use: A replication series across clusters of schools. *School effectiveness and School Improvement, 23*(2), 203–228.

Ministerie, van Onderwijs Cultuur & Wetenschappen (1999). *Varie¨teit en waarborg: Voorstellen voor de ontwikkeling van het toezicht oponderwijs (Diversity and a guarantee: Proposals for the development of the supervision of education).* Zoetermeer: Ministerie van Onderwijs, Cultuur & Wetenschappen.

Schildkamp, K., & Ehren, M.C.M. (submitted). *An exploratory study into the use of accountability data in the Netherlands*.

Schildkamp, K., & Handelzalts, A. (2011, April). *Data teams for school improvement.* Paper presented at the American Educational Research Association Conference, New Orleans, USA.

Schildkamp, K., & Kuiper, W. (2010). Data-informed curriculum reform: Which data, what purposes, and promoting and hindering factors. *Teaching and Teacher Education, 26*, 482–496.

Wayman, J. C. (2005). Involving teachers in data-driven decision making: using computer data systems to support teacher inquiry and reflection. *Journal of Education for Students Placed at Risk, 10*(3), 295–308.

Wayman, J. C., & Stringfield, S. (2006a). Data use for school improvement: school practices and research perspectives. *American Journal of Education, 112,* 463–468.

Wayman, J. C., & Stringfield, S. (2006b). Technology-supported involvement of entire faculties in examination of student data for instructional improvement. *American Journal of Education, 112*, 549–571.

Wayman, J. C., Midgley, S., & Stringfield, S. (2006). Leadership for data-based decision making: Collaborative educator teams. In A. Danzig, K. Borman, B. Jones, & B. Wright (Eds.), *New models of professional development for learner centered leadership* (pp. 189–205). Hillsdale: Erlbaum.

Wayman, J. C., Cho, V., & Johnston, M. T. (2007). *The data-informed district: A districtwide evaluation of data use in the Natrona County School District.* Austin: The University of Texas.

Wohlstetter, P., Datnow, A., & Park, V. (2008). Creating a system for data-driven decision-making: Applying the principal-agent framework. *School Effectiveness and School Improvement, 19*(3), 239–259.

Young, V. M. (2006). Teachers’ use of data: loose coupling, agenda setting, and team norms. *American Journal of Education, 112,* 521–548.

Chapter 5
Professional Attitudes to the Use of Data in England

Christopher Downey and Anthony Kelly

Parkview Comprehensive School certainly isn't short of data. Teachers and school leaders collect a wealth of data throughout the week, which is used to track pupil progress and well-being and to inform decision making at all levels in the school. Teachers in the school are currently having a meeting on their data use practices. Greg, the Inclusion Leader at Parkview, is responsible for ensuring that the students with additional educational needs are swiftly identified and have their needs met. He comments to the school team on the importance of data use: "You become much more effective, and awareness is much more acute. There is no room for guess work now because you've got the data. It pinpoints exactly where the kids are. What's the problem? Why is it happening? It's those sorts of conversations that you begin to have. It is transforming. Everything is moving forward and the data is, if you like, underpinning all that".

Eric, a middle leader with a pastoral responsibility for pupils, makes a connection between data and teacher effectiveness: "I agree very strongly with regular monitoring and comparing against targets. We need to look at it class-wise and teacher by teacher. There are teachers who are consistently overachieving with particular groups of students. We need to look at what they are doing so that we can spread it wider. And, if there are teachers where groups of pupils consistently underachieve, then we need to make sure we put the support in place to make sure that that doesn't happen again".

Not all teachers at Parkview are as positive about this approach to data use. Phil comments that he is afraid that the school has a rather narrow definition of data, basically that data use is only about the use of assessment data. This is typical of the way data tend to be viewed in England due, at least in part, to the strong focus on external accountability and school performance in school 'league tables'. This leads Roberta, another pastoral leader at Parkview to comment: "I don't think data is deliberately used to hold teachers professionally accountable, but it seems to be the inevitable consequence of data use. I think this is a negative way forward, creating the same problems as seen in the health service".

Like all schools in England, Parkview has access to extensive datasets for benchmarking and self-evaluation based on the attainment and progress of pupils in national assessments. These are the same attainment data which are used to produce the array of school performance indicators that find their way into 'league tables'. John, a Deputy Head at the school expresses a cynical view of the accountability agenda associated with data. John feels that the system sometimes rewards game-playing behaviour at the expense of genuine, data-informed enquiry; "You do feel that it is very much a political game and you are having to put a spin on your data and use it to show the school in the best light, and really sometimes to me that works against trying to find where you need to develop your capacity to improve".

C. Downey (✉) · A. Kelly
Southampton Education School, University of Southampton, Southampton, UK
e-mail: cdowney@soton.ac.uk

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_5, © Springer Science+Business Media Dordrecht 2013

> Clare is Parkview's 'Data Manager' and, like John, a member of the school's Senior Leadership Team. Part of her role is managing and responding to the range of views on data use among the teaching staff. She admits: "I know some teachers are a little worried that schools are—and our school is—becoming very data-driven and that we are forgetting the individual. But I think there is a happy medium and I wouldn't want my school or myself criticised for not providing enough information to staff". Clare sees herself first and foremost as a 'data facilitator' rather than a 'data manager' and is convinced that she should model effective data use to her colleagues. She states, "As an Assistant Head teacher, I think it really allows me to encourage students to consider just how able they are. When I spent some time with this student and we went through all her data... Suddenly she felt confident and I find that amazing; the confidence that it can give to students. That's something I couldn't have done 10 years ago and I think that's brilliant. It's very powerful".

5.1 Introduction and Background

> England arguably has more data and more sophisticated data about education than any other jurisdiction in the world. (Earl and Fullan 2003: 385)

Even as Earl and Fullan were reaching their conclusion that the English education system is awash with data, more extensive and more sophisticated datasets were being devised and constructed by a range of stakeholders engaged in education including Government, charitable trusts and commercial organisations. Many of these datasets have been made available to schools in order to inform their self-evaluation and school improvement, as well as facilitating the production of public performance indicators such as those included in the now infamous English school 'league tables', formulated each year by the media shortly after the Government releases its annual summary of school performance data in its School and College Performance Tables (DfE 2010).

Schools have always collected a wealth of *internal* data, such as the results of teacher assessments, attendance data, pupil behaviour records, the outcomes of pupil surveys, etc. Such internal data sources provide information for schools that is both pupil- and school-specific and can be an extremely useful source of data to inform decision making and improvement planning. For many years, schools have supplemented their analysis of internal data with *external* data sources in the form of the academic outcomes of national assessments such as National Curriculum Standard Attainment Tests (SATs) at age 11, the General Certificate of Secondary Education (GCSE) at age 16 and Advanced level (A-level) examinations at age 18. It is the pupil-level attainment and progress data constructed from the outcomes of these national assessments, which form the major focus for this chapter. We recognise that this takes a particularly narrow view of data being used in schools.

A key advantage of these external assessments is that they allow schools to benchmark their performance, in so much as that can be measured by the outcomes of these national assessments, against the performance of pupils in other schools. In the past, such benchmarking data were solely expressed as the proportion of a school's students attaining a particular grade threshold, simply a 'raw' attainment measure,

neither adjusted for the prior attainment of the pupils on entry to the school, nor for contextual differences between individual pupils or schools. Over time, these externally produced data sources have been increasingly used to determine the effectiveness of schools and to report school performance in the public domain, thereby holding schools to account for the academic outcomes of their pupils. Thus, schools have become preoccupied (some might even argue that it is an obsession) with data based solely on the academic outcomes of pupils in the form of scores from assessments carried out at the end of the primary (4–11) and secondary (11–16) phases of the English school system. We have described the development of various school performance indicators in England both for public accountability and for school improvement purposes in detail elsewhere (Kelly and Downey 2011) but give a brief summary here for the indicators associated with secondary schools.

The UK Government issued its 'Parents' Charter' early in the 1990s, heralding the publication of the first school performance tables and the establishment of a new independent school inspection regime. At that time, only the percentage of pupils attaining particular attainment thresholds in GCSE and in A-level examinations were published in the performance tables, together with data on mean pupil attendance and the number of pupils requiring a high level of additional support in each school. Many school leaders and teachers became frustrated with crude nature of these raw, unadjusted threshold measures of school performance. Academic researchers working within the field of school effectiveness had been developing value-added measures of school performance, adjusting for the prior attainment of individual pupils, and some schools and local authority (school district) staff became aware of the potential of these more sophisticated measures to inform school improvement through participating in studies conducted by teams of school effectiveness researchers. Eventually, value-added measures found their way into the published tables of school performance, as well as being provided to schools for the purpose of benchmarking and self-evaluation. Initially, the value-added (VA) models of pupil academic progress adjusted simply for the prior attainment of pupils. Later, more complex contextual value-added (CVA) models were developed, taking into account (or adjusting for) a wide range of factors considered to be outside the control of schools, including pupil-level factors such as sex, measures of socio-economic status, ethnicity, and also school-level factors such as the mean prior attainment of pupils in the same cohort. The development of these value-added measures of school performance was, by and large, supported by teachers (Saunders and Rudd 1999), though the explicit aim of introducing them was, according to Government, to foster a culture of 'intelligent accountability' within schools (Miliband 2004), and to make schools 'data rich' (Miliband 2003) on the implicit assumption that such data can lead to improved outcomes for pupils (Schildkamp et al. 2009).

Since their introduction, both raw attainment and value-added progress measures have been used to focus school improvement on self-evaluation and pupil target-setting, as well as being part of the UK government's accountability agenda through the publication of performance tables, the work of School Improvement Partners and the Ofsted (Office for Standards in Education, Children's Services and Skills) inspection framework. Performance data have been presented to schools in a variety

of incarnations such as Performance and Assessment (PANDA) reports, the Pupil Achievement Tracker (PAT) and most recently via the sophisticated outputs produced by the web-based 'RAISEonline' (RAISE is an acronym for Reporting and Analysis for Improvement through School Self-Evaluation). Pupil attainment and progress data now flow to schools from a variety of sources including the Government Department for Education (DfE), Ofsted, the Fischer Family Trust (an independent charity involved in the development of education in England and Wales) as well as a range of commercial organisations marketing self-evaluation data services to schools such as the internationally recognised Centre for Evaluation and Monitoring (CEM). The requirement to make use of pupil attainment and progress data is written into the national Teacher Performance Standards: from trainees seeking Qualified Teacher Status providing evidence that they can use it 'to evaluate the effectiveness of their teaching' (TDA 2007a: 9), through all levels of classroom practitioner (TDA 2007b, c) to the relatively new category of 'Excellent Teachers' who are charged with the wider responsibility of using data to 'analyse and evaluate the effectiveness of teaching and learning across the school' (TDA 2007d: 7).

The assumption that the availability and use of pupil attainment and progress data will improve performance at the school, classroom and pupil levels, presupposes that school culture around its use can facilitate high-level professional enquiry, and that adequate management structures exist in schools to facilitate its utilisation. Yet, good management structures alone are not sufficient. There are other obstacles to the development of data-friendly cultures in schools, such as:

- the tension inherent in the fact that the same data are used for both improvement-evaluation and accountability-monitoring purposes—the same (yard)stick used by teachers to improve own performance can also be used as a stick to 'beat' them;
- the data literacy requirements associated with predominantly quantitative pupil attainment and progress data—some of the terminology used to facilitate the professional dialogue needed when schools engage with these types of data is based on complex statistical models and carries a context-specific set of terms such as 'significance' and 'confidence', which, while straightforward to those familiar with the technical aspects of their use, also have different shades of meaning in everyday life (Downey and Kelly 2007, 2008).

Previous research, focused predominantly on the perspective of school leaders, has revealed many top-down issues regarding data use (e.g. Stevens et al. 2005; Day et al. 2008), but such a perspective needs to be balanced by the equally important bottom-up perspective of teachers (e.g. Bush et al. 2005). It is a common practice in secondary schools in England to appoint a 'data manager' to oversee and coordinate the use of data throughout the school. These teachers, often senior leaders in their school such as Deputy or Assistant Head teachers, play a crucial role, though there are mixed views of the position. It is viewed by some as valuable in providing tailored outputs that obviate the need to learn complex systems; by others as adding yet another layer to the hierarchy in schools (Kirkup et al. 2005). Generally, teachers' professional attitudes to data use, while influenced by the way data are presented and managed by 'data managers' (Dudley 1997, 1999a, b), can also be shaped by teachers' emotional response to various sources of data.

5.2 Research Questions and Research Base

The remainder of this chapter describes an exploratory, survey-based research study designed to elicit teachers' professional attitudes to the use of data in a sample of English secondary schools. The project was designed as a pilot for more in-depth research into teacher attitudes to the use of pupil attainment and progress data. For the purpose of this study, we restricted the definition of data specifically to pupil attainment and progress data; both from *external* sources such as those provided by government or other organisations, and also schools' *own* data generated through internal assessments and tests. While we recognise that schools have access to, and utilise, a much wider body of data to inform school improvement and decision making, the focus on pupil attainment and progress data adopted in this research study reflects something of the bias towards these type of data in the regular practice of English secondary schools working within the public accountability domain described previously.

We sought to capture responses to data in terms of teachers' self-reported level of, and attitudes toward data use in order to answer the following research questions.

1. To what extent do teachers report making use of pupil attainment and progress data in their professional roles?
2. What is teachers' self-reported level of understanding of data? Are teachers confident that they have the skills necessary to make use of data?

Training is key to improving teachers' 'data literacy' and can provide the necessary knowledge and skills to access, analyse and interpret data (Wayman 2005; Earl and Katz 2006; Vanhoof et al. 2010). Such training can impact on teachers' confidence and willingness to make use of data.

3. What frequency of training in data use do teachers report receiving?

The structures that schools set up to manage data, in terms of their collection, access, analysis and interpretation, are all vital in facilitating the effective use of data to inform and improve teacher practice and student learning (Earl and Fullan 2003; Earl and Katz 2006; Wayman et al. 2006; Wohlstetter et al. 2008). The key element in research into the management of data lies not so much in *how* the data are managed, but rather by *whom*.

4. Who, in the teachers' view, is currently responsible for managing, analysing and interpreting data in their school and who would teachers prefer to fulfil these roles? Do teachers report having access to data?

In any high-stakes accountability environment, such as the one in the contemporary English or US educational systems, there is always an inherent tension in the use of the same data both for accountability and improvement purposes (Schildkamp and Teddlie 2008). Even in settings with less emphasis on the use of data for public accountability, the use of data to provide evidence of school performance for the purpose of self-evaluation still holds this same tension in view (Vanhoof and Van Petegem 2007).

5. What do teachers perceive as being the current reasons for collecting pupil attainment and progress data? What do they think should be the reasons for collecting data?

5.3 Selecting and Recruiting the Participating Schools

Secondary schools (those teaching pupils up to at least the age of 16) were recruited to participate in the survey based on their school performance profile according to key measures published in the 2008 School Performance Tables. The school performance profile is based on:

- *Proportion of pupils attaining five or more high grades at GCSE (2008)*: The raw attainment threshold measure we selected for allocating schools to various data profiles was the percentage of the school's pupils attaining high grades (grades A through C) in the 2008 GCSE examinations in five or more subject areas including English and mathematics. Grades awarded in GCSE examinations run from A through G. A supplementary A* grade is awarded to pupils achieving the highest range of scores. This is a well-established performance indicator used in the annual published tables and the indicator that gets the most attention in the media's production of 'league tables' of school performance. The threshold for low attainment was set as 30 % of the school's pupils, as this figure was declared in 2006 as a new 'National Challenge' benchmark by the UK Government that all schools should aim to exceed, and any schools with attainment below this threshold were deemed to be potentially failing their pupils. The threshold for high attainment was set at 60 % in line with criteria used to allocate certain secondary schools into a 'High-Performing' category (PricewaterhouseCoopers 2008: 8).
- *The CVA score published in the 2008 tables*: CVA is a measure of the academic progress made by pupils in a school by age 16. It adjusts for the prior attainment of a secondary school's pupils based on national assessments made prior to intake (at age 11), as well adjusting for a number of other contextual factors considered to be beyond the control of the school. The CVA scores published in the 2008 School Performance Tables included 95 % confidence intervals to indicate whether each school's CVA score was significantly above, in line with, or significantly below the national average score, which we used to allocate schools to the performance data profiles for recruitment to the survey.

Application of these national school performance indicator thresholds identified a number of schools with complementary and contrasting school-level performance data profiles. Table 5.1 presents the performance data profiles (2008) of the schools in this study.

Schools in these seven performance data profile groups constituted a total of 1,383 schools; 45 % of secondary schools in England. The sample schools were contacted by telephone and, for those schools with which contact was made (1,341 schools), an e-mail invitation was sent to the Head teacher inviting participation in the survey

Table 5.1 GSCE, CVA scores and data profiles (2008) of the schools selected for this study

Proportion of pupils attaining five or more high grades at GCSE (2008)	Significance of school CVA score (2008)	Summary of school 2008 performance data profile	No. of invited schools	No. of responding schools (% response)	No. of teachers responding (% response)
60 % and above	Above average	Plus-plus (PP)	302	44 (14.6)	223 (27.4)
60 % and above	Below average	Plus-minus (PM)	59	11 (18.6)	60 (7.4)
Below 30 %	Above average	Minus-plus (MP)	90	8 (8.9)	23 (2.8)
Below 30 %	Below average	Minus-minus (MM)	187	28 (15.0)	100 (12.3)
Below 30 %	Non-significant	Other national challenge (ON)	153	13 (8.5)	36 (4.4)
30–50 % inclusive	Below average	Coasting[a] on CVA (CC)	386	51 (13.2)	253 (31.1)
Declining trend over the previous 4 years	Non-significant	Coasting on trend (CT)	164	23 (14.0)	118 (14.5)
Total			*1341*	*178 (100)*	*813 (100)*

[a]The criteria for identifying 'coasting schools' (Balls 2008) included measures of raw attainment (in terms of absolute value and recent trend) and of value-added progress (in the form of a significantly low CVA score). Although no upper limit on the percentage of students obtaining five or more A-C GCSE passes (including English and mathematics) was set by the Secretary of State in his criteria for the identification of coasting schools, the 30–50 % figure was widely used in the national media (Lipsett 2008)

and requesting that the Head teacher forward the details of the survey to all members of the teaching staff in the school. A total of 813 teachers participated in the survey by completing the questionnaire. The participating teachers were drawn from 178 different schools with a range of school-level performance profiles (see Table 5.1).

While the response rate in terms of number of schools from which the participants are drawn is relatively low, it was not our intention in this exploratory research to determine findings that should be generalisable to all secondary schools in England. Our aim was to go beyond the focus on school leaders adopted in previous research in order to elicit professional attitudes towards data across the full range of responsibilities held by teachers.

5.4 Collection of Data

The online questionnaire consisted of 28 items. The initial group of items collected demographic information about the participants (such as sex, subject specialism, level of responsibility, age and length of teaching experience—these last two grouped

into age categories). The remaining questions explored the themes in the core research questions including extent (frequency) of data use, level of understanding of data and perceived confidence to use data. The third and final set of items explored issues relating to the management of data in terms of who is *actually* responsible for data management, analysis and interpretation in the participating schools, and who teachers think *should be* responsible for these tasks.

Participants were also asked if they would be willing to be contacted by the research team to give further responses related to the focus of the survey. A quarter of the participants (220) indicated their willingness to participate in this way and we contacted half of these and invited them to participate in a brief (approximately 20 minutes) telephone interview to which 20 responded within the timeframe available to us. The interviews explored themes such as how participants perceived data impacting on their role in school, and their perceptions and attitudes towards their school's practice with regard to data use.

5.5 Discussion of Findings

In our survey, the various levels of responsibility prevalent in secondary schools were categorised as follows:

- Senior Leaders, divided into Head teachers, Deputy Head teachers and Assistant Head teachers.
- Middle Leaders, divided into Subject (or Department) Leaders, Pastoral Leaders and Key Stage Leaders.
- Classroom teachers.

In this discussion, the terms teachers and staff are used interchangeably to provide variation and always refer to participants across the full range of levels of responsibility, acknowledging that Head teacher and their other senior leadership colleagues are also teachers. Where the commentary is related to those participants reporting classroom teaching as their highest level of responsibility, with no other leadership role, this will be clearly stated.

5.5.1 Use of Pupil Attainment and Progress Data

With regard to research question 1 (To what extent do teachers report making use of pupil attainment and progress data?), we found that there were significant relationships between teachers' self-reported extent of use of pupil attainment and progress data and teachers' position of responsibility within the school. On average, higher positions and greater levels of responsibility were associated with higher levels of data use.

Participants reported that the use of pupil attainment and progress data was widespread practice in their schools (Fig. 5.1)—approximately 85 % stated that

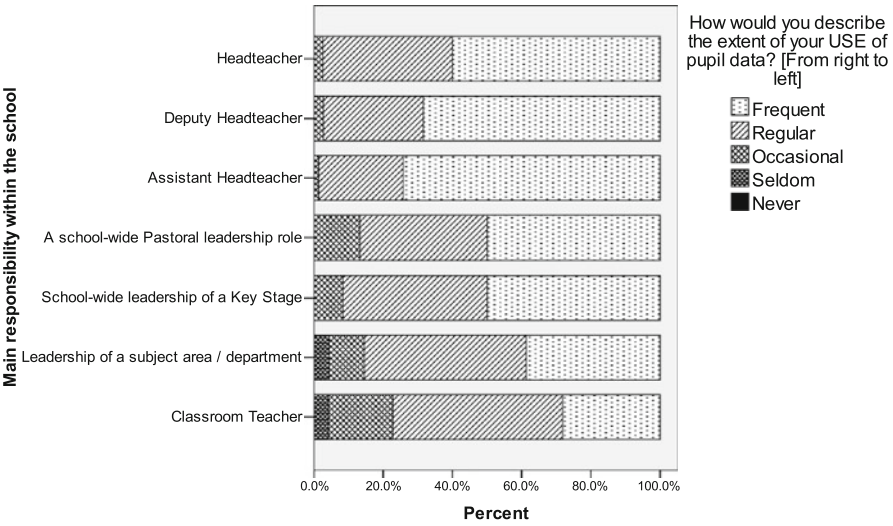

Fig. 5.1 The extent of use of pupil data by level of responsibility

they used data regularly or frequently. Classroom teachers reported the lowest extent of use and there was a plateau effect among participants who held senior positions of responsibility. Deputy and Assistant Head teachers reported more extensive use of data than Head teachers. This finding is consistent with the role of school 'data manager' usually being delegated by Head teachers to one or more of their junior colleagues within the senior leadership group of teachers.

However, some teachers indicated that the school was spending too much time on using data, as illustrated by the comment: "I disagree that we should be spending so much time analysing data... to look at underachievement or overachievement. You're spending a lot of time looking at the data and not enough time in the corridor checking what the children are doing on a day-to day basis" (Deputy Head teacher).

Overall, participating schools with significantly positive CVA scores in their school performance profile (PP and MP types) had higher levels of data use, and 'coasting' schools (both CC and CT types) reported significantly less frequent use. A significant relationship between school type and the extent of use of data *by classroom teachers* was observed, which may be indicative of a data culture that places particular value on the role pupil attainment and progress data plays in self-evaluation throughout the range of staff working in schools with high value-added data profiles. Consistent with this conclusion was the finding that teachers in participant schools with high raw attainment but significantly negative CVA (the PM type) were most likely to report an extent of data use that was only 'occasional' or 'seldom'. Further evidence of a more distributed approach to data use in the high-use school types (PP, MP), was suggested by the fact that middle leaders with school-wide pastoral responsibilities reported the highest levels of use along with Assistant Head teachers.

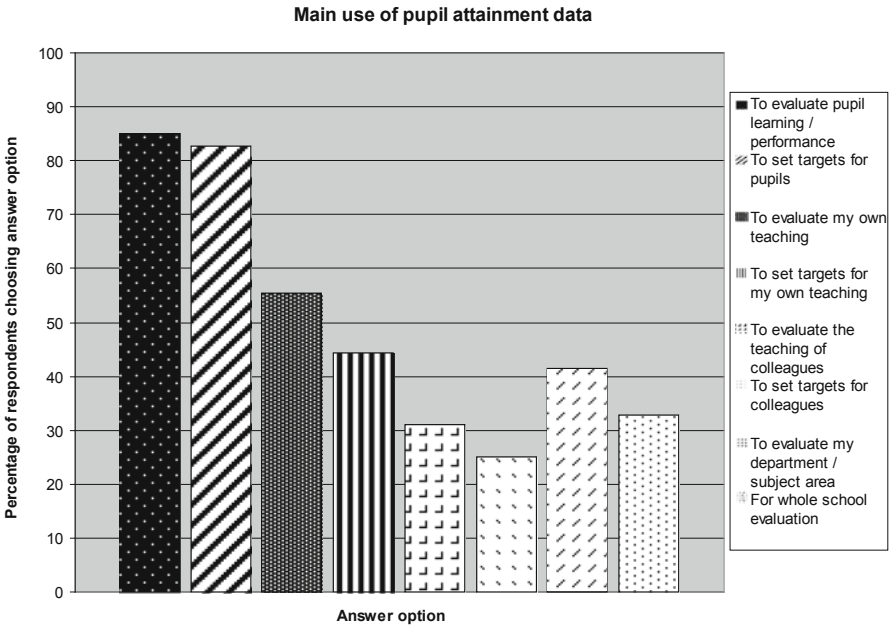

Fig. 5.2 What school staff do with pupil data

Figure 5.2 shows what staff reported that they *do* with data. The most popular uses (*to evaluate pupil performance* and *to set targets for pupils*) were pupil-focused, rather than teacher- or accountability-focused. Just over 50 % reported using data *to evaluate own teaching* and a lower percentage (42 %) used it *to set targets for own teaching*. Teachers indicated that schools were starting to make more structured use of data, as a pastoral leader explained: "We're a (National) Challenge school, so obviously the pressure is on as far as GCSE results are concerned. That has influenced hugely the way we use target data. Before that happened, it was very ad hoc and some departments used it well and some did not. It is now much more consistent across the school".

5.5.2 *Teachers' Understanding of Pupil Attainment and Progress Data and Confidence in Their Skills to Access, Utilise and Interpret Data*

With regard to research question 2 (What is teachers' self-reported level of understanding of data? Are teachers confident that they have the skills necessary to make use of data?), we, once again, found significant relationships between teachers' self-reported understanding of pupil attainment and progress data and their position of responsibility within their school. Higher positions of responsibility were associated

with higher levels of understanding of data. The majority of teachers rated their understanding of pupil attainment and progress data as 'good' (on a 5-point scale ranging from very good to very poor).

However, teachers did raise some questions in terms of the background to external data, as became clear from the statement made by one of the teachers in the questionnaire: "We get these arbitrary targets and I don't know exactly how they have been created, but I don't feel that they are very accurate. And they seem to get worse every year; they seem to set absurdly high targets which we then know we'll fail to reach. And they don't really explain how they get to these targets. I feel that somebody ought to be protesting about this because we get beaten with that stick".

Essentially, teachers' self-rating of their understanding increased with role seniority, although there was a reversal between Deputy Head teachers and Head teachers, where Deputy Head teachers report the highest levels of understanding, which may again be explained by the fact that deputies are more often charged in the first instance with managing the use of pupil attainment and progress data across their school. Although the relationship between understanding of data with the school performance data profile was found *not* to be significant, staff in PM and coasting schools rated their understanding lower than those in schools with other data profiles.

When asked, "Do you feel confident that you have the skills to access /utilise/interpret data?" over 80 % of participants reported being confident that they possessed the necessary skills for these tasks. This question was designed to elicit teachers' perceived confidence as to whether they possess the whole gamut of skills required to successfully engage with data. We found no significant relationship between participants' perceived confidence and the ir level of responsibility. Classroom teachers and Subject Leaders were, on average, only slightly less confident about their skills than those in other responsibility categories. Those who lacked confidence in their own skills used a free response follow-up question option to report the following issues:

- the challenge of technical aspects of processing and interpreting data and the need for more time and opportunities to develop skills through in-service training;
- lack of help for those using RAISEonline and Schools Information Management Systems and a dearth of training on the interpretation of VA and CVA data;
- lack of familiarity with what is available so that informed choices can be made as to the utility value of the various pupil attainment and progress data sources;
- the tension between the metrics being too crude on the one hand and too complex on the other;
- the prevalence of jargon and acronyms;
- concerns that the available data lack application to *individual* pupils and problems regarding aggregation;
- making links between data, school improvement interventions and classroom practice.

And, in terms of *how* teachers would like their skills developed and improved, they suggested:

- more after-school/one-to one support sessions, preferably for school-specific training in generic aspects of data utilisation;
- that data utilisation should form a larger part of initial teacher training courses;
- regular in-school forums to establish priorities and update staff once skills are acquired;
- regular opportunities to dry-run/practise data techniques, and checks that interpretations are correct through greater use of worked examples in training;
- policy makers should 'stop moving the goalposts' by expanding or modifying the suite of school performance measures.

5.5.3 The Impact of Training and Continuing Professional Development

With regard to research question 3 (What frequency of training in data use do teachers report receiving?), we found that there was a significant relationship between teachers' self-report that they possess the necessary skills to access, utilise and interpret data and the reported frequency of training and professional development received in the area of data utilisation and interpretation in the last 5 years. Overall, about 40 % of participants reported receiving training or continuing professional development (CPD) at least annually. For another 40 %, training was less frequent than annually and 18 % reported having never received any training in the last 5 years. Relative to other feedback in this survey, and given the high volume of CPD in schools generally, this is not a positive picture. What is not available in our survey results is any background information on the nature and quality of CPD related to data use and interpretation, although some of the suggestions listed above on as to how teachers would like to improve their confidence in their ability to handle data shed light on what some participants feel is missing from their data-related CPD. One classroom teacher indicated that: "If I were in charge I would make sure that teachers could actually understand what is going on, so they would need training rather than just being told that these are the scores you have to achieve". Or, as stated by a pastoral leader: "People are finding it difficult ... getting to grips with the data, rather than the actual information that the data holds. There is a big difference between data and information and I don't think we have entirely grasped that".

Classroom teachers and department heads reported the lowest frequency of CPD (and the highest levels of never having received training), though 11 % per cent of Head teachers, 8 % of Deputy and Assistant Head teachers, 18 % of middle leaders and 27 % of classroom teachers reported not having received *any* training over the past 5 years. Furthermore, we found that there was a significant relationship between reported frequency of training and perceived skills in accessing, utilising and interpreting data, with a very clear drop in confidence among those who reported not having received training any time during the last 5 years. The positive news is that this analysis shows that the impact of recent training, however infrequent, can be appreciable.

The relationship between understanding and frequency of data-related training is found to be moderated by the level of responsibility.

- Senior and middle leaders divide into three significantly different groups:
  - Those reporting *annual* or *more frequent than annual* training were associated with reporting the greatest level of understanding of data.
  - Those reporting *less frequent than annual* training reported significantly lower levels of understanding of data.
  - Those reporting *not having received any training during the last 5 years* reported the lowest levels of understanding.
- For classroom teachers, the key appears to be receiving training *on at least an annual basis* in order to improve their reported level of understanding of data, with less frequent training being of no significant value in improving reported understanding.

5.5.4 *Management, Analysis and Interpretation of Pupil Attainment and Progress Data: Who Does What and Who Should Do What in Schools?*

With regard to research question 4 (Who in teachers' view is currently responsible for managing, analysing and interpreting data in their school and who would teachers prefer to fulfil these roles? Do teachers report having access to data?), we found that the majority (59 %) of participants reported that data *management* is mostly done by *one* senior colleague with only 28 % reporting that *a number of* senior colleagues engage in data management. Management of data was less often distributed than data *analysis* and data *interpretation*. There were no significant differences in who *manages* pupil data across the different school types, though in terms of data *analysis*, coasting schools reported a significantly lower involvement of senior staff and PM schools the greatest engagement of classroom teachers. Generally, the number of teachers reporting involvement in data *interpretation* was twice the number involved in data *analysis* across all school types.

Figure 5.3 shows who staff think *should be* responsible for data *analysis*. The responses for data *interpretation* were almost identically distributed. The overall preferred approach is for Subject Leaders or for a team of senior colleagues to analyse (and interpret) the data. Less than 20 % of participants felt that data should be analysed and interpreted by an individual senior colleague such as a data manager or a Deputy Head teacher, and more than one-third felt that data should be analysed and interpreted by classroom teachers.

There were no appreciable differences across the responsibility range of participants with regard to who staff feel should be responsible for data analysis, though a strong opinion exists among some staff that classroom teachers should be the ones

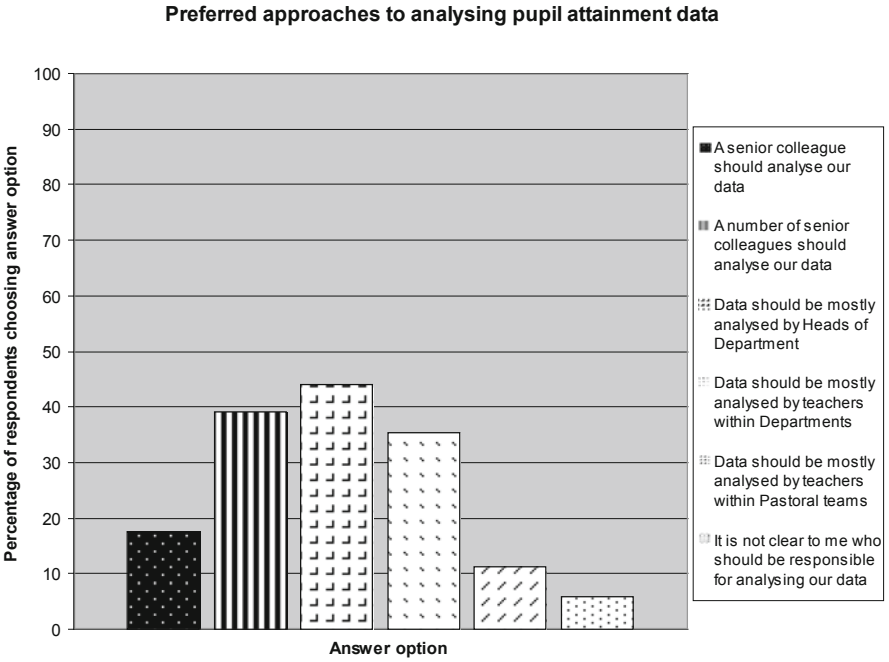

Fig. 5.3 Who should be responsible for data analysis

to *analyse* pupil attainment and progress data. Generally, participants felt even more strongly that classroom teachers should be responsible for data *interpretation*.

On the whole, teachers reported that pupil attainment and progress data were widely and readily available in the participating schools. Almost 60 % of staff can access pupil data *and* carry out their own analysis and interpretation; 20 % indicated that it is accessible only to staff with a management position in the school or is given to others (by management) pre-interpreted, the remaining 20 % reported that their analysis of data is limited to their own teaching subject area. In terms of school type, data were least widely available in coasting schools and schools with CVA scores significantly below average (PM and MM).

While the full range of teachers reported having access to data, what is clear is that the *extent* of access to data remains an issue more than a decade on from the conclusion by Black and William (1998) that data are not generally shared *between* teachers within schools, and are not always considered critically in terms of their relevance. Classroom teachers and Subject Leaders reported that pupil attainment and progress data are least available to them. Generally, the more senior the role a teacher holds, the greater the reported access to data and the greater the facility to carry out one's own analysis and interpretation. Classroom teachers and Head teachers, perhaps unsurprisingly, but for different reasons, reported being given pre-interpreted data more than other staff. Classroom teachers and Subject Leaders were

also the categories most likely to be able to access *only own subject data*. As one of the classroom teachers stated: "The Head teacher . . . likes to hold on to these things, you know. He likes his secrets and data is one of his things. That's what he does. So sometimes it's difficult to find out where all the data has come from; what the background is. He is giving me a figure that a kid is to get by the end of the year. Well, where have you got that from? What have you included and what have you not?"

5.5.5 *The Rationale for Collecting Pupil Attainment and Progress Data: What Teachers Perceive It To Be and What They Consider It Should Be*

With regard to research question 5 (What do teachers perceive as being the current reasons for collecting pupil attainment and progress data? What do they think should be the reasons for collecting data?), we asked participants to select (from eight options) what they felt were the current reasons for collecting pupil performance data, and in a supplementary question what they felt should be the reasons for collecting it. Figure 5.4 shows the range of responses: the first four (on the left of Fig. 5.4) are reasons internal to the school; the second set of four (on the right of Fig. 5.4) are reasons external to the school.

The two reasons most often for collecting pupil performance data are '*to assist schools in the process of self-evaluation*' and '*to enable pupils to make better academic progress*', but more importantly, it is noticeable that internal reasons were more often chosen than external reasons. There is little to differentiate by school type, and newly qualified teachers more often felt that the purpose is '*to enable parents to choose the best school for their children'*. Deputy Head teachers and Key Stage leaders also stood out: 100 % of the former stating that pupil data are collected '*to assist schools in the process of self-evaluation'*; 100 % of the latter responded that it is collected '*to enable students to make better progress'*. By comparison, classroom teachers and Subject Leaders felt that '*ranking schools according to performance'* was the primary reason for collecting the data.

Comments given in the free response sections of the questionnaire suggest that there is considerable negative feeling around current reasons for collecting pupil performance data: 'to tick a box' and 'to satisfy Ofsted and statisticians'; to be 'used as a stick to beat teachers and schools'; to set 'ever-increasing targets'; and to 'encourage absurd competition' between schools. Or, as one classroom teacher stated, "I think our use of data is driven very much by external pressure . . . I think if we weren't requested constantly by these external people for data, data use would be much more specific and much better aimed at the individual student". One Assistant Head teacher stated, "I cannot see how year-on-year we can exceed our targets. It's nonsensical and it takes you away from the pupil-level data, which should be what we're all about. . . The problem is that you have no choice. You feel very much that

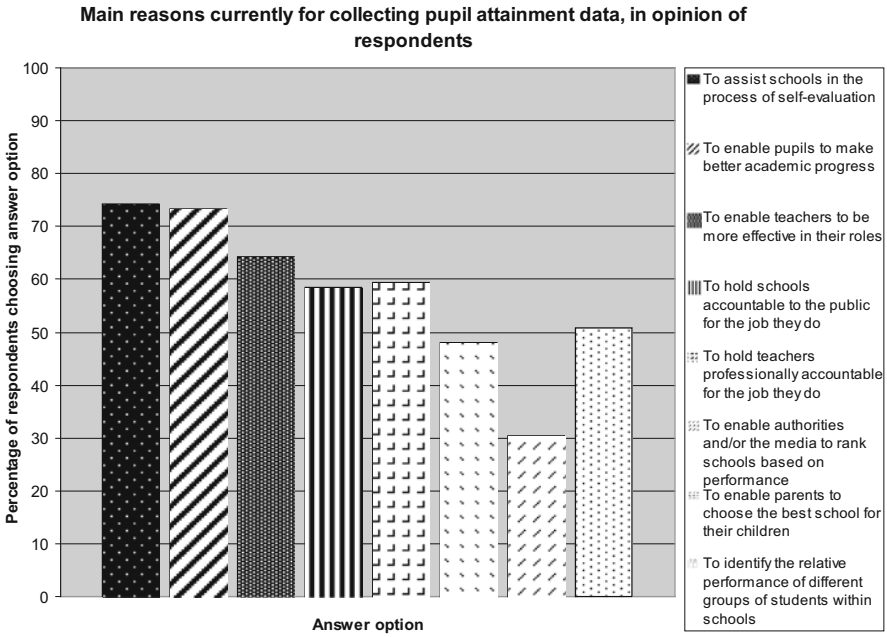

Fig. 5.4 Why pupil attainment and progress data are collected

things are imposed, and that's against your better judgment and your professional knowledge and your knowledge of the students".

Some feel that official pupil performance data are collected because "the government doesn't trust teachers to be professional" and that over-reliance on it detracts from other more important issues in education, "turning schools into factories in a forlorn attempt to measure the immeasurable". More than half of all participants accepted that collecting performance data is a necessary feature of their lives as educators; 19 % felt it is desirable; 17 % felt irritated and resentful; only 4 % felt rewarded as a result, as one Classroom Teacher expressed: "Data does have a very positive effect on students' learning. . . You can identify people who are just cruising and could do better . . . so you can identify them easier. We are focusing on identifying those children who need extra time and extra resources to achieve the school targets".

When asked what the reasons for collecting pupil attainment and progress data *should be* (offering the same answer options as previously), the responses (Fig. 5.5) were markedly different to those given as current reasons for collecting such data. There is clearly a considerable difference between what staff think are the *existing* reasons for collecting pupil data and what they think they *should be*. More than 90 % felt that pupil performance data *should be* collected primarily 'to *enable pupils to make better academic progress'* (up 20 % on what they think of this as the *existing*

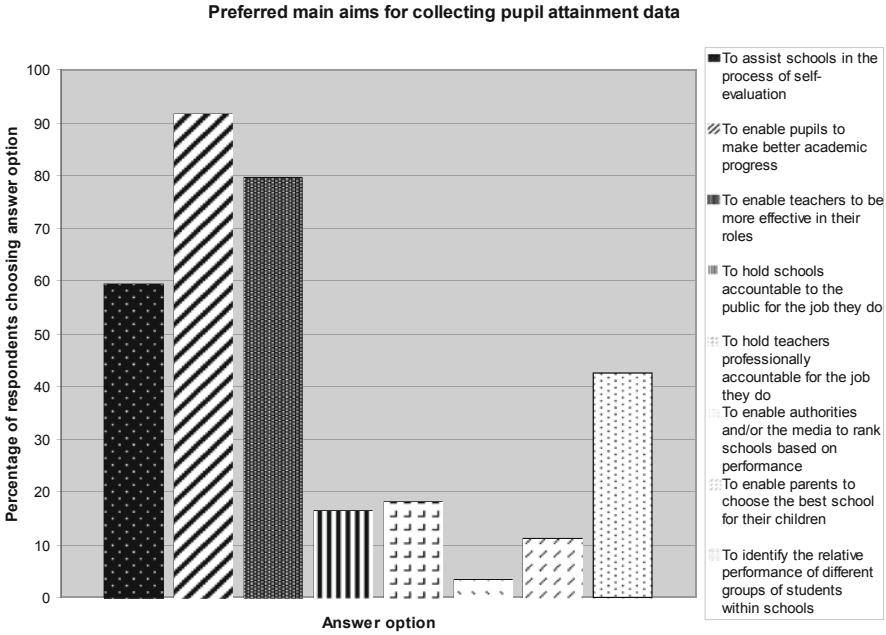

Fig. 5.5 Why pupil attainment and progress data should be collected

reason); about 80 % thought that it *should be* primarily to '*enable teachers to be more effective'* (up about 15 %). The other (six) answers were significantly down on what staff thought of them as *existing* reasons (c.f. Fig. 5.4), most noticeable when comparing the four 'external' reasons (on the right-hand side of Figs. 5.4 and 5.5).

It is clear that participants thought that the current reasons for collecting pupil data were primarily 'external' (i.e. for accountability and public use), but that it *should be* collected primarily for 'internal' reasons (i.e. for self-evaluation and improvement). A tension clearly exists between external and internal uses of data.

5.6 Summary and Conclusion

The utilisation of pupil attainment and progress data is a key element in the professional practice of teachers in this English study. The results of this study show that teachers in the participating schools report that they make regular use of such data, and have the necessary skills for the task. The responses from questionnaires and interviews are consistent with this positive view, although some responses were more equivocal about the place, purpose and value of the data. It is interesting that schools with significantly higher than average CVA scores report the highest extent of use of data and the highest level of satisfaction with that extent of data use.

This may be indicative of a more developed culture in these schools around the use of data at the pupil level and at the school level. School-level CVA score is dependent on the *degree of progress* made by *every* pupil in a cohort, in contrast to threshold measures, which simply count the proportion of pupils who manage to get 'over the bar'. Improving school-level CVA is rarely achieved by simply targeting a group of borderline students (in contrast to threshold measures). Thus, it may be that schools with significantly higher than average CVA scores focus on the progress of *a wider range of* students, requiring the use of data to be more devolved to make the task manageable.

Moreover, the results of this study make clear that there is a tension between internal and external use of data. In the main, staff in the participating schools think that the current reasons for collecting pupil data are primarily 'external' (i.e. for accountability and public use), but that it *should be* collected for 'internal' reasons (i.e. for self-evaluation and improvement). The outworking of this tension between external and internal use of data was clearly expressed by, and observed among, primary school teachers and leaders by Earl and Fullan (2003) in their evaluation of the Primary National Literacy and Numeracy strategies in England. This tension has also been explored in other national contexts; for example, in Belgium (Flanders) by Vanhoof and Van Petegem (2007) and in the Netherlands and the United States by Schildkamp and Teddlie (2008). More information about this tension is also provided by Lee, Seashore Louis and Anderson (Chap. 11), Schildkamp and Ehren (Chap. 4) and Wayman, Spikes and Vollonino (Chap. 8).

The significant relationship observed between training and improved understanding (of data) has clear implications for continuing professional development of all teachers. The positive news is that training makes a difference to teachers' understanding (see also Vanhoof, Verhaeghe, Van Petegem and Valcke, this book), but there are clear and persistent patterns of difference in the responses given by senior managers, middle managers and classroom teachers. While is understandable insomuch as data are often key tools for monitoring progress and benchmarking performance against other schools operating in similar contexts, but there is a clear hierarchy of data use within schools.

Responsibility for the management, analysis and interpretation of data lies overwhelmingly within senior management groups and while this approach may be expedient, given the volume of effectiveness data coming through to schools, it tends to lock up access and expertise within a narrow set of *data gatekeepers*. The fact that a large proportion of teachers would prefer to have data analysed and interpreted by teams of teachers, or within departments, suggests that schools may need to become more democratic with their data to keep staff onboard. Such a democratisation would require wider access than currently exists to sources such as RAISEonline, which this research suggests would be a major challenge to existing practice.

Moreover, it also suggests that school staff should collaborate more around the use of data. A number of researchers make strong arguments for network-based approaches to utilising data with a strong 'democratic' emphasis (see also Schildkamp and Ehren, Chap. 4 ; McNaughton, Lai and Hsiao, Chap. 3). Katz and Earl (2010) are advocates of networks, which build capacity for teachers and leaders to conduct

collaborative enquiry of data. Schildkamp and Kuiper (2010) echo the need for facilitation to support the work of collaborative data teams, and have outlined the professional development needs that such teams might require.

Teachers in the participating English secondary schools report having access to a wealth of sophisticated pupil attainment and progress data as well as the necessary skills to make use of those data to inform school improvement. Nevertheless, key challenges remain if these data are to be used to their full effect, especially in terms of the frequency of training and professional development in data use, and in establishing appropriate structures and culture within schools to foster a democratic approach to data that strikes a balance in favour of data-informed improvement in the context of what many view as an inevitable data-driven accountability agenda.

5.7 Reflection Questions

Practitioners

1. This chapter identifies several reasons with regard to why schools are currently using data and why schools think they should be using data. Reflecting on data use within your organisation, what are the *current* reasons for using data? Are these the same reasons why you think your organisation *should* use data? If not, what could you do in order for these rationales for data use to come to greater overlap?
2. Who in your organisation is responsible for the following tasks:

   a. collecting data;
   b. analysing and interpreting data;
   c. using data.

   Who do you consider should be responsible for these tasks in your organisation?
3. Do you feel that people in your organisation have the necessary knowledge and skills to analyse, interpret and use data effectively? If not, what options are available, and for whom, in order to obtain the necessary knowledge and skills?
4. This chapter suggests that collaboration around data use can be a promoting factor for effective data use. Do people in your organisation collaborate around the use of data? How could you or your organisation increase collaboration around data use?

Policymakers

1. This chapter talks about the tension between data use for internal (improvement oriented) reasons and external (accountability oriented) reasons. How can policy serve to decrease this tension while promoting effective use of data?
2. From this chapter, it also appears that the schools which might potentially benefit most from the use of data, the underperforming or coasting schools, are also significantly less likely to use data. How could you encourage these schools to make greater and more effective use of data for improvement?

3. Data use appears to be strongly associated with the hierarchy of role and responsibility within secondary schools. How can policy help to make data use more democratic and distributed across the full range of teaching staff working in schools?

Researchers and students

1. Attitude, knowledge and skills are important aspects of data use. In this chapter, and in other research, knowledge and skills are often studied by using surveys. However, surveys can only measure perceived knowledge and skills. What alternative measures could we use to assess the knowledge and skills associated with data use in schools? What might the potential strengths and limitations of these alternative approaches be?
2. Data use is often narrowly defined as the use of assessment data. However, schools have a lot more data sources available (e.g. parental survey results, classroom observations, student focus groups, behaviour records). How can we study data use, taking into account the full range of data types available?

References

Balls, E. (2008). *Gaining Ground—Improving progress in coasting secondary schools*, letter to all Local Authority Directors Children's Services (online) http://www.standards.dcsf.gov.uk/sie/documents/sos.pdf. Accessed 12 Feb 2009.

Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan, 80*(2), 139–148.

Bush, A., Edwards, L., Hopwood Road, F., & Lewis, M. (2005) *Why here? Report of qualitative work with teachers working in schools above and below the floor targets: DfES research report RR666*. Nottingham: DfES.

Day, C., Sammons, P., Hopkins, D., Harris, A., Leithwood, K., Gui, Q., Penlington, C., Mehta, P., & Kington, A. (2008). *The Impact of school leadership on pupil outcomes: DCSF research report RR018*. Nottingham: DfES.

DfE (2010). School and College Performance Tables (online) http://www.education.gov.uk/performancetables/. Accessed 30 April 2011.

Downey, C., & Kelly, A. (2008). *Utilising value-added progress data in the context of Every Child Matters*, paper presented at the International Congress for School Effectiveness and Improvement (ICSEI). Auckland, New Zealand, 9 January 2008.

Dudley, P. (1997). *How teachers respond to pupil data*, paper presented at the BERA Annual Conference (York, 10–14 September).

Dudley, P. (1999a). Primary schools and pupil data. In G. Southworth & P. Lincoln (Eds.), *Supporting improving primary schools: The role of heads and LEAs in raising standards*. London: Falmer.

Dudley, P. (1999b). Using data to drive up standards: statistics or psychology? In C. Conner (Ed.), *Assessment in action in the primary school*. London: Falmer.

Earl, L., & Fullan, M. (2003). Using data in leadership for learning. *Cambridge Journal of Education, 33*(3), 383–394.

Earl, L., & Katz, S. (2006). *Leading schools in a data rich world*. Thousand Oaks: Corwin.

Katz, S., & Earl, L (2010). Learning about networked learning communities. *School Effectiveness and School Improvement, 21*(1), 27–51.

Kelly, A., & Downey, C (2007). *Are value-added scores getting the measure of school performance in the UK?*, paper presented at the International Congress for School Effectiveness and Improvement (ICSEI) (Potorož, Slovenia, 6 January).

Kelly, A., & Downey, C. (2011). *Using effectiveness data for school improvement: Developing and utilising metrics*. London: Routledge.

Kirkup, C., Sizmur, J., Sturman, L. & Lewis, K. (2005). *Schools' use of data in teaching and learning: DfES research report RR671*. Nottingham: DfES.

Lipsett, A. (2008). *Balls to tackle 'coasting' schools*, The Guradian newspaper (online) http://www.guardian.co.uk/politics/2008/nov/13/edballs-coasting-schools-gcses accessed November 2008. Accessed 20 April 2009.

Miliband, D. (2003). *The annual leadership lecture 2003*. Nottingham: National College of School Leadership.

Miliband D. (2004). *Personalised learning: Building a new relationship with schools*, paper delivered at the North of England Education Conference Belfast, January.

PricewaterhouseCoopers (2008). *High performing specialist schools: Interim evaluation, DCSF research report RW034*. Nottingham: DCSF.

Saunders, L., & Rudd, P. (1999). *Schools' use of 'value added' data: a science in the service of an art?*, paper delivered at the British Educational Research Association Conference (BERA) Brighton, September.

Schildkamp, K., & Teddlie, C. (2008). School performance feedback systems in the USA and in The Netherlands: A comparison. *Educational Research and Evaluation, 14*(3), 255–282.

Schildkamp, K., Visscher, A., & Luyten, H. (2009). The effects of the use of a school self-evaluation instrument. *School Effectiveness and School Improvement, 20*(1), 69–88.

Schildkamp, K., & Kuiper, W. (2010). Data-informed curriculum reform: Which data, what purposes, and promoting and hindering factors. *Teaching and Teacher Education, 26,* 482–496.

Stevens, J., Brown, J., Knibbs, S., & Smith, J. (2005). *Follow-up research into the state of school leadership in England: DfES research report RR633*. Nottingham: DfES.

TDA (2007a). *Professional standards for teachers—Qualified teacher status*. London: Training and Development Agency for Schools.

TDA (2007b). *Professional standards for teachers—Core*. London: Training and Development Agency for Schools.

TDA (2007c). *Professional standards for teachers—Post threshold*. London: Training and Development Agency for Schools.

TDA (2007d). *Professional standards for teachers—Excellent teachers*. London: Training and Development Agency for Schools.

Vanhoof, J., & Van Petegem, P. (2007). Matching internal and external evaluation in an era of accountability and school development: Lessons from a Flemish perspective. *Studies in Educational Evaluation*, *33*(2), 101–119.

Vanhoof, J., Verhaeghe, G., Verheaghe, J. P., Valcke, M., & Van Petegem, P. (2010). The influence of competences and support on school performance feedback use. *Educational Studies, 37*(2), 141–154.

Wayman, J. C. (2005). Involving teachers in data-based decision-making: Using computer data systems to support teacher inquiry and reflection. *Journal of Education for Students Placed At Risk, 10*(3), 295–308.

Wayman, J. C., Midgley, S., & Stringfield, S. (2006). Leadership for data-based decision-making: Collaborative data teams. In A. Danzig, K. Borman, B. Jones & B. Wright (Eds.), *New models of professional development for learner centered leadership*. Mawah: Lawrence Erlbaum.

Wohlstetter, P., Datnow, A., & Park, V. (2008). Creating a system for data-driven decision-making: Applying the principal-agent framework. *School Effectiveness and School Improvement, 19*(3), 239–259.

Chapter 6
Approaches to Effective Data Use: Does One Size Fit All?

Elizabeth Archer, Vanessa Scherman and Sarah Howie

One morning, Pieter, Rajesh, and Sibongile, three principals in different schools in Gauteng, South Africa, sit in their respective offices looking at the report from the learner performance feedback system that their grade 1 (6- or 7-year old) learners are participating in. Although the reports are in the same format and their schools are all participating in the same provincial education system in South Africa, their educational experience and that of their learners is very different. Nonetheless, all three principals share the belief that the data on their learners' phonics, reading, and mathematics skills are essential in improving the teaching and learning taking place in their schools. All three also have a keen awareness of the unique needs and contexts of their school and teachers and a leadership philosophy that they have found works for them in their school. Pieter is very person orientated in his leadership; he is aware that his teachers do not have a natural preference for working with data and takes a hands-on approach in leading the team of teachers in meetings and planning to use the data. Rajesh has established a strong culture of professional development in his school and sees the data use as not only an opportunity to directly improve teaching and learning but also an opportunity for his head of department to develop her data-literacy and facilitation skills. He sits with her to discuss the report and then allows her to guide the process further, working with the teachers in a group or individually. Sibongile is conscious that her teachers did not have the best of preservice teacher training. While her teachers appear to realize how valuable data can be and they are always interested in seeing how well their school has achieved, they are often uncomfortable with looking at graphs and numbers. She interprets the data from the report and provides it to the teachers as she feels necessary, helping them plan accordingly and popping in to classes to see how the plans are being realized. In all these three cases, the data from the feedback system took very different paths once these entered the three schools, but in all three schools it was clear that the data were used to improve teaching and learning.

This chapter looks at how three very different schools use their school's data from the South African Monitoring system for Primary schools (SAMP) feedback system to improve how their schools provide education. SAMP was developed as a collaboration between participating schools and university researchers and has been

E. Archer (✉)
Department of Institutional Statistics and Analysis, University of South Africa,
Pretoria, South Africa
e-mail: archee@unisa.ac.za

V. Scherman · S. Howie
Centre for Evaluation and Assessment, Faculty of Education,
University of Pretoria, Pretoria, South Africa

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_6, © Springer Science+Business Media Dordrecht 2013

in use since 2002. SAMP is currently used in 22 schools in the Tshwane area in South Africa and is administered in three languages Afrikaans, English, and Sepedi. Pieter's, Rajesh's, and Sibongile's schools were selected as their schools used the data to improve teaching and learning and their learners showed strong gains throughout the first year of schooling. It is hoped that a deeper understanding of how data move in schools (data paths) and how schools can appropriately use data may assist policy makers in developing monitoring policies that can be successfully implemented to attain quality education. The cases may also provide guidance to school leaders and teachers on the multiple ways in which data may be used effectively to develop data paths befitting their own context and school culture.

6.1 Introduction: Context

Education systems are not only complex in themselves, but are also embedded in a political, cultural, and economic context (UNICEF 2000). This is very evident in South Africa where there are many challenges to the provision of quality education (often vestiges of the apartheid era). Many schools remain underresourced, with inadequate infrastructure and large class sizes. There is a substantial teacher shortage in particular subjects and phases such as mathematics, science (Howie 2010), African languages, and the Foundation Phase (junior primary school phase, the first 3 years of schooling) and the educational workforce includes many poorly trained teachers (Department of Education 2006c). During the apartheid era, education was utilized to socialize children into their expected societal roles according to race (Department of Education 2002). The resulting segregation by race, geography, and ideology led to the establishment of 19 different education departments, which, in turn, reinforced the inequalities of that society through their curricula (Department of Education 2002). The ensuing inequality was considerable, with the government spending up to nine times more on each White pupil than on a pupil from Bantustans (apartheid era political homelands set up for Black Africans) Education (Department of Education 2002).

Significant changes have taken place in the South African landscape since the fall of apartheid in 1994. The 19 different education departments have subsequently been unified under one Department of Education (DoE; now the Department of Basic Education). Although the first few years of education are available in all 11 official languages, in practice, learner access to education in their home language is only afforded to approximately 60 % of South African children (Howie et al, 2008). Formal schooling in South Africa begins with a reception year, grade R and followed by grade 1 to grade 12 with learners entering grade1 in the year they turn 7 years of age. The first 4 years of schooling in South Africa (grade R–3) is known as the Foundation Phase and aims at establishing basic skills, with the primary emphasis on literacy and numeracy, so that learners can learn and work more independently in the later phases.

This unification and restructuring of education in South Africa, along with various other curriculum reforms, has endeavored to provide access (largely achieved with an 89 % net enrolment at the primary level; World Bank 2008) equality in education

(some progress made) as well as improve its quality (little progress made). A quintile system was also introduced to differentiate funding from the DoE in order to redress past inequalities. The quintile system is used to allocate funds differentially to schools in order to redress the large difference between schools (Van den Berg and Burger 2002). Quintiles for each province are determined based on rates of income, unemployment, and illiteracy in the school catchment area. This system has not been without its problems, as parents from impoverished areas have moved their children to schools to wealthier areas thus defeating the intentions behind the government funding model. This has led to the changed composition of learners in schools in largely urban areas of South Africa and former White, colored, and Indian schools becoming integrated and the former African schools in rural areas and townships remaining African in composition.

Therefore, although there have been many improvements, particularly in terms of access to education in South Africa, the challenge of improving the quality of that education to equip pupils to redress their disadvantaged backgrounds remains (Naker 2007). The challenge of improving the quality of education is clearly seen in pupils' performances in key subjects such as reading, mathematics, and science as evinced in international studies where South African pupils attained the lowest scores internationally in the Trends in Mathematics and Science studies (1995–2003) and in Progress in International Reading Literacy Study 2006 at both primary and secondary levels. The low achievement has been confirmed in national and provincial systemic evaluations (Department of Education 2006a, b; Howie 2008; Howie et al 2008; Martin et al. 2004).

The South Africa Revised National Curriculum statement (Department of Education 2002) embraces assessment not only for monitoring and reporting, but also as a driving force for learning, with the ultimate aim of improving the quality of education. The South African government believes that data are essential to improve the quality of education and that these data should be generated through monitoring aspects such as learner performance, curriculum planning, and teaching. Therefore, policies for monitoring such as the Integrated Quality Management System (IQMS) have been instituted (Education Labor Relations Council 2003). The IQMS consists of three programs aimed at enhancing and monitoring performance of the education system. The three programs are: *Developmental Appraisal* to determine and address individual teachers' development needs, *Performance Management* for teacher progression, and *Whole School Evaluation* to evaluate the overall effectiveness of a school as well as the quality of teaching and learning.

Additional pupil performance and monitoring data are generated through continuous assessment in the classrooms, systemic evaluations at grade 3, 6, and 9 levels (Department of Education 2006a, b) and international comparative educational studies of the International Association for the Evaluation of Educational Achievement (IEA) and the Southern African Consortium for the Monitoring of Educational Quality (SACMEQ; Howie et al. 2008; Martin et al. 2004). The mere existence of these data cannot lead to improvement of the quality of education in South Africa. For improvement, appropriate use of the data for decision making and action is essential. The data therefore need to be fed back into the system, both at national and school level and used to inform decision making and improvement strategies (Gawe and

Heyns 2004). While attempts have been made by the South African government to collect data for improvement purposes, there is little evidence of effective use of data by schools (Archer 2010). This may in part be due to the data being reported at a high level of aggregation with not enough detail to meet the decision-making and planning needs of the varying school contexts.

In this chapter, the issue of how data can be effectively used is examined by illustrating how three schools acted on data received during their participation in the South African Monitoring System for Primary schools (SAMP) project. The chapter focuses on how data move within the school context and addressing the issue of facilitating appropriate, constructive use of pupils' performance data in schools.

6.2 Data Dissemination and Data Use: How the One Influences the Other

The ultimate purpose of use of performance data is to improve teaching and learning. According to Van Petegem and Vanhoof (2005), there are four reasons to gather performance data: for information needs, for accountability purposes, to create marketing mechanisms, or to stimulate discussions on quality in education in order to lead to improvement. Studies have also shown that programs designed to strengthen the feedback that students receive about their learning results in considerable learning gains (Black and Wiliam 1998a), especially if particular qualities of students and students' work and how the learner can improve are highlighted (Black and Wiliam 1998b).

Data use for making informed decisions has increasingly become emphasized in education. Especially, as data-driven decision making has been linked to improvements in learner performance (Campbell and Levin 2009) and the active support of data use correlates well with use of performance data (Saunders 1999). However, the drive for data-driven improvement makes it necessary to develop coherent systems that allow schools to interpret and act upon information received on students (Halverson 2010). These systems may be internal or external to the school, but in both cases focus on providing feedback on the learner performance data. Many authors (Kluger and Denisi 1996; Hattie and Timperley 2007; Shute 2008) agree that feedback is regarded as crucial to improve knowledge and skill acquisition.

The feedback of data for use can be viewed from a more systemic perspective where a system external to the school provides feedback or internal to the school on a classroom level where teachers provide feedback to students. In both cases, the process of knowledge and skill acquisition is involved, principals and teachers make sense of data for improvement purposes and students making sense of communications regarding how they can improve their performance.

A number of concepts were introduced above, which should be clarified: feedback, data, and information. For the purposes of this chapter, feedback is seen as an action taken by an external agent to provide data on performance (Hattie and Timperley 2007; Kluger and DeNisi 1996). The data provided are intended to be used to modify thinking or behavior in order to improve teaching and learning. A piece of datum, which is not known to the receiver before receiving it, becomes information at the

moment it is received (Kamel et al. 1997). In other words, when data are interpreted then these become information as the meaning, relevance, and purpose has been provided by the receiver (Schildkamp and Kuiper 2010). Furthermore, data are seldom used in the form in which these are presented but require interpretation on the part of the receiver and it is very often the interpretation which is used.

The fact remains that schools are measured by the outcomes they achieve which results in the generation of data but these data have to be converted into useable information (The Urban Institute 2004). Harris et al. (2006) argue that when schools make use of data to drive change coupled with extensive professional development then an increase in performance can be achieved. This is corroborated by Cradler (2008) who argues that when data are used to inform decision making regarding instructional planning, the probability to attain desired outcomes increases substantially. However, as Earl and Katz (2006) state, the "interpretation and application of data by teachers, and by the public, are woefully inadequate and sometimes very wrong" (p. 18). So, while teaching and learning should be an interactive process and schools need to know how their learners are progressing and the difficulties that are experienced with regard to learning (Black and Wiliam 1998a), a gap often exists between the existence of data and the use of data (Earl and Katz 2006). This is very often compounded by the way in which data are employed and move throughout the school system once the data are received (Archer 2010).

The routes the data travel in the schools is known as data paths and are also influenced by the culture[1] of participating schools and leadership styles of the principals and head of departments (HoDs). As stated by Salpeter (2004), "[t]he most important element of an effective data-driven program is not the data, the analytical tools, or even the curriculum framework. . . it is the school culture in which the data inquiry takes place."

The term data path originated in the field of information technology and refers to how a collection of functional units perform data processing operations. The purpose of a data path is to provide routes for data to travel between units (Mano and Kime 2004). This same concept is applied here, with the functional units represented by the principals, head of departments, teachers, and other staff in the school who are included in the school decision-making processes utilizing the data from the feedback systems. It is not just who is included in the data processing and decision-making process, which is important, but also the roles of the various participants as well as who is excluded from the process. It is thus important to make a systematic effort to facilitate the flow of data to lead to appropriate and effective use of the data for

[1] The concept of culture, as used here, has many facets, it includes a certain cultural heritage associated with a specific language and racial group, the level of urbanization of staff, the sense of school culture, specifically the spirit of collaboration, approach to shared learning, and a drive for improvement. It also encapsulates the values and norms seen as part of the school culture. All of these factors may have an influence on whether or not data are seen as important and valuable in school improvement. These factors may influence both the likelihood that data will be used as well as the approach to data use that will be employed. For instance, in a culture that highly values communal processes, a team approach may be employed to work with data while in another culture data may be seen as the domain of those in leadership positions and therefore would not be interrogated and interacted with independently by staff members.

a particular school. This means that it is imperative to manage the data flow and not just the data, as has been witnessed in organizational environments (Krovi et al. 2003). By mapping the data movement within the school environment the way in which data are transferred from one point to the next within the school is analyzed (Hibberd and Evatt 2004). Knowledge of school data paths means that the feedback system can be developed to meet the needs of schools and the data paths usually employed, thus providing a better understanding of the school environment and a direct link with data stakeholders. The mapping provides understanding of how data are used and by whom, which means that the way in which information is provided can be formulated in a manner that will facilitate a higher degree of use.

6.3 Research Design and Methodology

The overall SAMP research project aimed not only to generate knowledge but also to design and develop a well-functioning feedback system to provide data to schools on learner performance. A design research approach was applied focusing on creating solutions for complex real-life problems within the specific context (De Villiers 2005; Plomp 2009; Van den Akker 1999). The design research process is iterative and follows a cyclical pathway of development and evaluation (Nieveen 1997; Richey et al. 1996; Thijs 1999). This cyclical iterative analysis of design, development, and implementation was combined with formative evaluation to understand issues concerning use of data. Each cycle of design research consisted of the introduction of a version or prototype of the feedback system that was evaluated by users and experts. The evaluation then informed further improvement of the feedback system in the form of the next prototype. Developing various prototypes was seen as generating "successive approximation of the ideal" (Van den Akker 1999, p. 2). Although there were several design cycles in the overall optimization process for SAMP, this chapter focuses on the data generated through observations, journals, and interviews in the evaluation of one of these design cycles. The evaluation data collected during this cycle of development focused particularly on how data were used by schools and how data moved within the schools, the focus of this chapter[2]. This section describes the SAMP feedback system, which provided the data of which the use was investigated as well as the methodology used in this design cycle to investigate school data use and data paths.

6.3.1 The Feedback System

This section provides a short description of the feedback system. For more details, see Archer (2010). The SAMP is one of the monitoring and feedback systems of the

[2] For an in-depth discussion of the cycles of design, development, implementation, and evaluation of the SAMP feedback prototypes, see Archer (2010).

Value-Added project initiated in 2002 by the Centre for Evaluation and Assessment (CEA) in collaboration with the Centre for Evaluation and Management (CEM) at the University of Durham in the United Kingdom. The SAMP feedback system aims to provide learner performance monitoring data to schools to support schools in planning and improvement action at a grade and individual learner level. These data provide an indication of a child's readiness for academic learning and scores from the system correlate well with subsequent academic achievement (Tymms and Coe 2003). The current SAMP feedback system provides the data and support for use of the data by combining a number of elements: written reports, manuals, feedback sessions between the feedback system staff (at the University) and school personnel, an electronic resource, and support website.

The grade 1 learners (entry level, 5–7 years) participate in two linked assessments, one at the beginning of the year and one at the end of the first year of schooling. Learners are individually assessed in early phonics, early reading, early mathematics, and handwriting. Each school receives a written report with pupil and school results after each assessment (baseline and follow-up). The follow-up report providing specific information on the gains made between the two assessments. Data are presented in table and graphic form along with in-text discussion. The report allows for a comparison of the school's results over 2 years (comparing this year's grade1 learners performance with that of the previous year's cohort), as well as comparison with the average performance of the schools participating in SAMP. Every report concludes with a summary and list of selected activities that may be useful to address school-specific issues.

A manual to facilitate interpretation by the schools' staff members accompanies the report. The manual contains a description of the project and the various subtests and scales. The links between the curriculum and each subtest, as well as the underlying skills assessed in each subtest, are indicated to facilitate use of the data. The validity and reliability data for the instruments are discussed in a section on the quality of the instruments. The manual concludes with a section on how to interpret the data and make use of it in the schools.

A feedback session (led by the feedback system facilitator at the university) with the aim of helping schools interpret and use the data also takes place after each assessment where the project, reports, and report interpretation are discussed. All Foundation Phase (grades 1–3) teachers, Heads of Departments (HoDs), and principals are invited to the feedback sessions, which provide an opportunity for face-to-face communication with other schools and the monitoring team biannually. A presentation describes the project and then explains to participants how the data can be interpreted. Participants raise issues and share ideas for addressing problems in various school contexts and for improving the feedback system.

In addition, materials are provided to the schools in the form of an electronic resource as well as the SAMP resource website to support data use for decision making, planning, and action in the schools. The electronic resource takes the form of a CD or DVD and is given to each school. Each CD or DVD contains a database of free educational resources for classroom or home use. These resources vary from printable materials such as worksheets to educational presentations and electronic

educational games. Each resource also contains electronic copies of the report and manual for the particular school and the school's data set to facilitate further analysis by the school. The website contains similar resources, but is updated regularly with additional materials.

6.3.2 Sample

The sample for this chapter consists of 3 schools out of the 22 schools participating in SAMP that were purposefully selected. The schools were identified by the researchers as actively engaging with the feedback system. This meant that they had all attended the feedback sessions, received the reports and manual, and had full access to the electronic resource and website. The three schools also showed good gains from the baseline to the follow-up assessments, which they attributed to the use of the SAMP data. The three schools in these case studies had participated in the SAMP feedback system for at least 2 years.

The three schools were chosen from each of the English, Afrikaans, and Sepedi language groups. Pieter's school represented the Afrikaans language group. While the school has mainly White, Afrikaans first-language learners, it has just become a dual-medium school presenting classes in English due to a growing population of Black, African learners, a phenomenon explained earlier in the chapter. The school has an intake of about 100 new grade 1 students every year. English is the medium of instruction in Rajesh's school with the student population consisting mainly of Black, African second-language learners with a wide variety of home languages. Annually, about 150 learners enroll for grade 1 at this school. At Sibongile's school, the students mainly learn in their first language, Sepedi and all of the learners are Black, Africans. Some 140 learners start their first year of schooling here every year.

6.3.3 Instruments and Data Collection

The data collection for the cases involved three different data collection strategies with the data collected from each strategy informing and guiding the development of the following strategies. These included:

1. *Nonparticipant observations (n = 3 meetings, one per school)*: Participants, ranging from principals, HoDs, and teachers, were observed by the researcher during the meetings concerning the feedback data. Naturalistic observations[3] were conducted noting the groups' interaction and approach to working with the data. Meetings were digitally audio and video recorded and extensive field notes were taken.

[3] Naturalistic observations are unstructured observations where the observer is a nonparticipant observer and tries to capture all that takes place in as natural as possible form by trying to minimize interference due to his or her presence.

2. *Classroom journals (n = 6 journals in total across the three schools)*: Teachers were requested to fill in a daily semistructured journal over a 4-week period about their use of the feedback in their school and class. Teachers were guided to record information relating to: the influence of the feedback on, for instance, the teacher's planning, practice, communication and individual pupil support, the accessibility and practicality of the feedback, and barriers to using the feedback. Not all teachers decided to complete the journals, the journals that were completed were used in the analysis.
3. *Semistructured interviews (n = 5 interviews across the three schools)*: The semistructured interviews were conducted with principals, HoDs, and teachers. Principals were interviewed individually and the teachers and HoDs participated in group interviews. The interviews served to follow up on the observations and journals in order to gain further clarification. The semistructured interviews focused on: the types of data and materials used in the feedback system; the types of use that takes place and the purpose thereof; procedures of data use in the schools (data path, different roles of staff, additional training and support); changes in the school attributable to use of the data; barriers to using the data and possible improvements in the feedback of the data.

6.3.4 Analysis

The data collected through these data collection strategies were thematically analyzed. Data were iteratively analyzed throughout the data collection process. Analysis informed development of later data collection strategies to clarify information received from earlier data processes (for instance, the analysis of the observations facilitated the development of the classroom journals). This iterative data collection and analysis process resulted in a rich picture of data use in each of the schools.

All data were captured electronically and analyzed per meaningful unit of text. A meaningful unit could be represented by, for instance, a sentence or paragraph referring to the same aspect. Codes were generated through an inductive process and allocated to each unit of text. Once coding was completed, codes were clustered together in meaningful groups to generate themes. For example, the theme professional development includes codes such as *use to increase data literacy* and *use to identify training needs*. The computer-aided qualitative data analysis program Atlas.ti (v.6) facilitated the analysis process. While the study examined all aspects of use, this chapter focuses on the movement of the data throughout the schools in the form of the data paths and the types of data use that were seen in each of the schools studied. The grounded theory method analysis led to the generation of the three data paths discussed in Sect. 6.4. The analysis of the of the types of use combined inductive and deductive method with different types of use explored inductively, to examine all use, but the naming of the types of use found was guided by the conventions in literature and particularly the purpose of uses as discussed by Schildkamp and Kuiper (2010).

6.4 Results

In the following sections, each of the three cases are introduced and discussed. Every case is firstly described in terms of the school environment and then the data path for each school is analyzed. Finally, an analysis is undertaken per school in terms of the types of data use taking place in the school.

6.4.1 Pieter (School A/E)

Pieter had been with School A/E for a number of years and has witnessed some major changes in the challenges the school faced. When Pieter started at School A/E, most of the students were fairly poor, White, Afrikaans students from the area. Over the years, a number of Black, African pupils had moved into the area. In response to the change in demographics, the school switched from Afrikaans to dual medium with classes now being offered in either Afrikaans or English. The pupil population could still be considered as socioeconomically poor, but little financial support was received from the DoE. As the school was located in an urbanized area with good infrastructure, the school was placed in a higher quintile[4], thus decreasing funding from the DoE. The teachers and staff expressed concern about the demands of maintaining discipline in the school, which reduced time dedicated to tasks in the classes. Pieter could see that parent involvement in the school would be of great help, but had difficulty in increasing parent participation, in particular as many parents had a low level of education. In addition, many parents could not afford the school fees, which meant that Pieter often needed to look for alternative and additional funding for the school. Pieter was, however, quite positive as a number of teachers were studying further at tertiary institutions. A major focus for the school was ensuring that the new English education component was functioning well.

Pieter was committed to a team approach in addressing school issues. He acknowledged the different strengths and weaknesses in staff members and encouraged them to familiarize themselves with their own personality profiles and problem-solving preferences during teamwork. Pieter felt very strongly that data-based decision making and planning had to take place and emphasized that all data generated had to be interpreted and used appropriately.

6.4.1.1 Data Path: Team Approach

Firstly, at least two grade 1 teachers attended each SAMP feedback session, usually accompanied by Pieter himself or the Foundation Phase HoD. Secondly, once the

[4] Schools in South Africa are categorized into quintiles for each province based on rates of income, unemployment, and illiteracy in catchment area. Quintile 1 represents the poorest schools, while quintile 5 represents the least poor schools. The quintile system is used to allocate funds differentially to schools in order to redress the large difference between schools (Van den Berg and Burger 2002).

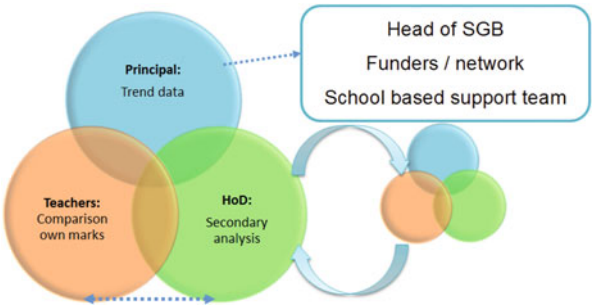

Fig. 6.1 School A/E data path: Team Approach

reports were received by the school, a meeting was scheduled with the grade 1 teachers, HoD, and principal. Thirdly, each group of attendees was tasked with different preparation aspects for the meeting. Teachers compared pupil results with their own assessment results and their list of pupils identified for the remedial program. In order to provide feedback to the preschools, the HoD was tasked with conducting a further analysis to determine how pupils' preschool education was related to their performance. (Communicating with the preschools about the data on the grade 1 performance was a priority determined by the school.) The principal collated school performance trend data based on all previous reports from the SAMP project.

During the meeting between the principal, HoD, and teachers (see Fig. 6.1), the data were discussed and compared to other assessment data. Fourthly, tasks were allocated, measurable goals set for improvement, and a date fixed for the next meeting to monitor progress. Fifthly, data were conveyed to other stakeholders. The principal undertook reporting the school's status and progress to the School Governing Body (SGB). The data were also relayed to the School-Based Support Team (SBST) to help with planning and support for pupils identified as being at risk in the feedback. Finally, follow-up meetings were held to monitor progress and to provide opportunity for further planning. Between formal meetings, the HoD and teachers held informal discussions about progress of individual pupils, the planning and support for pupils identified as being at risk, the success of changes to the curriculum and classroom activities, and support materials drawing on information given during feedback sessions and in the reports.

The type of data path observed in School A/E was labeled the *Team Approach*. The principal viewed this group-based approach as the most appropriate for his school. "We [the team] have a meeting and we analyze the data, we work out an action plan and strategy... then we decide whose responsibility it is... what we can do to address the challenge... then we have follow-ups through-out the year" (Interview, Principal[5]). In this instance of the Team Approach, the group of teachers, HoD, and Pieter met together about the data, each had certain follow-up data tasks allocated to them. Planning was conducted together in the group and monitoring of progress took

[5] The particular data collection method from which the data originated is indicated in brackets. In this case, the quotation was taken from an interview with Pieter, the principal.

place at formal group meetings where all were again present to evaluate progress, address new issues, or adapt planning. The data were thus used consistently in a team format with several follow-up meetings to monitor implementation and conduct further planning. In this case, the principal, Pieter, was also involved in each step to ensure that appropriate data use was taking place.

6.4.1.2 Types of Use

In School A/E, the data were used to *support conversations* between the grade 1 teachers about individual pupil results, the school curriculum, and classroom approach "I was concerned about pupil X, he did well in your assessments, but struggled in class. So we all (grade 1 teachers and HoD) sat together and made a plan" (Interview, Teacher 1). More formal discussions were held with preschools in the area to emphasize the type of school readiness skills (such as phonic awareness) that the pupils required prior to formal schooling. "This year we had a meeting with the church preschool. We talked to them about the skills the Grade 1 pupils need for our school and gave them a whole list of tasks they (referring to pupils) should be able to fulfill" (Interview, HoD). Data from the follow-up assessment were also relayed to the grade 2 teachers to highlight areas in which the grade 1 pupils needed further support: "... if they (the children) can't do something, the Grade 2 teachers need to know where to start" (Interview, Teacher 2). The data were used to support requests to the SGB, DoE and potential funders for further resources: "... when I am asking for extra funds for a remedial teacher, occupational therapists, it is something to have in hand" (Interview, Principal). In addition, the data were used in parent meetings to support teacher evaluations and recommendations. The HoD suggested that the teachers use the data to encourage individual pupils' parents to become more involved particularly if their children were struggling with school work.

In Pieter's school, the feedback data were triangulated with all other available assessment data, including evaluations from speech therapists and occupational therapists. The data were used to gauge if the assessment standard of the teachers was appropriate and to validate the teachers' identification of pupils who may possibly have failed. "I used the individual results today to see if I am marking too leniently" (Journal, Teacher 1).

Further analysis of the data as presented in the feedback reports was encouraged by Pieter in order to examine trends of school performance over a number of years and to provide feedback to preschools in the intake area of the school (Observation, agenda, and meeting materials). The data were used for formal goal setting for individual pupils and the school. Measurable goals were set in terms of achieving gains as well as achieving a minimum final score. "We work for that 10 % gain. It motivates us through the year" (Interview, HoD). The school was concerned with maintaining a high standard relative to other schools with similar characteristics in the sample. The principal was therefore able to *monitor* both the gains of pupils and performance of the teachers in achieving the goals set.

Furthermore, the principal and HoD discussed the results from the reports to establish the *professional development needs* of the teachers. For instance, the new

English teacher expressed concern about the learners' Vocabulary scores and her ability to enrich the vocabulary of second-language learners, Pieter thus arranged for her to attend a course in vocabulary stimulation. The data were also employed by the principal to meet the *accountability demands* to the School Governing Board (SGB) through feedback at the SGB meeting and the National Department of Basic Education (DBE) by incorporating the feedback reports into the IQMS as part of the school self-evaluation data. Through the teachers, HoD, and SBST, the data were also directly used for *curriculum development* for the school's grade R to grade 2 classes (Observations, HoD, principal, and teachers 1–3).

6.4.2 Rajesh (School E)

Rajesh had seen some changes in the pupils the School E caters for over the previous few years. While School E was situated in an area with a predominantly Indian population, a number of Black, African pupils started commuting to the school from the township areas. The language of learning and teaching in the school had always been English, but the majority of the pupils were now African and more than a dozen home languages could be identified in the grade 1 classes. Rajesh also noticed that parental involvement in the school became more limited as pupils mostly commuted to school.

Rajesh, the school principal, was committed to the improvement and further education of his staff, with even the tea-lady being involved in tertiary studies. He not only encouraged staff to participate in the professional development program organized by the DoE, but also arranged for private training opportunities. Unfortunately, this led to a high turnover rate of staff as the teachers were often head-hunted by more affluent schools after they had completed their additional training and studies.

At the time of the research, the grade 1 teachers were using a program called "Sheltered Instruction Observation Protocol" (SIOP) to focus on language development through all the learning areas. The introduction of this program was in response to the main challenge facing the school: most pupils were not first-language English pupils. As Teacher 3 (Interview) explained: "You will find all 11 official languages in any class in the school and a few extra for a bonus."

6.4.2.1 Data Path—Cascade Approach

Rajesh, as the principal, took a strong interest in the feedback from SAMP, but rarely attended the feedback sessions himself. Mostly, all the grade 1 teachers, the HoD, and sometimes teachers from grades R, 2, and 3 attended. A formal path for the data in the school was in place referred to here as the *Cascade Approach* (Fig. 6.2) as the data cascaded through the different levels of the school from the principal to the HoD and teachers and finally the deputy principal.

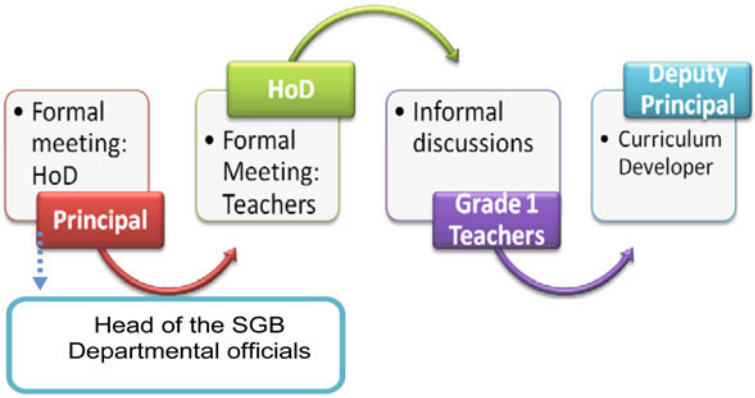

Fig. 6.2 School E data path: Cascade Approach

The first step in the approach was a meeting between the principal and HoD where feedback was discussed and areas of concern highlighted along with areas of strength and potential improvement. As the second step, the HoD presented the data at a formal meeting with all teachers from grade R to grade 3. The principal insisted on all the teachers being involved.

The third step involved the grade 1 teachers continuing discussions, mostly informally, about individual pupils and changes to the curriculum. The teachers also focused on evaluating whether the new SIOP intervention was proving effective. The curriculum planning for the following year was aligned with the activities recommended in the feedback.

Finally, the data were kept in the deputy principal's office for teachers to access. The deputy principal was responsible for curriculum development and she would then integrate the recommendations into the curriculum planning for the following year. The principal (Interview) impressed upon his teachers the importance of working with the data, but did not take control of the process: "I don't get involved with the HoD's meetings with the teachers. It is development (sic) for the HoD to interpret the report." He did, however, use the feedback to report to the SGB and DoE officials to motivate for extra support and funding for the school.

6.4.2.2 Types of Use

In School E, the data were used to *support conversations* between the grade 1 teachers about the efficacy of any new activities, pupils in need of support, and possible adjustments to the curriculum. "It is important for us to share what activities are working or not" (Interview, Teacher 1). Use of data encouraged communication between teachers from grade R to grade 3 to facilitate an alignment of goals for the school and to coordinate curriculum planning. "... [A]ll the Foundation Phase and grade R teachers meet about the feedback, because they will all see these children

somewhere down the line." (Interview, Principal). The feedback was reported to the school, to the SGB, and used to garner additional funding from external funders, as well as the DoE. Upon occasion, the data were used in parental discussion as an external validation of teacher evaluations and recommendations. "Sometimes the parents won't believe us that their child is struggling. Then, we can show them the marks and say look this was done scientifically by the university, it is not just in our tests that he is struggling" (Interview, Teacher 2).

The principal and HoD discussed the results from the reports to establish the *professional development needs* of the school. Based on discussions, private and DoE training opportunities were identified to address the needs. The principal also saw the process of working with the data as a professional development opportunity for his staff and therefore supported his HoD in interpreting the data. These data underwent further analysis to establish if the SIOP intervention was having an impact on the pupils: "It was good to see that the vocab.(sic) results increased so considerably, it seems as if the SIOP is working" (Observation, HoD).

These data had a direct impact on the *curriculum development* for the whole school through the Curriculum Developer (deputy principal). "The reports definitely get used... eventually they end up with our deputy principal for curriculum development" (Interview, Principal). A 15-minute school-wide daily reading period was introduced, based in part on the data from the SAMP feedback. The aim of the reading period was to improve pupil literacy across the school. The curriculum development was also impacted directly through the formal teacher meetings of the grade R–3 teachers.

The principal employed the SAMP feedback to meet the *accountability demands* of the SGB and the DoE through the mandated IQMS. "See, [shows IQMS file] I even have your documents in my IQMS file" (Interview, Principal). Data were not viewed in isolation in School E, but triangulated with classroom assessment data and the principal's classroom observations. The teachers appreciated the opportunity to validate their assessment standards with an external source. This was particularly useful in the difficult task of identifying pupils who were at risk of failing halfway through the school year. "It is difficult to identify the learners, you always wonder... now we can look at the feedback results as back-up" (Interview, Teacher 3).

The data were also used for formal *goal setting* to evaluate the success of actions based on the data. Measurable goals were set in terms of achieving gains as well as achieving a minimum final score. "The overall score is higher than last year. The score on the Rhyming Words subtest is worrying. The gain is smaller than last year. We said we wanted to increase the gain." (Observation, HoD). The school was also concerned with maintaining a high standard relative to other schools with similar characteristics in the sample. The principal was therefore able to *monitor* both the gains of pupils and performance of the teachers in achieving the goals set.

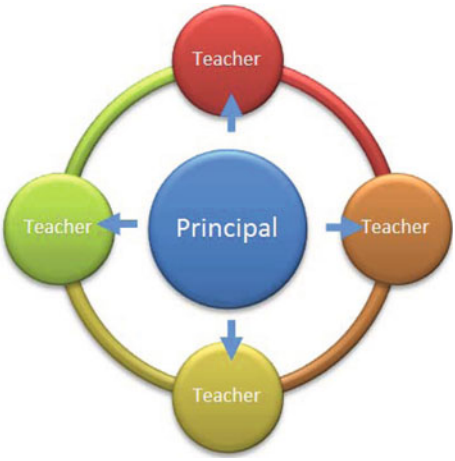

Fig. 6.3 School S data path: Top-Down Approach

6.4.3 Sibongile (School S)

Sibongile's school was situated in a township area. The language of learning and teaching in the School S had always been Sepedi. Pupils were predominantly from the local area. The socioeconomic status of the area was very poor and many of the parents were unemployed and fairly young.

The school principal was committed to ensuring the smooth running of the school and that the school was an asset to the community. The school was sensitive to the plight of the community and often provided food parcels to hungry families. The school was also frequently involved in dealing with the social problems and poverty the children faced in the home environment. Sibongile and her staff would often be the first place children who were experiencing abuse or neglect in the home environment would turn to for help. Parental involvement in the school was limited and Sibongile noted that many pupils experienced little support in the domestic environment as parents were often absent. Many of the teachers in the school had received only basic formal educational training (some under the apartheid government). Sibongile was trying to address this low level of preservice training through professional development activities presented by the DoE.

6.4.3.1 Data Path: Top-Down Approach

All the grade 1 teachers attend and participated in the feedback sessions. Sibongile, as principal, took responsibility for the use of the feedback and usually attended the sessions as well, along with her grade 1 teachers. Sibongile read and interpreted the reports for the teachers: "I summarize it and tell the teachers what the report says . . . informally in the hallways or on class visits, also in the meeting after we receive the reports." (Interview, Principal). This *Top-Down Approach* is illustrated in Fig. 6.3. Sibongile also communicated directly to the grade R and grade 2 teachers

about the feedback as it applied to them. Teachers informally discussed individual pupils and specific suggested activities with each other. The grade 1 teachers mainly examined the report in terms of individual pupil results and the conclusion section with the suggested activities.

6.4.3.2 Types of Use

In School S, the data were used to *support conversations* between the grade 1 teachers concerning the various suggested activities, pupils in need of support or extra stimulation and possible adjustments to the curriculum. "We haven't tried these activities (points to suggested phonics activities in report). This may help with the phonics problem; we can try some rap songs" (Observation, Principal). The data were sometimes used to support conversations with parents about pupils experiencing problems or at risk of failure. "The other day one of the grandfathers wouldn't believe his grandchild was failing, he was giving the teacher a real tough time. Once she showed him the marks from your test [referring to SAMP], he believed her" (Interview, Principal).

The principal interpreted the data and explained to the grade R and grade 1 teachers what *curriculum development* was required. She then also monitored to see if the changes were taking place at classroom level. "I am in and out of classes all the time, talking to the teachers and seeing if they are doing what we talked about" (Interview, Principal).

The principal supported the teachers in using the data to triangulate with their own classroom assessment standards. In this way, the teachers could establish if they were marking at an appropriate level. The data were also compared to the results of pupils who were identified to the DoE as being at risk of failure.

The principal facilitated formal *goal setting*, operationalized in terms of gains, relative achievement to other schools and minimum final results in the feedback reports. "As long as we are showing a gain, I am happy" (Observation, Principal). These goals made it possible for the principal to *monitor* pupil gains and teacher performance. The goals also served as a motivational factor for the teachers. "Just look how happy they are when they hear the results" (Interview, Principal).

6.5 Discussions and Conclusions

All three schools presented in this chapter used the data for multiple purposes as illustrated in Table 6.1 (Based on Schildkamp and Kuiper 2010). Each school, however, had its own data path either a Team, Cascade, or Top-Down data path.

There seems to be evidence of overlapping of different types of use, depending on the purpose. The three schools employed very different data paths for use in their schools. Pieter's school used a Team Approach, combining the skills and data from the HoD, principal, and teachers who all worked together to interpret and eventually set goals and monitor the achievement of the goals. Rajesh's school followed a

Table 6.1 Summary of school data use

USES		School A/E  Team	School E  Cascade	School S  Top-Down
Supporting Conversations	Teachers:			
	Grade R/Pre-school	×	×	×
	Grade 1	×	×	×
	Grade 2	×	×	×
	Grade 3		×	
	School Governing Body	×	×	
	Departmental Officials		×	
	Professional Development Providers	×	×	
	Funders	×	×	×
	Parents	×	×	×
Professional Development	Increasing Data Literacy	×	×	
	Identifying Training Needs	×	×	
Curriculum Development and Planning	Grade R	×	×	×
	Grade 1	×	×	×
	Grade 2	×	×	
	Whole School	×		
	Curriculum Developer[a]		×	
	School Based Support Team[b]	×		
Meeting Accountability demands	Integrated Quality Management System[c]	×	×	
	School Governing Body	×	×	
Goal Setting	Gains	×	×	×
	Final Results	×	×	×
	Relative to Other Schools	×	×	×
Monitoring	Teacher Performance	×	×	×
	Pupil Gains	×	×	×

[a] The curriculum developer is the person in the school responsible for the overall curriculum development and alignment for the school. Not all schools make provision for such a role.

[b] A School Based Support Team (SBST) usually comprises a group of experienced teachers who plan for supporting individual learners who have been identified as being at risk within the school. The team acts as a resource for individual teachers throughout the different grades.

[c] The IQMS consists of three programs aimed at enhancing and monitoring performance of the education system. The three programs are: Developmental Appraisal to determine and address individual teachers development needs, Performance Management for teacher progression and Whole School Evaluation to evaluate the overall effectiveness of a school as well as the quality of teaching and learning. (Education Labour Relations Council, 2003).

structured, Cascade Approach, with each person in the path having a specific role. The data moved from the principal to the HoD, the teachers, and then the curriculum developer. Sibongile's school used a Top-Down Approach with the principal relaying her interpretation of the data to teachers and the HoD while she also monitored how the improvement actions were implemented in the classes. All three schools used the data for multiple purposes as illustrated in Table 6.1.

Three distinct approaches to data use that appeared to be appropriate for the three different specific contexts (schools) were identified and explored in this chapter: Team, Cascade, and Top-Down. The data suggest that the most appropriate and effective approach of use may depend on the culture of the school, school leadership approach, level of teacher development, context and level of functioning of the school. A more advanced, sophisticated approach to data use may not always lead to improvements, but may be disheartening and inappropriate in a specific context. For instance, Sibongile's School implemented the less sophisticated Top-Down Approach using basic analysis of individual data and overall differences in scores, which proved effective in transforming data into action in the school, through the principal's leadership and guidance. This level of data use was appropriate for School S as the teachers were hesitant to interact with complex data and data presentations, but felt comfortable interacting with the basic presentation of data. The Cascade Approach seems to function effectively when data use is to be combined with additional opportunities for professional development and conceptual learning. This could be seen in the case of School E, where continuous professional development was highly valued and the principal encouraged staff to take responsibility for data use and interpretation. The Team Approach suited the collaborative culture of School A/E where additional analysis and triangulation of different data were brought about via the principal's active role in facilitating the data analysis and interpretation. The Team Approach, therefore, provides the opportunity for a data-literate and data-focused individual to facilitate the data use process where most of the other participants do not have a natural aptitude, experience, or preference for data use, resulting in a more sophisticated level of data use. These are only some of the possible effective data paths and there may be many others implemented in schools.

There are, however, certain commonalities in the approaches to effective data use illustrated above. In all cases, the principals valued and emphasized the importance of data-based practice and planning, ensuring that formal time and space were created to work with the data, whether it was through arranging meetings, visiting classrooms, or supporting HoDs in meetings with staff. Multiple role players were involved in the data analysis, interpretation, and application process, from teachers to HoDs and principals, although not in the case of the Top-Down approach where the teachers were provided with interpretations by the principal, Sibongile. Target setting was used to motivate teachers and monitor progress in the schools. School data were never viewed in isolation, but interpreted in conjunction with other sources through triangulation. In all cases, the data were used to facilitate conversations about the curriculum and individualized support with role players such as other teachers from different grades, parents, the SGB, and the DoE. Feedback was also provided with links to support material to provide a stepping stone to action. Data must also be provided in

such a manner that it meets the needs of different schools at various levels of data use sophistication. From the case studies, it appears that an effective feedback system should thus try to establish or encourage these conditions for effective data use.

In terms of policy, it is essential that monitoring and data use policies provide the opportunity and time for use of data. As can be seen in all three cases, formal meetings were arranged to interact with the data and discuss planning, as well as monitor progress in schools. It would also be beneficial if training in data literacy and data use for planning and evidence-based practice is mandated. This would equip users with the skills not only to report, but also to identify and use sources of information that are appropriate to ensure quality. The data in this chapter seem to suggest that policy on data use should not be prescriptive about school data paths, but should rather provide exemplars of various possible approaches, which are appropriate for different contexts. In South Africa, the information that schools receive from government is not always sufficiently detailed to meet the decision-making needs of the varying school contexts. For this reason, it is important that there are layers of sophistication (different levels of detail, complexity of presentation, and disaggregation) within the data, which the school can access as needed for its particular milieu.

6.5.1 Reflection Questions for Practitioners

1. What sort of data path is your school currently using?
2. How are different role players in your school involved in the data analysis, interpretation, and application process throughout the data path?
3. How appropriate is your school's current data path for your school culture, school leadership approach, level of teacher development, context and level of functioning of the school?

6.5.2 Reflection Questions for Policy Makers

1. How do policies in your country[6] support development of data literacy in schools?
2. To what extent does your country's current policy prescribe school data paths? What impact may this have on the effectiveness of data use in different school contexts in your country?
3. How do the policies in your country encourage school data use?

6.5.3 Reflection Questions for Researchers

1. Three possible data paths were identified in this chapter. How can other data paths be identified through further research? How would you approach this research in your country?

[6] Policies are referred to here as relating to a country, it may, however, refer to policies for a specific region, state, or province depending on how a specific county's education system is structured.

2. Certain data paths such as the Top-Down approach are generally viewed as less desirable. How can the school milieu mediate value judgments about approaches to data use?
3. How can data feedback systems, which are able to meet the needs of different schools at various levels of data use sophistication, be developed?

References

Archer, E. (2010). *Bridging the gap: Optimising a feedback system for monitoring learner performance*. Pretoria: University of Pretoria.

Black, P., & Wiliam, D. (1998a). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice, 5*(1), 7–75.

Black, P., & Wiliam, D. (1998b). Inside the black box: Raising standards through classroom assessment. Retrieved June 7, 2004, from http://www.pdkintl.org/kappan/kbla9810.htm.

Campbell, C., & Levin, B. (2009). Using data to support educational improvement. *Educational Assessment, Evaluation and Accountability, 21*(1), 47–65.

Cradler, J. (2008). Data-driven decision making and the electronic learning assessment resources (ELAR). Retrieved May 12, 2010 from http://www.clrn.org/elar/dddm.cfm.

De Villiers, M. R. (2005). Three approaches as pillars for interpretive information systems research: Development research, action research and grounded theory. Research for a changing world: Proceedings of South African Institute for Computer Scientists and Information Technologists 2005 conference (pp. 111–120). White River: SAICSIT.

Department of Education. (2002). Revised National Curriculum Statement Grades R-9 (schools). Retrieved October 25, 2006, from http://www.polity.org.za/pdf/Curriculum.pdf

Department of Education. (2006a). *Grade 3 Foundation Phase National systemic evaluation report*. Pretoria: Government Printer.

Department of Education. (2006b). *Grade 6 Intermediate Phase Systemic Evaluation Report*. Pretoria: Government Printer.

Department of Education. (2006c). *The national policy framework for teacher education and development in South Africa: More teachers; better teachers.* Pretoria: Department of Education.

Earl, L. M., & Katz, S. (2006). *Leading schools in a data-rich world*. London: Sage.

Education Labour Relations Council. (2003). *Training manual on the Integrated Quality Management System*. Retrieved April 16, 2007, from www.elrc.co.za/UploadedDocuments/IQMS%20Training%20Manual.doc.

Gawe, N., & Heyns, R. (2004). Quality assurance. In J. G. Maree & W. J. Fraser (Eds.), *Outcomes-based assessment* (pp. 159–184). Sandown: Heinemann.

Halverson, R. (2010). School formative feedback systems. *Peabody Journal of Education, 85,* 130–146.

Harris, A., Chapman, C., Muijs, D., Russ, J., & Stoll, L. (2006). Improving schools in challenging circumstance: Exploring the possible. *School Effectiveness and School Improvement, 17*(4), 399–407.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112.

Hibberd, B. J., & Evatt, A. (2004). Mapping information flows: A practical guide. *The Information Management Journal, 1,* 58–64.

Howie, S. J., Venter, E., Van Staden, S., Zimmerman, L., Long, C., Scherman, V., et al. (2008). *Progress in International Reading Literacy Study (PIRLS) 2006 summary report: South African children's reading literacy achievement*. Pretoria: University of Pretoria.

Howie, S. J. (2008). Measuring the health of the education system: Lessons from international studies for South Africa. Keynote address, presented at Association for the Study of Evaluation and Assessment national conference, Pretoria, July 2008.

Howie, S. J. (2010). ICT-supported pedagogical policies and practices in South Africa and Chile: Emerging economies and realities. *Journal for Computer Assisted Learning, 26*(6), 507–522.
Kamel, N., Narasipuram, M. M., & Toraskar, K. (1997). An approach to value-based modelling of information flows. *The Information Society, 13,* 93–105.
Kluger, A. N., & Denisi, A. (1996). The effects of feedback interventions on performance: a historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119,* 254–284.
Krovi, R., Chandra, A., & Rajagopalan, B. (2003). Information flow parameters for managing organisational processes. *Communications of the ACM, 46*(2), 77–82
Mano, M. M., & Kime, C. R. (2004). *Logic and computer design fundamentals* (3rd ed). Englewood Cliffs: Prentice Hall.
Martin, M. O., Mullis, V. X., Gonzalez, E. J., & Chrostowski, S. J. (2004). *TIMSS 2003 International science report*. Boston: TIMSS & PIRLS International Study Centre.
Naker, D. (2007). *What is a good school? Imagining beyond the limits of today to create a better tomorrow*. Kampala: Raising Voices.
Nieveen, N. (1997). *Computer support for curriculum developers: A study of the potential of computer support in the domain of formative curriculum evaluation*. Enschede: PrintPartners Ipskamp.
Plomp, T. (2009). Educational design research: An introduction. In T. Plomp, & N. Nieveen (Eds.), *An introduction to educational design research: Proceedings of the seminar conducted at the East China Normal University*, Shanghai (PR China), November 23–26, 2007 (pp. 9–37). Enschede: SLO.
Richey, R. T., Klein, J. D., & Nelson, W. A. (1996). Developmental research. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 1213–1245). New York: Macmillan.
Salpeter, J. (2004). Data: Mining with a mission. *Technology,* March, 30–36.
Saunders, L. (1999). Who or what is 'self'-evaluation for? *School Effectiveness and School Improvement, 10*(4), 414–429.
Schildkamp, K., & Kuiper, W. (2010). Data-informed curriculum reform: Which data, what purposes, and promoting and hindering factors. *Teaching and Teacher Education, 26,* 482–496.
Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research, 78*(1), 153–189.
The Urban Institute. (2004). Analysing outcome information: Getting the most of data. Retrieved November 5, 2009 from http://www.urban.org/UploadedPDF/310973_Outcome-Information.pdf.
Thijs, A. (1999). *Supporting science curriculum reform in Botswana: The potential of peer coaching*. Enschede: PrintPartners Ipskamp.
Tymms, P., & Coe, R. (2003). Celebration of the success of distributed research with schools: The CEM Centre, Durham. *British Educational Research Journal, 29,* 639–653.
United Nations Children's Fund. (UNICEF). (2000). *Defining quality in education*. New York: United Nations Children's Fund.
Van den Akker, J. (1999). Principles and methods of development research. In J. J. Van den Akker, R. Branch, K. Gustafson, N. M. Nieveen & T. Plomp (Eds.), *Design approaches and tools in education and training*. Dordrecht: Kluwer Academic.
Van den Berg, S., & Burger, R. (2002, October 22–24). Education and socio-economic differentials: A study of school performance in the Western Cape. Paper presented at the 2002 DPRU/FES conference, Johannesburg, South Africa Retrieved June 9, 2010, from www.commerce.uct.ac.za/Research_Units/DPRU/Conf2003PDF/Conf2002pdf/VdBergBurger.pdf.
Van Petegem, P., & Vanhoof, J. (2005). Feedback of performance indicators: A tool for school improvement? Flemish case studies as a starting point for constructing a model for school feedback. Revista Eletronca Iberoamericana sobre Calidad, Eficaciay Cambio en Educación, *3*(1), 222–234, Retrieved January 30, 2007, from http://www.ice.deusto.es/rinace/reice/vol3n1_e/VanPetegemVanhoof.pdf.
World Bank. (2008). *World development indicators*. Washington: Word Bank.

Chapter 7
Improving Data Literacy in Schools: Lessons from the School Feedback Project

Jan Vanhoof, Goedele Verhaeghe, Peter Van Petegem and Martin Valcke

School principal Michel groans, 37 unread emails since he checked yesterday. In the long list, it was immediately apparent that the feedback on pupils' test results that he is expecting has also arrived. Michel is curious about the results of this year's pupils. Quickly, he tries to note a few findings by scrolling through the report on his laptop. The number of figures and tables is quite impressive. The report is extensive and at first sight it is hard to quickly pick out the highlights. He concludes he will have to allocate some time to reading the report. He makes a hard copy with the intent to read it the same evening at home. It is Michel's conviction that the information in the report is too valuable to be neglected. Later that day, at home, even after having devoted a full hour on the report, his enthusiasm is tempered. The fact that he's not familiar with concepts such as "learning gains" and "value added" make it very hard to learn relevant lessons from the report. The next morning he says to his vice principal, "I was a bit disappointed, you know. Sure, I'm just not used to these concepts. For instance added value, significantly higher or lower... These are things that you just don't come across in education, do you? Wow, you'd need to put in some serious study and our teachers don't understand any of that. There's no point in giving them all that because they are just going to say: "What on earth are you talking about?" Michel adds that he finds it hard to label exactly what the problem is. It is not only about understanding what is in the report, it is also about how to use it. One thing is for sure he says, we will have to develop the necessary skills if we want to enjoy the benefits of this report. But how?

The use of data is no easy matter for Flemish schools; both users and the data systems concerned must meet certain preconditions in order to be able to engage properly and successfully with data. This study focuses on the data literacy of users such as Michel and addresses the question of how schools can be supported in their growth process towards the acquisition of data use-related knowledge, skills, and attitudes. We focus specifically on how Flemish primary schools use the data on pupil performance that they receive as part of the Flemish School Feedback Project. Various support initiatives (such as study days, on-site training, and peer consultations) are described and evaluated on the basis of 45 interviews with school principals and two focus group discussions. The description of these results led to concrete suggestions and

J. Vanhoof (✉) · P. Van Petegem
University of Antwerp, Antwerp, Belgium
e-mail: jan.vanhoof@ua.ac.be

G. Verhaeghe · M. Valcke
Ghent University, Ghent, Belgium

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_7, © Springer Science+Business Media Dordrecht 2013

tangible ways of setting up support activities or support routes, aimed at improving data literacy in schools.

The increasing autonomy of Flemish schools is accompanied by a greater emphasis on initiatives aimed at getting schools to justify their approach with regard to quality assurance (e.g., how schools maintain and improve their quality) and encouraging schools to create information-rich environments. The rationale behind these initiatives is that making data available to schools puts them in a position to make more informed decisions. It is said that policy makers and practitioners too often base their decisions on informed intuition without any properly thought-out process of research and analysis (Creighton 2007). Existing research draws a rather sobering picture, however, and shows that the results of data use are generally still somewhat limited (Schildkamp et al. 2009; Zupanc et al. 2009). We know that the lack of knowledge and skills in working with data is currently a major obstacle (Earl and Fullan 2003; Kerr et al. 2006; Saunders 2000). As indicated by Michel, school principals usually receive little or no training in the field of conducting research, data collection, data management, or data interpretation. A large number of school principals claim that they do not have the necessary prior knowledge in order to be able to understand data correctly (Verhaeghe et al. 2010). It is no surprise, therefore, that research findings indicate that school principals (and teachers) state that they need support both with the interpretation and further use of data (Schildkamp et al. 2009).

The exploratory research reported here focuses on a specific data initiative, namely the data feedback, which Flemish primary schools receive from the "School Feedback Project." Our focus is on data-use competencies (hereafter referred to as "data literacy") and the impact of different types of support on these competencies. More specifically, we formulated the following research questions: (1) "What, according to Flemish school principals, are their own strengths and weaknesses with regard to data literacy?," (2) "To what extent, according to Flemish school principals, have support initiatives had an impact on data literacy?," and (3) What, according to Flemish school principals, are the advantages and disadvantages of the different types of support?

The next section explains the research context in which these questions will be answered. We begin with the Flemish policy context and then go on to look at the form and content of the school feedback initiative to which this study relates. Section 7.2 examines the conceptual background behind the choice of types of support found in the School Feedback Project. The data collected in order to evaluate these types of support were chiefly obtained by means of interviews conducted with participants (see Sect. 7.3). The results of this exploratory evaluation are discussed in Sect. 7.4.

7.1 Introduction: Context Description

Until now, only a limited number of initiatives to develop data systems have been undertaken in Flanders. The Flemish dislike of central examinations and the resulting lack of systematic data collection on the performance of pupils are in part responsible

for this (Van Petegem et al. 2005). However, schools are required by law to monitor and improve their own quality in a systematic manner. How they do that is a matter for the individual school and is part of the autonomy, which schools have in Flanders. Deregulation and decentralization are therefore a continuing part of the educational policy implemented in Flanders. Schools are becoming increasingly autonomous and are achieving a greater degree of self-direction. The Flemish government does not impose any formal systematic obligation upon schools in Flanders to carry out self-evaluation or to compel them to collect output data. Policy with regard to school feedback use is therefore primarily one of encouragement rather than coercion. Flanders has no system of central examinations. Pupil achievement is mostly evaluated by using tests designed by individual teachers. The Inspectorate is an autonomous organization functioning within its power granted by the Flemish government to monitor and promote the quality of education. The Decree on Quality of Education stipulates the conduct of audits of individual schools as an important task for the Inspectorate. When carrying out audits, the inspectorate is primarily concerned with schools' output (such as pupil performances; in relation to their context; such as features of the neighborhood), input (such as pupil characteristics), and process (such as instructional practices and leadership). This is not without consequences for the way in which schools themselves look at their own functioning in general and their output in particular.

The ultimate objective of the School Feedback Project referred to in the present study is to collect data concerning the performance of pupils in a systematic way and to encourage schools to make use of these data. The feedback project uses data from the School Trajectories in Primary Education (SiBO) research project, which is a longitudinal study that was set up to investigate the school careers of 6,000 children during the course of their primary education. Data were collected by means of class-based tests and written questionnaires about the child, the family, the class, the teacher, and the school (For details on the data gathering, see: Verachtert et al. 2009; Verhaeghe et al. 2002, 2010). After each measurement occasion, the schools received an individualized report with the results aggregated to school level. In the present study, we focus on the use of the individualized feedback reports, which were supplied to schools during three consecutive academic years (2007, 2008, and 2009). All these school feedback reports included results for mathematics, reading fluency, reading comprehension, and spelling, supplemented by data concerning the pupil mobility and intake characteristics (child factors, background characteristics, and initial language skills). The aggregated results of an individual school were always set against the average scores for the Flemish reference sample. The compilers of the reports tried to explain central concepts such as learning gains and added value in a clear manner so that the report could be read by school principals without any prior knowledge of statistics. For similar reasons, the statistical forms of representation used, such as bar and circle diagrams, growth curves, and cross-tables, were also explained.

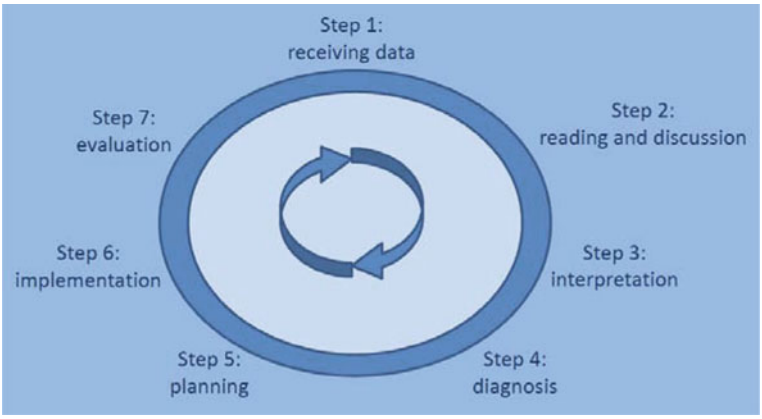

Fig. 7.1 Steps in school feedback use

7.2 Conceptual Framework

7.2.1 What We Understand by the Term Data Literacy

We define data literacy as a competency, which is the integration of the knowledge, skills, and attitudes necessary to perform to an expected standard in specific situations (Gonczi 1994). First, data literacy "encompasses the strategies, skills and knowledge needed to define information needs, and to locate, evaluate, synthesize, organize, present and/or communicate information as needed" (Williams and Coles 2007, p. 188). Being data literate is a condition for converting data into valuable and usable information (Earl and Fullan 2003). This also applies to data use in schools (Webber and Johnston 2000). The statistical knowledge and skills of the data user appear to determine, in part, the interpretability of the school feedback reports (Williams and Coles 2007). Second, the concept of data literacy competencies also requires that explicit attention be paid to attitudes to data use. An attitude indicates how positively or negatively an individual is disposed towards a certain matter (Petty and Wegener 1998). The attitude of users with regard to data use determines in large measure the extent to which they are prepared to invest time and effort into using the information (Williams and Coles 2007). Bosker et al. (2007) suggest that a negative attitude with regard to school feedback is one of the principal obstacles to the use of feedback information.

The definition of data literacy used in the present study is based on research, which suggests that successful data use involves a number of consecutive steps (Verhaeghe et al. 2010). These steps are set out in Fig. 7.1. In the process arising out of the receipt of a school feedback report, we can identify the following steps: receipt, reading, and discussion of the school feedback as steps in the process of arriving at a correct interpretation. In our conception, a correct interpretation encompasses

an accurate reading of the data (correct understanding) and an evaluation of the school's performance as represented in the feedback report (evaluation of strengths and weaknesses). This is then followed by a feedback use phase, including, among other things, a diagnosis (in looking for explanations for the results), but also the drawing up of plans in response to the school feedback and the implementation and evaluation of these plans. The emphasis made on distinguishing between "interpretation" and "use" is a result of the finding that schools often get stuck when it comes to moving on from interpretation to planning and policy implementation.

Each step in Fig. 7.1 requires specific data-use competencies. In the School Feedback Project, the competencies, which the support provided aimed to help improve and inculcate, were described as follows:

- Being conscious of possible uses of data.
- Being able to describe the central data concepts in their own words.
- Being able to interpret the figures and tables correctly.
- Being able to establish the strengths and weaknesses of their own school, as these appear from the report.
- Being able to integrate this information into other data sources.
- Being able to provide explanations for their own strengths and weaknesses.
- Being able to undertake quality assurance initiatives or improvement actions based on these explanations.
- Being able to set up and implement improvement actions.
- Evaluation of improvement actions.

The School Feedback Project sought to find suitable forms of support for schools to develop data use-related knowledge, skills, and attitudes. To this end, a variety of different types of support was deployed.

7.2.2 Variation in Types of Support in the School Feedback Project

Within the School Feedback Project, various types of data use support were explored. The difference between the various types of support can be reduced to the different ways in which the following six characteristics were met.

- *The support provided needs to be accessible:* This dimension refers to the extent of the efforts that participants are required to make in order to take part in a particular type of support. This implies that, for example, the help desk should be available quickly and simply. An analysis of the accessibility involves questions such as: Does the school need to be enrolled?; Does the school have to keep a particular time slot free?; Does the school have to prepare for the support? There is a difference in this regard between being able to contact a help desk quickly and easily and a planned and pre-prepared peer consultation.
- *Proximity:* Gardner (1995) places various training initiatives on a continuous scale with initiatives that take place outside the school at one end (Inservice Education and Training—INSET) and initiatives that take place inside the school

at the other end (Onservice Education and Training—ONSET). This distinction between INSET and ONSET does not only refer to the physical place of training but also to the contents of the training. This continuum may be applied to support initiatives for teachers in the context of data use. In this case, ONSET would refer to a support initiative, organized on the school, using the school's own results. On the contrary, INSET support would encompass a training not organized on the school, not referring to the school's results.

- *Tailoredness:* Peeters et al. (1996) suggest that support is only worthwhile when it meets a need. They define a need as a shortcoming that is felt and recognized by the school itself. Nevo (1995, p. 173) also points out that support "must be adapted to the specific needs of school educators." If support takes school-specific data and problems as its starting point, there is a greater chance that any resulting changes will be accepted through greater involvement and practical application (Gardner 1995; Murnane et al. 2005).
- *Interpretation-oriented or use-oriented:* The learning objectives of the different support activities are highly diverse. In the case of interpretation-oriented activities, schools benefit more from the expertise of researchers who are familiar with data interpretation, whereas in the case of use-oriented activities, schools benefit more from the expertise of school advisors who are familiar with the subsequent steps in using the data, which is why, later on, we will distinguish between an interpretation-oriented focus and a use-oriented focus. The expertise expected of support-providers is different when the prime emphasis is on being able to correctly interpret concepts and figures than when schools wish to go on to set up concrete improvement actions.
- *Interaction within the school:* When only one person per school participates, it is important to be able to rely on him or her being able to convey the knowledge and understanding acquired to the school team (Kerr et al. 2006). When several school team members take part in the support, this can act as a stimulus to more internal consultation and further follow-up. In this way, feedback use can evolve from an individual activity into a shared responsibility (e.g., in the form of data teams; Huffman and Kalnin 2003; Wayman et al. 2007).
- *Interaction between schools:* In addition to interaction within the school, support can also be aimed at promoting interaction between schools. An advantage of bringing school feedback users from different schools together is that participants can learn from each other (formally and informally) by social interaction (Mathison 1992).

If we use these characteristics to arrive at a typology of the different forms of support, this helps us see both the variation between these forms, as well as their principal advantages and disadvantages. The various forms of support used in the School Feedback Project are explained briefly below. Table 7.1 shows the link between the abovementioned dimensions and the different types of support. Clear advantages and disadvantages of the various types of support are shown with a plus or minus sign. A slash indicates a neutral or unclear position. The table shows that there is no single type of support, which exhibits all the various characteristics that are regarded as valuable.

Table 7.1 Advantages and disadvantages and participation in the various types of support

	Help desk	INSET by researchers	ONSET by researchers advisor	ONSET by pedagogical	Peer consultation
Accessibility	+	/	/	/	−
Proximity	/	−	+	+	/
Tailoredness	+	−	+	+	+
Interpretation-oriented (i.e., steps 2−3)	+	+	+	−	/
Use-oriented (i.e., steps 4−7)	+	/	/	+	+
Interaction within the school	−	−	+	+	/
Interaction between schools	−	/	−	−	+
Sample 2007 (16 interviews)	Offered to all 195 schools (16 interviewees)				
Sample 2008 (no support trajectory) (18 interviews)	Offered to all 195 schools (six interviewees)	Participation by 23 schools (six interviewees)	Participation by seven schools (six interviewees)		
Sample 2009 (support trajectory, in cooperation with pedagogical advisors; 11 interviews)	Offered to all 195 schools (11 interviewees)	Participation by 11 schools (same 11 interviewees)		Participation by 12 schools (same 11 interviewees)	Participation by four schools (same 11 interviewees, both with participants and nonparticipants)

- *Help desk:* Staff from the School feedback project were permanently available to schools by phone or e-mail to answer questions during the period studied. The availability of this help desk was stressed in the feedback reports, on the website, and at study days. There were no restrictions on the nature of the questions and all the schools were allowed to make use of the help desk ($n = 195$).
- *INSET* (*external training*) *by researchers:* This type of support concerns the participation of 34 schools in a study day attended by the school principal together with—if the school so desired—a colleague. During the study day, about ten school principals sat together to look at different aspects of the school feedback reports. The study day was focused primarily on the correct interpretation of the feedback reports and on suggestions for their use. During the study day, schools did exercises that were not based on their own data. This study day was organized and provided by the staff of the School Feedback Project (i.e., the researchers employed on the project).
- *ONSET* (*internal training*) *by researchers:* Seven schools were visited by one of the staff of the School Feedback Project. The school principal together with—if the school so desired and subject to feasibility—the care coordinator and/or two teachers were instructed in how to interpret the feedback data and possible ways of using the feedback results. During this session, participants worked with school-specific data together with data from a fictitious school, unlike in the case of the INSET format. This ONSET session was organized and provided by the staff of the School Feedback Project (i.e., researchers employed on the project).
- *ONSET* (*internal training*) *by a pedagogical advisor:* The 12 schools, which participated in this type of support, were visited by a member of the pedagogical advisory service. Pedagogical advisory services are responsible for promoting educational quality and providing guidance to teachers and school principals in their professional practice. With the support of their own pedagogical advisors, schools drew up an inventory of the school-specific strengths and weaknesses based on the school feedback report. The pedagogical advisor tried to encourage the participants to arrive at their own interpretation, rather than imposing his or her own interpretation. The data from the school feedback report were compared with other data sources. Finally, the participants looked for explanations for their own strengths and weaknesses. The school principal decided which other team members he or she wished to involve in this discussion (individually or during a staff meeting).
- *Peer consultation:* On the basis of the school feedback reports: In meetings involving groups of two schools (each of which had two representatives), four schools exchanged experiences with describing and explaining their own results. The other schools acted as critical friends in helping them interpret their own data, with a focus on achieving a use-oriented approach. The organizers did their best to arrange these peer visits for groups of schools, which were as homogenous as possible in terms of their pupil populations. The peer consultations were led by one of the staff of the School Feedback Project and also attended by the pedagogical advisors of the schools in question. The items dealt with during the session were divided into two components. The initial focus was on the interpretation and

explanation of the school's own results. Every participant was given the chance to test their own conclusions and explanations against those of other schools. They were also allowed to put questions to the participants from other schools. The second component went into more depth regarding the use of output data.

7.3 The Collection of Evaluation Data

In order to describe the support needs of Flemish school principals and to establish the impact of the various types of support on their data literacy, we set up an exploratory qualitative data collection. We report on the experiences of participants from several samples, selected in our studies conducted in 2007 (Verhaeghe et al. 2010), 2008 (Vanhoof et al, in press; Verhaeghe et al., in press), and 2009 (Vanhoof et al. 2011). In 2007, all schools were offered the possibility to call to the help desk (see Table 7.1). Out of the target population of 195 SiBO schools, 16 interviewees were selected which—as far as possible—exhibited a maximum variation on a number of relevant aspects (such as school size, number of equal opportunity pupils, experience with self-evaluation, and school performance, as stated in the report). The participants from 2008 were selected randomly to take part at the external or internal training by a researcher. Also, during 2008, the helpdesk was permanently available to all schools from the School Feedback Project. In 2009, 12 schools participated in combined support initiatives. These schools, which did not participate in 2008, were selected by their pedagogical advisors in a pilot study. However, their participation was voluntary. This means they were granted access to the help desk, were visited at school by a pedagogical advisor, and received external support by a researcher. In addition, four of these schools were willing to participate in a peer consultation. The pedagogical advisors ($n = 7$) in this study were involved in a pilot study in close cooperation with the School Feedback Project to examine possibilities for future feedback support.

One of the main characteristics of qualitative research is that it is very well suited to getting an idea of people's opinions about events, processes, and structures in their lives (Miles and Huberman 1994, p. 10). In specific terms, we opted for semistructured in-depth interviews and focus group discussions. In total, 45 interviews were conducted with the school principal, spread over 3 academic years. In addition to the semistructured interviews, we also used two focus group discussions in which the pedagogical advisors involved in 2009 participated ($n = 7$) and which were not attended by the school principals. These focus groups, moderated by researchers of the School Feedback Project, were organized to reflect on the experiences of the pedagogical advisors in the support initiatives.

The interviews and the focus group discussions were all recorded and transcribed. The findings from the various data collections were subsequently coded independently and analyzed by the staff of the School Feedback Project, with ATLAS.ti, a qualitative analytic software tool. Codes were assigned by following the middle-order approach, which allows for the initial application of broad categories that can

later be refined (Dey 1993). Text fragments were mainly assigned to codes in a deductive way. First, text fragments were placed under broad categories (e.g., effects of support, types of feedback use,. . .) and were then assigned to a predefined coding structure. If no predefined code was appropriate, the text fragments considered to be of importance were placed under the suitable broader category. New codes were created for these fragments inductively, emerging from the data, as in the grounded theory approach (Strauss and Corbin 2007). The evidential value of the findings rest on data, which were collected during the interviews and focus group discussions, which is why we have included verbatim quotations from the recordings in the results section, by way of illustration.

7.4 Findings

In this section, we report the results of the in-depth interviews and focus group discussions. We will start by looking at how the school principals describe their own strengths and weaknesses with regard to data literacy (see Sect. 7.4.1). In Sect. 7.4.2, we look at how Flemish school principals describe the impact of the support initiatives in which they participated and the advantages and disadvantages of the various support formats to which they attribute this impact. Finally, in Sect. 7.4.3, we list a number of relevant attention points with regard to support provision.

7.4.1 Findings with Regard to Data Literacy: Strengths and Weaknesses

a. Knowledge and Skills in the area of School Feedback use The most significant shortcomings appeared to exist in the area of possessing the necessary knowledge and skills to interpret the reports, even with the explanation provided in the report. School principals said that they find the interpretation of the school reports "difficult" or "very difficult" (and, in some cases, even "impossible"). Some indicated that they were unable to interpret the information in the report on their own and it generally required a great deal of time and effort on their part. The respondents stated that in order to carry out the following step (arriving at a correct diagnosis) they felt it was also important that schools were able to see how the various data sources at their disposal related to each other. Only a limited number of school principals said that they were capable of doing so. Other shortcomings in knowledge and skills arose in the area of conveying the information to the school team or in the subsequent diagnosis and planning of actions. Certain school principals felt unsure about their own interpretation of the results (e.g., limited data competencies).

Various explanations for these rather limited data competencies were given during the interviews. In the first place, respondents indicated that their existing knowledge of statistics and maths was fairly limited. This was attributed to the fact that data use is an area to which limited attention was paid during their professional training.

The indications regarding limited data literacy need some qualification, however. For example, some school principals said that they did not have any difficulties in interpreting the reports, so not every school principal found the information complex or said that he or she is insufficiently familiar with the concepts used.

> School principal: "I reckon that, with the explanation given in the text, I am perfectly capable of interpreting the content and can arrive at my own conclusions."

According to a number of school principals, a lack of structure and user-friendliness in the school feedback report was an obstacle to interpreting its contents properly. It was also commented that their reports contained too much information and that data were included those made the content unnecessarily complicated. Some respondents said that the terminology used was different from the terminology they were used to in the field of education. The concepts used are thus seen as too far removed from educational practice and are therefore perceived as abstract and pointless. Not all school principals interviewed, therefore, attributed their problems of interpretation to their own shortcomings. Another explanation for the lack of the necessary knowledge and skills in some schools was that there had been a change of principals and the departing principal had failed to pass on the necessary information to his or her successor. Finally, according to the Flemish school principals interviewed, they are very short of time and do not have time to invest in the interpretation of data and in that way, to develop data-use competencies.

b. Attitude with Regard to School Feedback use Most of the school principals had a fairly positive attitude with respect to data use. That school principals show a positive attitude is above all the result of a growing interest in the use of objective measuring instruments, which can establish pupils' learning gains and make it possible for schools to arrive at comparisons with a reference group.

> School principal: For me it is very important to look beyond my own school walls. It is obvious you have an idea whether these children are performing well or not. But if you can make a comparison with a reference group then you can determine a value or score.

According to the principals, teachers had a much more negative attitude. The negative attitude among teachers can, among other things, be attributed, according to the principals, to the large amount of work involved in the process of data collection, the concern that the results will show them in a negative light, the fact that external evaluations are perceived as threatening and the preference of pupil-level data.

> School principal: In my opinion, the school and class level is the most interesting, in view of my function. I am supposed to work mainly on school and class level and less on the pupil level. Thus for me this is more interesting than an individual report. But of course a teacher will see it differently. I am sure of that. This teacher will probably prefer feedback about the pupils in this class.

7.4.2 Findings with Regard to the Various Types of Support

Before looking at the specific types of support, we will examine the general expectations with regard to support and the impact of the support provided.

a. Expectations with Regard to Support and Impact of Support Broadly speaking, schools expected to be able to acquire expertise with regard to the interpretation and use of school feedback. In the first place, they wanted that support to provide clear explanations of the concepts used. Another point that was repeatedly mentioned was the desire for support in converting possible shortcomings into actions for improvement. Not all the schools, however, had clear expectations. This is quite an important point given that the judgment concerning the impact of the support depends on the specificity and intensity of the school-specific expectations. There were some schools, which, in any case, already made intensive use of the reports and, according to them, already got the most out of them. If this is indeed the case, it is by no means automatically true that they are going to benefit from the provision of support. In general, however, the respondents indicated that the various support activities contributed to the following valuable results.

- *Supporting the interpretation process:* The support activities have resulted in a better understanding of the concepts used and have brought concepts such as output, learning gains, and added value to life and helped schools to make use of them. Overall, schools feel that they have been well supported in their interpretation process.
- *Supporting the diagnostic process:* By taking the time to exchange thoughts about possible explanations and by benefiting from inputs given from an outsider's perspective, schools said that they had gained insights, which sometimes surprised them. Support by someone from outside appears to be helpful in the diagnostic process.
- *Confirming and broadening existing choices and ways of thinking:* In a number of schools, the support activities to a large extent resulted in a confirmation of their existing insights. Although this might have given support-providers the feeling that their contribution had therefore been of rather limited benefit, participants stressed that this was also a valuable result. Sometimes, however, support helped schools move a stage further. In this case, the support helped schools to look critically at their existing choices and ways of thinking and opened up new avenues of approach.
- *Encouraging informed school development:* Respondents said that the results had an effect beyond the use of the school feedback reports themselves. In a number of schools, the support also contributed to an intensification of reflection and quality assurance activities. In some schools, the support introduced a new way of thinking, leading them to look at different sources of information.
- *Further investment in school feedback use:* It was often the case that taking part in support led schools to commit themselves to tackling certain issues and to approach the process of data use more systematically. For most respondents, taking part in support appears to have acted as an incentive to study the reports more carefully and to distribute them more widely within the school.

> School principal: "Yes, I've no doubt about it, had it not been for the support, it (the report) would still be buried under the piles of other unread things. Maybe, I would eventually have got round to reading it, but I'm not so sure I would have."

b. Perceived Advantages and Disadvantages of the Different Types of Support In this section, we will provide a brief discussion of how the various types of support worked in practice and indicate the advantages and disadvantages of these types of support reported by the respondents.

- Help desk
  All the schools taking part in the School Feedback Project had access to the help desk, but made almost no use of it and its impact on the competencies of the school principals was thus very limited. There are various reasons for this limited use. In a small number of schools, the school principals said that they did not make use of the help desk because they had sufficient in-house expertise within the school. A number of school principals indicated that they regard a help desk as too impersonal. The reports often contain sensitive information and for some school principals that was too great an obstacle. A number of respondents also stated that they didn't feel comfortable with admitting that they are not able to interpret the information in the school report on their own. Another element is the finding that despite the fact that the existence of the help desk was clearly stated in the report and on the website, some school principals were unaware that they had a help desk at their disposal. An additional hypothesis to explain the limited use of the helpdesk is related to the limited use of the feedback report. Maybe the help desk would have been consulted more intensively if the feedback would have been used more intensively within the schools. This hypothesis should be examined in future research.
- INSET (External training) by researchers
  During the INSET sessions conducted by researchers, schools were given an explanation of the concepts and figures used in the feedback reports and were given the opportunity to carry out practical exercises and undergo assessment. A variety of didactic working methods were used, ranging from instruction-oriented presentations to interviews and group discussions. An initial finding during the sessions was, according to the respondents, the large variation in prior knowledge. Some participants appeared to have no problems in interpreting the reports and found sufficient support in the information already provided in the report to permit them to arrive at a correct interpretation. For others, however, this was clearly not the case. The organizers of the study day did their best to allow for these differences, by means of offering different study routes, which were seen by the participants as a strong point. In giving their opinion on the value of the training, respondents mainly referred to increased knowledge and skills with a view to the interpretation of the feedback reports. The researchers were regarded as experts in this area. When it came to giving a general opinion as to the value of the study morning, however, there was a wide variety of answers, ranging from very positive to fairly negative. The opinion expressed by the participants seems generally to be related to their prior knowledge: the more limited the prior knowledge, the more positively they rated the study morning.

  School principal: "Certainly on that first study day we were very well taught. They showed us, finally, how to correctly interpret the report. Basically, for those of us who have to look at these school results and such like, and I think I learnt a great deal."

School principal: “Actually all they did was to go over the results again and how we ought to assess and interpret the scores and, we’d done that already before. I found that a waste of time.”

Finally, it should be noted that participants found it valuable to be able to meet the school feedback report staff in person.

- ONSET (Internal training) by researchers
  The schools, which participated in this type of support, were given an individual explanation on their school premises approximately 1 month after having received the school feedback report. On average, the sessions lasted about 120 minutes and were generally attended by the school principal together with one or more members of the school management team. Only in one case was a teacher involved. During these ONSET sessions given by the researchers, schools were given an explanation of the concepts and figures used in the feedback reports and were given the opportunity to carry out practical exercises and undergo assessment. The participants valued the opportunity, in addition to the explanation provided based on a report on a fictitious school, to relate the items discussed to their own school feedback report. According to the respondents, the learning content of a session of this kind was almost bound to be better suited to the problems and needs perceived in their own school. Since there were a limited number of participants, support-providers were able to continually test whether they had truly mastered the material. Although discussing confidential information face to face with someone from outside can come across as threatening or controlling, this was not seen as a problem by the participating schools. As the data collection and data analysis was carried out by the university and given that this was part of an academic research study, participating schools felt confident that matters discussed would be treated confidentially. Researchers are regarded as neutral actors who could be used as a sounding board without any further implications. An additional advantage of this type of ONSET is that it takes place in a familiar environment and requires a minimum effort from the school. Given the nature of the researchers’ expertise, the focus of this type of internal training was heavily interpretation-oriented. However, as the participants were working with their own figures (which was not the case in the INSET sessions), schools were able to make a start towards the process of translating the interpretation into their own context. According to respondents, therefore, ONSET may have the advantage that schools feel to be better guided in the diagnosis and planning phase.
- ONSET (Internal training) by the pedagogical advisor
  In most cases, only the school principal took part in this type of support, and in a small number of cases, he or she was accompanied by a member of the school management team. Only in one case, teachers were involved as well in the ONSET support. As with the other type of ONSET, in this case participants also valued the possibility of focusing on their own school. The advisors responded to the expectations and needs of the participating schools, which meant that sessions were conducted differently in the various schools. The length of the sessions ranged from 80 minutes to 5 hours.

Pedagogical advisor: "Of the two schools, in one of them it was a case of: teach me to interpret the material better, go through it with me, and let see if my interpretation coincides with yours. In the other school they didn't need help with interpretation, but rather with how to convert that into actions."

The participants declared to be satisfied with the sessions and said that their prior expectations were fulfilled. However, the positive results mainly related to the interpretation of the feedback reports. The pedagogical advisors were less enthusiastic about the results with regard to diagnosis and the drawing of correct policy conclusions. Moreover, a number of school principals had doubts about what was actually achieved during the session with their pedagogical advisor. Although many schools really got to grips with the feedback report during the session, this positive evaluation did not apply to all schools. This is partly to be attributed to practical drawbacks. For example, for some schools the support interventions did not fit in the school's year plan. Others criticized the lack of a long-term approach in the support provided. One school principal said in the interview that she had hoped that the session would enable the school to immediately take steps towards future actions, but that she was disappointed that this did not happen. The advisors' inputs into the diagnostic process were very highly valued. The respondents said that the advisors had a different kind of expertise from the expertise possessed by the researchers and that these different types of expertise were in that sense complementary. Participants expected very high levels of expertise of the advisors. Advisors who are subject specialists tended to come up with different explanations than those given by advisors whose area of expertise was system consultancy. According to school principals, however, both types of expertise are necessary.

- Peer consultation
  Of the 12 schools, which were invited to take part in the peer consultation scheme, only four actually did so. Short interviews with the nonparticipating principals revealed that some schools deliberately chose not to participate. For some schools, the message of the report was sufficiently clear and not taking part may therefore have been a reasoned decision. Likewise, if, according to schools, the feedback did not require them to take immediate concrete actions, the need to test their results against those of other schools was perceived as of minor importance. In several of the schools, which declined to participate, there were doubts as to whether meetings of this kind were really the right forum in which to discuss their own results because, among other reasons, they suspected that people would be reticent to talk openly about possible negative results.

  School principal: "I don't believe in it, I don't believe that schools are going to come out in the open about problems. I think this is not the right time to do so. Because that means that you are, in reality, openly admitting a weakness."

  A number of respondents said that in order to take part in peer consultation, schools needed to be at a stage where they were ready to do so. A relevant finding in this regard is that respondents were open to the idea that they could learn from other schools, but were not yet prepared to participate in such a process.

School principal: "I think that it's still a bit early for this school to take that step, which is why I think we are not yet ready. (. . .) However, I can imagine that a school team might not think it is such a good idea to bring in people from outside. I don't agree with this view . . . but you have to grow towards this, and that might require a bit more time than we might prefer."

Finally, explaining their nonparticipation, most of the respondents pointed to a lack of time. None of this detracts from the fact that the schools, which did participate, did so because of a perceived need on their part and out of a desire to discuss a number of very specific questions. The participants in the peer consultation started from the idea that it might be interesting to look beyond the horizons of their own school and, above all, to be able to compare themselves in a tangible way with another school.

During the peer consultation, schools got the chance to explain their situation and to sketch out the own context in which they operate. The session then continued using directing questions such as "What were the most important findings in your opinion? What explanation do you have for these?" In one of the groups, the session focused heavily on the contents of the school feedback reports, and in the other group the focus was much broader. Participants in the peer visits declared themselves satisfied with the meetings held. Both peer consultations took place, according to the participants, in an open atmosphere. The most valued aspect was the fact that the meetings were between similar schools and the possibilities of learning from each other.

School principal: "Yes, the other school had nothing to hide and nor did I. This meant that, we could be frank and we were able to give each other feedback, and also share positive experiences."

7.4.3 Findings with a View to Designing a Combined Support Route

Describing their own support needs and evaluating types of support also brought the respondents to a number of issues regarding the design of data use-related support. It is interesting to note that they placed a considerable emphasis on the complementarity of different types of support, which is consistent with the conceptual starting points of the present study. As Table 7.1 illustrated, none of the support initiatives independently comprised all support characteristics that are required to foster effective use of data. Thus, a combined support trajectory might be beneficial. As one participant from the 2009 sample reported:

School principal: I think a combined approach is the best way. First, you get a view on the scientific background of the report and in addition you get a more pedagogical-didactical view. Both views connect and make the picture more complete than you were only offered one aspect.

Table 7.2 also shows that, in order to take full advantage of all its potential benefits, a support route should be composed of a carefully thought-out combination of different

Table 7.2 Advantages and disadvantages of a combined support route

	Help desk	INSET by researchers	ONSET by pedagogical advisor	Peer consultation	Combined support route
Accessibility	+	/	/	−	+
Proximity	/	−	+	/	+
Tailoredness	+	−	+	+	+
Interpretation-oriented	+	+	−	/	+
Use-oriented	+	/	+	+	+
Interaction within the school	−	/	+	/	+
Interaction between schools	−	/	−	+	+

components. A combined support route of this kind would thus consist, for example, of the availability of a help desk, an introductory external interpretation-oriented training session conducted by researchers, followed by an internal use-oriented training session conducted by a pedagogical advisor and a peer consultation. More arguments for this combined approach will be provided in the following paragraphs.

In this combined route, internal and external training by researchers is, in essence, interchangeable. The preference for INSET is due to the pragmatic argument that, in this way, facilitators can provide instruction to larger groups of data users on how to interpret data for less effort. Leaving out any of the other types of support might, however, definitely weaken the effectiveness of the support route as a whole, as respondents in addition ask for tailored support that goes beyond the interpretation phase (Verhaeghe et al. 2010). That said, it is still necessary to place more emphasis on some components of the combined support route (see Table 7.2) than on others. The relative balance could be determined in accordance with the finding that respondents regarded the contribution of the researchers as something, which is helpful in providing support with respect to interpretation, whereas they see the contribution of pedagogical advisors as being more helpful with regard to the subsequent steps—such as diagnosis, planning, and implementation. According to the respondents, it might also be a better idea to focus the peer consultation more on what has actually happened with the results, rather than focusing on the issue of correct interpretation.

Another issue is that participants feel that there is a need to set up types of support that encourage schools to establish communication with the rest of the school team. Although several types of support include this possibility (for instance, by engaging teachers in the internal trainings), very little use has been made of these possibilities so far. Working with the entire school team is, according to some school principals, worthwhile, among other things, because teachers like to learn with and from colleagues. This, in turn, raises the question as to, on the one hand, to what extent there is really sufficient backing for this from the staff within the schools concerned and, on the other hand, how far there needs to be backing in order to be able to reap the benefits of support. The existence of staff backing could therefore be suggested as a precondition for participation in support activities. On the other hand, one of the

support objectives might be the increase of the staff willingness to use data (e.g., by encouraging data teams).

The complementarity of the partners involved was also seen as valuable. The contribution of the pedagogical advisors in addition to that of research staff from the School Feedback Project is therefore, according to respondents, a very valuable element. They also stressed the unique nature of peer consultation and its potential. As school principals mention that researchers, and to a certain extent pedagogical advisors, are more removed from the day-to-day teaching practice, the consultation of peers might be interesting to share experiences from practice. In the interviews, it was also suggested that more than one meeting opportunity with other schools should be provided. Working towards a data culture is, according to school principals, a slow process. Therefore, according to the respondents, it is precisely in the long term that effects of peer consultations will be noticed.

In the stated expectations among participating schools with respect to the various components, it was frequently apparent that the support needs of schools are highly divergent. The challenge for support-providers consists of guaranteeing that support initiatives are sufficiently well tailored to the specific needs of schools. Setting out explicit expectations was therefore another element that was regarded as particularly valuable. For the support-providers this means, for example, that they need to have a clear grasp of the specific school context and must be given the chance to tailor their support to the needs and expectations of the schools concerned. This can be done by differentiation within the components of the support package and also by allowing schools the freedom to select specific components.

7.5 Conclusion

In describing the above findings, we have mainly focused on the support-provider. However, a number of methodological and policy-/practice-oriented considerations also emerge.

One question, which arises in making an evaluative judgment about types of support, is at what point it is possible to say that the support has been successful. This also involves the question of who should establish criteria and the question of who should pronounce judgment. The present study shows that it is very difficult to establish a priori criteria by which to test the success or failure of a support initiative. The differences in terms of expectations on the part of the various parties involved and among the different types of support are too great to permit this. Moreover, it must also be emphasized, with a view to the evaluation of the support provided, that in this study, we have only used the participants' perceptions. The impact of the different types of support, however, would also need to be tested via other sources and against other criteria (for instance, using data literacy tests in data use questionnaires).

One way of arriving at a meaningful evaluation of support is by applying Kirkpatrick's evaluation framework for training initiatives (1998), according to which four levels have to be achieved: reactions, learning, transfer, and effects. The first level consists of the reactions of the participants, measured immediately after the

support, the idea being the participants should have a general grasp and understand the relevance and possible applications. All too often the evaluation of support is limited to this level, while the impact on the following levels is not looked at (Rossi et al. 2004). Effects of support should also be evaluated at the learning level, which comprises an increase in the participants' knowledge and skills and a change of attitudes as a result of the support. In the present study, for example, we looked at to what extent support had an influence on the data-related competencies of the participants. Third, we looked at whether there was a transfer to the organization of what was learnt during the support and whether there were any changes in behavior. Finally, the objective of the support is to contribute to school improvement (i.e., fourth-level "effects"). In order to fully estimate the impact of support, we need to go further than what was possible within the constraints of the present exploratory study. Setting up experimental studies with different types of support would be a promising line of enquiry in this area.

In the course of the various interviews, a number of characteristics of school functioning came up which, according to schools and their advisors, offer guarantees for successful school feedback use in general and for the success of support activities in particular. It might therefore be worth regarding these characteristics as crucial learning objectives for data use-oriented support. School culture, in particular, is an element, which respondents repeatedly cited as playing an important role in predicting how the reports are used. In order to be able to get the most out of feedback reports, schools must be prepared to have an open discussion about the results. School principals often failed to involve team members based on the argument that the team was not ready for it, that they were not interested, because they did not want to single out individual teachers or because team members were too busy with their current duties and responsibilities to make time for this. It is, however, also not beyond the bounds of possibility that school principals failed to involve the team out of a concern that their own interpretation will not be shared by other people. A great many school principals felt that they need to be sure about the meaning and implications of the feedback before involving the team. Ideally, however, they should involve the team precisely in order to have a better guarantee of arriving at a correct interpretation.

Although this chapter has focused heavily on the responsibilities of schools and support-providers, the Flemish educational system must also not lose sight of the importance of other stakeholders. Various parties involved said that the government, and the schools inspectorate in particular, would do well to communicate in a more transparent way exactly what is expected from schools with regard to data use. There is a concern that data use will be perceived by many schools as an obligation. Defining expectations in terms of school development and responsibility is therefore crucial. The incentives, which the government gives to schools, are of great importance in explaining why what schools think about data use will develop in one direction or another. In this regard, it is important to think about the incentives that are given and the way in which those incentives are interpreted by schools. Although the schools inspectorate, for example, advocates a carefully thought-out use of data, respondents said that in quite a large number of schools quantity of data is more important than quality. The need for a sufficiently broad perspective on the current data use challenges also needs to be factored in. In order to improve the use of data

and to take part in support initiatives aimed at helping them do so, schools said that they will need to be able to invest more time and resources.

We conclude with the encouraging finding that there is a considerable interest in data use among Flemish school principals. Many principals start enthusiastically, like Michael. That said, at present, the availability of data has still only led to intensive use and noteworthy effects in a rather limited number of cases. The present study shows, however, that initiatives aimed at developing data-use competencies and having access to support can indeed make a contribution to improving these competencies. What the Flemish educational system needs to do now is to take note of the lessons of this exploratory study with respect to the various types of support and, in so doing, to provide schools with more accurately targeted support to help them in their continued growth process. In that way, the "But how?"—question raised by Michel, can be addressed successfully.

7.6 Reflection Questions

Researchers

1. What types of support for data use are available in your country? Is there any evidence of effects these types of support have?
2. How would you design and evaluate support for schools in the use of data?

Policymakers

1. What type of support can your policy offer to schools in the use of data? Based on this chapter, can you improve the support structures that are available for schools?
2. How much autonomy do schools have in your country/region/state/district? How does this affect support structures that are available or that you might want to set up?

Practitioners and People Working with Schools

1. The authors outline seven steps to successfully using data (see Fig. 7.1): (i) receiving data; (ii) reading and discussion; (iii) interpretation; (iv) diagnosis ; (v) planning; (vi) implementation; and (vii) evaluation.
   a. Which steps do you think are strengths in your school? How do you know?
   b. Which steps do you think need to be improved?
2. Think about the support that is offered to members of your school to improve their data literacy.
   a. How does the support to improve data literacy in your school meet the six characteristics outlined by the authors: support is accessible, proximity, tailoredness, interpretation orientation and use orientation, interaction within the school, and interaction between schools?
   b. How can a combined support route be designed and implemented to meet the needs of your school?

References

Bosker, R. J., Branderhorst, E. M., & Visscher, A. J. (2007). Improving the utilisation of management information systems in secondary schools. *School Effectiveness and School Improvement, 18*(4), 451–467.

Creighton, T. B. (2007). *School and data: The educator's guide for using data to improve decision making*. London: Sage.

Dey, I. (1993). *Creating categories. Qualitative data analysis.* London: Routledge.

Earl, L., & Fullan, M. (2003). Using data in leadership for learning. *Cambridge Journal of Education, 33*(3), 383–394.

Gardner, R. (1995). Onservice teacher education. In L. W. Anderson (Ed.), *International encyclopedia of teaching and teacher education* (2nd ed.). London: Pergamon.

Gonczi, A. (1994). Competency based assessment in the professions in Australia. *Assessment in Education: Principles, Policy & Practice, 1*(1), 27–44.

Huffman, D., & Kalnin, J. (2003). Collaborative inquiry to make data-based decisions in schools. *Teaching and Teacher Education, 19,* 569–580.

Kerr, K. A., Marsh, J. A., Ikemoio, G. S., Darilek, H., & Barney, H. (2006). Strategies to promote data use for instructional improvement: Actions, outcomes, and lessons from three urban districts. *American Journal of Education, 112,* 496–520.

Kirkpatrick, D. L. (1998). *Evaluating training programs: The four levels.* San Francisco: Berrett-Koehler.

Mathison, S. (1992). An evaluation model for inservice teacher education. *Evaluation and Program Planning, 15,* 255–261.

Miles, M., & Huberman, M. (1994). *Qualitative data analysis*. London: Sage.

Murnane, R. J., Sharkey, N. S., & Boudett, K. P. (2005). Using student-assessment results to improve instruction: Lessons from a workshop. *Journal of Education for Students Placed at Risk, 10*(3), 269–280.

Nevo, D. (1995). *School-based evaluation: A dialogue for school improvement.* Oxford: Pergamon.

Peeters, K., Van Cauwenberghe, A., & Schollaert, R. (1996). *Spiegeleffecten. De Vlaamse decretale navorming doorgelicht.* Leuven: Garant.

Petty, R. E., & Wegener, D. T. (1998). Attitude change: Multiple roles for persuasion variables. In D. Gilbert, S. Fiske & G. Lindzey (Eds.), *The handbook of social psychology*. New York: McGraw-Hill.

Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2004). *Evaluation: A systematic approach.* Thousand Oaks: Sage.

Saunders, L. (2000). Understanding schools' use of 'value added' data: The psychology and sociology of numbers. *Research Papers in Education, 13*(3), 241–258.

Schildkamp, K., Visscher, A., & Luyten, H. (2009). The effects of the use of a school self-evaluation instrument. *School Effectiveness & School Improvement, 20*(1), 69–88.

Strauss, A. C., & Corbin, J. M. (2007). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.). Thousand Oaks, CA: Sage.

Van Petegem, P., Vanhoof, J., Daems, F., & Mahieu, P. (2005). Publishing Information on Individual Schools? *Educational Research and Evaluation, 11*(1), 45–60.

Vanhoof, J., Verhaeghe, G., Verhaeghe, J. P., Valcke, M., & Van Petegem, P. (2011). The influence of competences and support on school performance feedback use. *Educational studies, 37*(2), 141–154.

Verachtert, P., Van Damme, J., Onghena, P., & Ghesquiere, P. (2009). A seasonal perspective on school effectiveness: Evidence from a Flemish longitudinal study in kindergarten and first grade. *School Effectiveness and School Improvement, 20*(2), 215–233.

Verhaeghe, G., Vanhoof, J., Valcke, M., & Van Petegem, P. (2010). Using school performance feedback: Perceptions of primary school principals. *School Effectiveness and School Improvement, 21*(2), 167–199.

Verhaeghe, J. P., Maes, F., Gombeir, D., & Peeters, E. (2002). *Longitudinaal onderzoek in het basisonderwijs. Steekproeftrekking* (*A longitudinal study in primary education. Sampling procedure*). Leuven: Steunpunt Loopbanen doorheen Onderwijs naar Arbeidsmarkt.

Wayman, J. C., Midgley, S., & Stringfield, S. (2007). Leadership for data-based decision making: Collaborative educator teams.. In A. B. Danzig, K. M. Borman & B. A. W. Jones, W. F (Eds.), *Learner-centered leadership: Research, policy and practice* (pp. 189–205). New Jersey: Lawrence Erlbaum Associates.

Webber, S., & Johnston, B. (2000). Conceptions of information literacy: New perspectives and implications. *Journal of Information Science, 26*(6), 381–397.

Williams, D., & Coles, L. (2007). Teachers' approaches to finding and using research evidence: An information literacy perspective'. *Educational Research and Evaluation, 49*(2), 185–206.

Zupanc, D., Urank, M., & Bren, M. (2009). Variability analysis for effectiveness and improvement in classrooms and schools in upper secondary education in Slovenia: Assessment of/for learning analytic tool. *School Effectiveness & School Improvement, 20*(1), 89–122.

Chapter 8
Implementation of a Data Initiative in the NCLB Era

Jeffrey C. Wayman, Daniel D. Spikes and Michael R. Volonnino

8.1 A Tale of Two Schools

The end-of-year achievement test is 6 weeks away. This test is the measuring stick required by the No Child Left Behind Act (NCLB) to determine if schools make "Adequate Yearly Progress" (AYP). Mrs. Pujols, who is in her 12th year of teaching mathematics, is confident that her large urban district in the Central United States will make AYP. She is entering her Twice- weekly Professional Learning Community (PLC) meeting with a smile on her face. The math department is about to discuss strategies for the final weeks. For a fleeting moment, she recalls her previous 11 years when she was at a different urban school. The school had missed AYP for 4 years in a row, triggering "corrective action" sanctions that may mean replacing teachers. These sanctions had begun to concern the entire faculty and make state testing time as stressful a period as can exist in education.

This struggling district called itself "data driven," but Mrs. Pujols shuddered when she thought of data use from that time. She remembers trying to organize last minute reviews for her students. The district had benchmark exams to gauge progress, but she was handed a giant computer printout and spent hours after school copying data into Microsoft Excel in order to be able to manipulate the results. She remembers noticing that one of her students, Jason Carpenter, had particularly low scores and had been missing over the past few days. Mrs. Pujols found herself taking an entire preparation period to talk to a counselor, the attendance officer, and a former teacher in order to devise a strategy that might help Carpenter. All of the information on Carpenter seemed to be in different places.

Frustrated with all of this, Mrs. Pujols went to her department head, Dr. LaRussa for advice. Dr. LaRussa reiterated how absolutely vital it was that all of her students pass the state test because the school was in danger of reconstitution, putting everyone's job in jeopardy. He told her that he would be outlining a plan over the next week for last-minute preparations. Each day, an instructional coach would remove from her class certain students for last minute preparations. These could be extended instruction in math, or arts for other students language—though he assured her that he would only sacrifice valuable math time for reading in the most extreme cases (after all, he chuckled, that's what art class is for). For the rest of her students, she should administer daily sections from a test preparation curriculum and that she should not deviate from it. He encouraged her to just "keep doing what you're doing" in terms of trying to make sense of the data. He also reminded her of the mandatory after-school faculty meetings over the next few weeks to discuss testing procedures.

J. C. Wayman (✉) · D. D. Spikes · M. R. Volonnino
Department of Educational Administration, The University of Texas at Austin, Austin, TX, USA
e-mail: jwayman@austin.utexas.edu

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_8, © Springer Science+Business Media Dordrecht 2013

Mrs. Pujols looked back at the time and remembered how exhausting everything was. It took forever to determine anything about her class. In fact, at times it seemed the school's main office had more information than she did with the amount of pullout instruction that occurred—she never knew who would be in her class on any particular day. At times, it seemed like educated guesswork and all the school did to help was give her a test-preparation book and the pages to administer on a particular day. But she knew that if her kids did not perform, everyone would lose. Luckily, all the late nights with Excel paid off and her students—even Carpenter—aced the state test. Despite the copious amount of praise she received for her performance, she began to think there was a better way and sought to change districts.

At her new district, she found the better way. At this particular PLC, the math department is discussing results from the benchmark test administered on Monday. The results indicate that half of her class still has difficulty with order of operations and the other half still hasn't quite mastered the rules of exponents, which was something that she had kind of suspected, but was glad to see put on paper. The principal, Mr. Banks, a legend in the district, uses the opportunity to first review the expectations that they all set within these areas at the beginning of the year for student performance.

After an updated discussion of classroom goals, Mr. Banks challenges Mrs. Pujols to look closer at the results of the benchmark results to observe which students have particular strengths in these areas and suggests that she creates study teams to help prepare for the big state test. He then advises Mrs. Pujols to create mini-assessments using the template and question databank in the districts' comprehensive computer data system (known in the district as the Complete Understanding to Benefit Students, or CUBS, system) and then create a special subreport for her class to track progress. Another teacher, who is having similar problems, volunteers, and they both agree to report back to the PLC next week with an update. Mr. Banks says that they will examine the data afresh and determine additional courses of action to make sure that each student has the right preparation going into the state test.

At the end of the meeting, Mrs. Pujols goes back to her classroom to begin working on the assessments. While sitting at her computer, an email comes through to say that Johnny Wood has transferred from another school within the district, and it will be her responsibility to prepare him over the final 6 weeks for the state test as well. The email also says that her dashboard on CUBS has been updated with Wood's profile. With one click, Mrs. Pujols examined the results from the same benchmark test that Wood took at his old school on Monday as well as his attendance record, family background, notes from counselors and past teachers, as well as his complete academic record since kindergarten. Mrs. Pujols noticed that Wood also needed some help with order of operations and immediately placed him on a team for when he reports to class tomorrow.

After finishing off the mini-assessments, adapting a couple of more lesson plans discussed in the PLC, and sending off one last email, Mrs. Pujols marvels at how two schools, facing the same NCLB requirements, use data in remarkably different ways. Data have enhanced her ability to reach her students. After a dozen years in the profession, she has found a more thorough and efficient way to teach. Her district has structured data use such that NCLB serves only to challenge her district at looking even closer at the numbers to make sure each child is being served.

8.2 Introduction: Accountability and the NCLB

The American public school system is a good illustration of the relationship between the state and federal governments of the United States. In the United States, education has historically been one of the primary responsibilities of the individual state governments, not the federal government. In fact, the right to education does not

appear in the federal US Constitution, but is part of every single state constitution. This makes for a decentralized structure in which state governments set basic policy including curriculum requirements, licensure requirements for teachers, and school funding formulas.

American educational entities are made up of 13,809 separate public local education agencies (LEAs) that oversee 48,033,126 students in 98,706 public neighborhood schools (US Department of Education 2010a, b). These LEAs frequently have the ability to enhance the basic funding and content standards set by the state government. This has produced a public education system that is highly segmented by class and race (Massey and Denton 1993; Orfield et al. 1997; Orfield and Gordon 2001).

Thus, in many ways it makes sense to think about the United States having not one school system, but several thousand, with some more beholden to external control than others. Strong federal involvement in education has been a relatively recent phenomenon, stemming from civil rights and antipoverty actions of the 1950s and 1960s. Since it lacks direct constitutional authority over education, Washington's policymaking power either stems from its civil rights responsibilities or the fact that it can make the receipt of federal funds received by the states contingent on compliance with its laws.

The NCLB represents the pinnacle of this historical development. The premise behind NCLB was that *all* students would be academically proficient by the 2013–2014 school year (US Department of Education 2004). For this to occur, NCLB aimed to hold schools accountable for the achievement of its students by requiring states to develop accountability systems that measure schools' progress toward academic proficiency. Proficiency standards were to be established by each individual state with each state responsible for determining what constitutes AYP toward this established proficiency standard. While this policy mandated improved achievement for all through a more widespread and sophisticated use of student data, AYP is mainly based on students' results on state standardized tests, graduation rates for high schools and an additional indicator for middle and elementary schools. By reporting AYP, the intent is to shine a light on schools that are most in need of improvement so that school districts can target their resources toward schools that need them the most.

The writers of NCLB intentionally deferred to schools the internal processes of using data to inform instruction, carrying the implicit assumption that once districts were given this imperative, they would have (or could quickly create) the know-how to improve performance. This has proved an ambitious assumption as research on data use has illuminated the substantial technological, pedagogical, and cultural challenges to educational data use, such as inefficient computer systems, lack of educator preparation to adjust practice based on data, and a mistrust of data initiatives (Datnow et al. 2007; Ingram et al. 2004; Means et al. 2010; Wayman et al. (in press); Young 2006). Despite the law's intention and expectation, districts are still struggling with transforming its data-based promises into reality. This struggle derives largely from the fact that, although NCLB set high expectations regarding the use of data, it offered districts little guidance as to how they should actually use data, and by mandating the disaggregation of test scores, it implicitly assumed districts might

use other data to improve instruction. Consequently, there remains a substantial gap between NCLB policy and its actual practice.

In this chapter, we explore the relationship between NCLB and data use. Our examination will be guided by Cohen and Moffitt's (2009) framework that examined the entire history of the ESEA of 1965 (of which NCLB was itself a reauthorization). Using this framework, we will argue that although NCLB may be an imperfect policy with plenty of room for improvement, there is nothing inherent to the law that would prevent a district from utilizing principles of good data use.

In the following sections, we first present a brief primer on NCLB. This is followed by a sysnopsis of Cohen and Moffitt's (2009) four-part framework, highlighting how data use currently relates to each of these parts. Finally, we use Cohen and Moffitt's framework to guide a set of systemic recommendations for how schools and districts may take to more effectively use data under NCLB.

8.3 No Child Left Behind: A Brief Primer

NCLB represents the highest profile of the accountability movement of the 1990s, seeking to use high-stakes testing to force districts to meaningfully improve their instructional practices (Ashby 2006; Koretz 2002; O'Day 2002). It was both a reauthorization and reimagination of the ESEA of 1965, a landmark piece of Civil Rights era legislation aimed at improving the education of poor and minority students through a vast increase of federal government support for public schools. These resources are now contingent upon compliance with the new accountability policy.

The core of NCLB is a testing mandate in which states have to design and administer an annual standardized test in reading and mathematics for students in grades 3–8 and at least once during grades 10–12. Additionally, states must test science achievement at least once during grades 3–5, 6–8, and 10–12. The design and administration of these tests are the province of the states, as are the passing standards.

The law set a target of 2014 by which every student must pass the test. Furthermore, individual schools must demonstrate that they are making AYP toward this goal. States set AYP passing targets, and these differ per state. NCLB mandates that AYP measures not only the improvement of schools as a whole, but also student population subgroups such as racial and ethnic groups and English Language Learners. The law also requires all test results be made publicly available.

The teeth behind AYP is a set of escalating sanctions for schools that fail to meet their goal. After 1 year of failure to meet AYP, schools are deemed "in need of improvement" and for the next 3 years must offer an increasing number of choices and services to students. This means that the school district is mandated to offer technical assistance to help the school to address the academic area(s) that caused them to not make AYP and to help the school to implement their school improvement plan. The law does not provide for additional funding to implement these measures. In addition, districts must offer school choice for each student in the school such that (s)he can choose to attend another school within the district.

The sanctions spike in the fourth consecutive year of missing AYP as the school is mandated to take "corrective action." This could include replacing staff members, instituting new curriculum, extending the school day/year, or changing the school management structure. After 5 years of not making AYP, the school district must plan for the most severe sanction level, which is to be implemented if it missed AYP for a sixth year. The school has to select from one of five remedies: reconstitution, reopening as a charter school, contracting with a third-party management entity, takeover by the state, or the dismissal of the principal and the majority of its faculty.

It is important to realize that at every juncture, the law gives vast discretion to both states and individual districts to determine the best course of action to reach their targets. Aside from mandating testing, the law itself does not prescribe anything specific concerning the use of data; instead, it relies upon the incentive of the sanctions, federal funding, and public opinion to influence the actions of educators. As we shall demonstrate, this gap has contributed to many difficulties and inefficiencies as districts, schools, and educators try to make use of their data.

8.4 Cohen and Moffitt's Framework

In order to understand the gap between NCLB policy and practice, we employ Cohen and Moffitt's (2009) framework. Cohen and Moffitt argue that there is an unavoidable tension between policy and practice that must be managed upon implementation. They identify four types of actions or resources that can affect this tension: (1) the aims and associated ambiguity of the policy, (2) the instruments that the policy deploys to make its impact, (3) the capability of practitioners to implement the policy, and (4) the overarching environment in which the policy takes place. In the following sections, we will examine how these four resources take shape in NCLB and the consequences that each has for data use.

8.4.1 Aims and Ambiguity

Cohen and Moffitt (2009) argue that policies with ambitious aims are usually accompanied by ambiguous means. This is especially true for education because schools exist in such diverse contexts that make it difficult to construct a "one size fits all" policy. The authors argue that this becomes problematic when policymakers exert great pressure for reform, but the ambiguity leaves practitioners with little guidance on how to achieve the final results.

As a policy, NCLB is a classic example of a policy with great aims, but also great ambiguity. Cohen and Moffitt (2009) point out that NCLB's aims are centered in two basic tenets: to improve achievement and to eliminate race and class inequality in achievement. At the same time, NCLB created ambiguity by deferring almost every

component of that improvement to the states and local districts. States defined the standards, wrote the tests, and set the proficiency bar. Districts must then take the data generated by achievement tests and use these to drive instruction (US Department of Education 2004).

The policy is intentionally silent on how to navigate these ambiguities to achieve these aims. Instead, it allows states and districts to marshal the resources and expertise necessary for effective implementation (Loeb et al. 2008; Opfer et al. 2008; Sunderman and Orfield 2007). This gap has proven problematic for educators because research shows that using data to change instruction is a complex, multifaceted task. Effective use of data requires components such as effective principal leadership (Copland 2003; Wayman et al. 2009), ample collaboration (Lachat and Smith 2005; Supovitz and Klein 2003), effective computer data systems (Wayman and Cho 2008; Wayman et al. 2004), teacher capacity to adjust practice based on data (Lai and McNaughton, this book; Schildkamp and Kuiper 2010; Wayman and Stringfield 2006), and district supports to enable these components (Datnow et al. 2007; Wayman et al. 2007; Wayman et al. (in press)). Unfortunately, this same research base and others (e.g., Means et al. 2010) shows that schools and districts are struggling mightily with aligning and carrying out these tasks.

8.4.2 Instruments

In order to navigate the aims and ambiguity gap, a policy provides its practitioners with instruments. Cohen and Moffitt (2009) define these as the funds, mandates for action, and compliance incentives that are deployed by the policy. They list the primary instruments of NCLB to be money[1], testing, and sanctions.

Cohen and Moffitt (2009) note that effective instruments are *strong* (i.e., powerful enough to accomplish the desired change) and *salient* (i.e., relevant to the purpose). In terms of data use, we believe the instruments of money, testing, and sanctions are not strong for two reasons. First, money and sanctions have not been shown to influence the "cycle of inquiry" suggested to be important to educational data use (Copland 2003; Young 2006). This cycle creates a loop in which districts are consistently using data to reexamine their present condition and future actions in order to better serve students. We are aware of no research showing that educators are more efficient in this cycle when money is withheld or when sanctions are applied (e.g., staff are fired or hired). Second, testing requirements are not strong because they focus on too narrow an outcome (improvement on end-of-the-year proficiency tests) to be useful in driving day-to-day school improvement. Effective cycles of inquiry use a broad set of outcomes that incorporate a variety of data for students at all levels and in multiple domains (Copland 2003; Wayman and Stringfield 2006; Young 2006).

We also believe that NCLB's instruments are not salient as they relate to data use. Cohen and Moffitt (2009) argue that these instruments are not salient in terms of

[1] Federal funds may be withheld from schools or districts failing to make progress toward AYP.

the general policy because they do not reach the teaching and learning process well: everything in NCLB must pass through multiple layers of governance (state, district, school) before reaching the classroom, and the authors argue this has minimized the instruments' meaningfulness to teachers. This argument also applies to data use: research shows these layers are often disconnected—uses of data are often miscommunicated between various district levels, adequate supports are provided in some areas, but not others, and perhaps most importantly, visions and beliefs about how data can support teaching and learning are often misaligned (Supovitz and Klein 2003; Wayman et al. 2007; Wayman et al. (in press)). As a result, instruments that may be salient at the district level may not be salient at the school or classroom level. Testing provides a stark example of this: studies have shown that teachers are rarely motivated by state test performance because they often do not believe these tests adequately measure student learning (Wayman et al. (in press); Young 2006).

8.4.3 Capability

Capability is the set of resources that the implementers of the policy bring to the table. In other words, capability is what practitioners do with the instruments provided and what additional resources they bring to bear. According to Cohen and Moffitt (2009), major reforms (almost by definition) expose deficiencies in organizational and individual capability because they force groups to do something unfamiliar. Exposing deficiency is not necessarily negative—in fact, exposing problems is good for organizations that quickly react to fix problems (Senge 2006). Unfortunately, research shows that districts have often been overwhelmed by problems stemming from trying to use data under NCLB (Valli and Buese 2007; Wayman et al. 2007).

In *Aims and Ambiguities* above, we discussed some necessary components for effective data use. Research suggests that capacity for these components can be built through effective support structures. Examples of structures include time to use data (Lachat and Smith 2005; Wayman et al. 2009); relevant professional learning to use data (Jimerson and Wayman 2011; Schildkamp and Kuiper 2010; Young 2006), and opportunities for collaboration (Lachat and Smith 2005; Supovitz and Klein 2003; Wayman et al. 2009). This same research base has shown that building these structures remains troublesome for many districts. This lack of effective structures is a mismatch with the assumptions of NCLB in which districts, schools, and educators were implicitly assumed to possess these capabilities (Loeb et al. 2008; Opfer et al. 2008; Sunderman and Orfield 2007).

8.4.4 Environment

Environment is the "political, social and economic circumstances in which policy and practice subsist" (Cohen and Moffitt 2009, p. 41). Thus, it shapes the three other resources. In other words, the environment frames the policy, providing a culture

around its implementation. NCLB itself emerges from a complex environment that stresses equal outcomes for all but does not always address the social inequalities that produce the disparate results in the first place (Ravitch 2010). Moreover, it swirls in the middle of perpetual debates about types of curriculum, the benefits of testing, and the need to motivate poor districts to perform better (Cohen and Moffitt 2009).

From a state and district perspective, the environment of NCLB depends on the degree the policy is framed: one aimed at school improvement or one that is merely punishing schools that are performing poorly (Meier et al. 2004). Its most prominent instruments are largely punitive. While it is true that effective districts embrace test results because they indicate a path to improvement (Haycock 2006; Honig and Coburn 2008; Rorrer et al. 2008), the environment created by punitive instruments may also achieve the opposite effect: there are numerous instances of districts manipulating outcomes, of teachers fearing data precisely because of perceived adverse consequences (Heilig and Darling-Hammond 2008; Jacob and Levitt 2003; Koretz 2002), of districts implementing onerous data initiatives (e.g., Valli and Buese 2007), and of educators focusing too strongly on test scores (Wayman et al. (in press); Schildkamp and Ehren, this book).

8.5 Effective Data Use Under NCLB

The NCLB set lofty expectations for school districts in terms of data use. There is little in the policy that actively guides and supports states, districts, and schools from implementing sound data strategies according to the principles outlined in this chapter. However, there is also little in the policy that actively inhibits the use of the strategies. In this section, we outline how districts and schools may implement effective data-using strategies for school improvement under NCLB.

It is our position that a systemic approach to using data will help districts, schools, and educators as they work within NCLB for educational improvement. Scholars have studied varied systemic effects in using data (Datnow et al. 2007; Supovitz 2006; Wayman et al. 2007), and we believe the Cohen and Moffitt (2009) framework provides an effective guide for implementing these approaches.

Thus, we present four sections corresponding to the four parts of the Cohen and Moffitt (2009) framework. We use these sections to build a practical, systemic response to the NCLB mandate. We see these sections as progressively building on one another. We will begin by casting the aims and ambiguities of NCLB within our recommendation that districts should approach data use as a wide-reaching data initiative. Next, we will describe how creating district-wide alignment in using data can clear the way for NCLB's instruments to operate effectively throughout the district. After this, we provide a section that discusses how building systemic capability enhances the capacity of educators to effectively respond to the demands of NCLB, within a broad data initiative. Finally, we discuss the environment within which these recommendations can operate, outlining specific areas that research has shown to be critical to effective data use. Cohen and Moffitt (2009) view the environmental

portion of their framework as shaping the others; similarly, we will be general in our approach to the first three sections and will use the environmental section to lend detail.

8.5.1 Aims and Ambiguities

The aims of NCLB are mostly focused within two tenets: improve achievement and eliminate race and class inequality in achievement (Cohen and Moffitt 2009). The law is intentionally ambiguous on how to achieve these aims, instead leaving latitude to states and local entities to develop these means. As shown in *Aims and Ambiguities* above, educational entities are struggling so much with NCLB's ambiguities that the aims often seem nearly impossible. We recommend that a district must deal with these ambiguities by couching state test scores within a larger, systemic data initiative.

Since achievement is measured in terms of state test scores, schools and districts often attempt to achieve NCLB's aims by focusing directly on raising state test scores (Means et al. 2010; Valli and Buese 2007; Wayman et al. (in press)). This is a very narrow focus and is counter to educational practice in the United States: American educators almost never believe that state test scores by themselves are an adequate measure of student achievement (Lachat and Smith 2005; Supovitz and Klein 2003; Wayman et al. (in press)). Instead, these educators look at student achievement as complex and multifaceted.

This approach requires multiple forms of data. These data include student demographics, local benchmarks, teacher-made assessments, attendance, and notes by previous teachers and counselors, among others. Such an approach would place state test scores within a larger focus on a variety of data. Research is clear that data initiatives are more effective when they employ a variety of triangulated data, thus painting a thorough picture of student learning (Datnow et al. 2007; Wayman and Stringfield 2006; Young 2006; Lai and McNaughton, this book). State test scores should be a part of this more general focus. We recognize state test scores to be a very important part and deserving of strong focus—after all, they are how policy currently measures schools and districts. But viewing state test scores as one outcome in a learning-focused data initiative is a more effective use of data and is probably more in tune with the missions of most schools.

8.5.2 Instruments

Cohen and Moffitt (2009) concluded that NCLB's instruments did not directly affect teaching and learning; relative to data use, we observed that these instruments did not specifically affect the cycle of inquiry recommended by many. In both cases, NCLB's instruments must pass through many layers of the educational system in order to affect teaching and learning. These observations argue for districts that are

aligned systemically so that information (data) flows more smoothly from state to classroom.

Different scholars have cast the use of data in an aligned school system in different ways. For instance, Stringfield has studied data use within the context of High Reliability Schools (e.g., Stringfield and Land 2002), Wayman has studied the Data-Informed District (e.g., Wayman et al. (in press)), and researchers such as Supovitz and Datnow have considered data use in terms of systemic school improvement (e.g., Datnow et al 2007; Supovitz 2006).

While the approaches of these scholars may be different, they all argue for the type of district-wide alignment that facilitates an effective flow of information and resources. Such alignment is multifaceted. For instance, educators must share common understandings of what data mean and how they are used. Structures such as common meeting times should facilitate collaborative work around data, both within levels (e.g., within schools) and across levels (e.g., principals meeting with central office staff). Effective technologies to deliver data to educators should be in place, not only because they make data use faster and more efficient, but because they connect educators throughout the district in ways that are otherwise not possible. In other words, structures not only make data use easier for practitioners, but provide opportunities for them to deliver higher-quality instruction as they have both the means and opportunity to incorporate those data into their instruction.

8.5.3 Capability

NCLB carried implicit assumptions that districts, schools, and educators possess capabilities needed to respond to the policy (Loeb et al. 2008; Opfer et al. 2008; Sunderman and Orfield 2007). Unfortunately, as shown earlier, these capabilities are often lacking or absent. The lack of direction in NCLB regarding how to use data effectively in the field has uncovered a variety of deficiencies—a lack of capability, in Cohen and Moffitt's (2009) terms—for using data.

As the work of Senge (2006) and Supovitz (2009) shows, a good learning organization is one where the individual members of the organization are each consistently learning. Consequently, the work of building capabilities throughout the district for using data can be viewed as an issue of building capacity among individual educators (see also Dunn et al., this book).

When considering building individual capacity to use data, the first thing that comes to mind is training. Educators at every level must know the properties and uses of the data they examine, they must know how to operate computer systems to access these data, and perhaps most importantly, they must know how to adjust practice or process based on these data. However, data use is new to most educators, so an equally important part of building capacity is ensuring that they can try new methods without incurring personal loss. Wayman et al. (2009) cast this in terms of "risk." That is, educators are more likely to try new uses of data if they feel it is worth their time and that any potential failures will not be penalized. Research suggests

that educators are more willing to engage this risk if they are well supported in areas such as professional learning, collaboration, efficient data access, and nonthreatening leadership (Deike 2009; Lachat and Smith 2005; Wayman and Stringfield 2006).

8.5.4 Environment

The environment created by NCLB is a punitive one, with negative sanctions, and many districts are finding this a difficult environment. Still, districts have a large measure of control over their local environments. As described above, we believe an appropriate response to NCLB's mandates involves creating an aligned, capacity-building environment where data respond to student needs holistically.

In line with Cohen and Moffitt's (2009) view that environment shapes the other three components of their framework, we use this section to concretely describe some components that facilitate such an environment. In the following subsections, we describe how collaboration, common understandings, principal leadership, professional learning, technology, and time can support the systemic response to NCLB we have thus far discussed.

8.5.4.1 Collaboration

Collaboration carries many benefits regarding data use. The benefit most often cited is the ability to learn together, share professional knowledge, and perhaps most importantly, reflect on practice (Datnow et al. 2007; Lachat and Smith 2005; Wayman et al. 2009). In stressing that collaboration was more than just meeting to examine data, Wayman et al. (2009) termed this capacity-building process "collaborative reflection."

Collaboration is particularly important for teachers if they are to use data to inform practice. However, it is important to note the importance of varied forms of collaboration. Studies have highlighted many different ways that teachers have collaborated, such as grade-level teams, subject-level teams, and collaborations formed by mutual interests (see Datnow et al. 2007; Lachat and Smith 2005; Schildkamp and Kuiper 2010; Supovitz and Klein 2003; Wayman et al. 2009; Wayman et al. 2012). These varied forms of collaboration will aid in alignment and capacity building—and we believe the more forms available, the better.

Consistent with our vision of an aligned district, collaboration should not be confined to a specific building or group of educators. Instead, it can occur across roles, such as central office administrators collaborating with instructional support personnel or teachers collaborating with principals. In fact, cross-role collaboration can even foster forms of distributed leadership. An example of this was seen in Copland's (2003) study, where principals were observed to not just collaborate with their teachers about data use, but also asking teachers to take responsibility for inquiry tasks, both individually and as a group. Copland (2003) cited the benefits of

distributed leadership for inquiry to include a more positive culture and ownership of the inquiry process.

While collaboration is important, it is unlikely to happen unless it is explicitly structured. For example, Wayman et al. (2009) found that teachers who were the most effective users of data were ones who found ways to collaborate with each other around a data system. Unfortunately, the schools and districts in this study did not structure collaboration time into the schedule, instead leaving it to individual teachers to carve out their own time. Thus, collaborating teachers, while successful, were few in number. In contrast, other studies (Lachat and Smith 2005; Wayman et al. 2006) observed structured collaboration in successful data-using contexts.

8.5.4.2 Common Understandings

If alignment is to be created such that data, information, and knowledge flow easily through district channels, research is nearly unanimous that common understandings are a must (Datnow et al. 2007; Honig and Coburn 2008; Stringfield and Land 2002; Supovitz 2006; Wayman et al. 2012). Examples of such understandings include a vision of how education is to be conducted in the district, commonly held beliefs about teaching and learning, and definitions of which data serve which functions. This research also agrees that, while establishing a direction is the responsibility of leadership, common understandings operate corporately—that is, these understandings are not effective unless worked toward by everyone in the district.

In working toward common understandings, it is important to remember the findings of O'Day (2002) and Spillane (1998): even in an environment where vision and definitions are clearly articulated, individual educators still act out of their own agency, interpreting such definitions within their own worldview. Accordingly, Wayman et al. (2012) explored the systemic considerations in district-wide data use and concluded that policies around goals and vision must be specific but must also allow for self-determination. That is, there should be a positive tension between clarity and specificity in setting definitions and the latitude for educators to ply their craft within these policies.

In working toward common understandings, many schools or districts may find it helpful to establish a process. One example is a process that Wayman calls *calibration* (Wayman et al. 2006). Calibration activities involve conversations throughout the district about teaching, learning, and the service of data.

Wayman et al. (2012) note that the detail of common understandings may not matter as much as the conversations themselves. Still, it is important to have a specific topic from which to ground these conversations. Relevant to the use of state test scores, for example, educators throughout a district could examine state standards, decide how to fit those standards within their educational approach, and determine what data should be used to improve test scores while pursuing broader and deeper learning objectives for students.

In discussing common understandings, Senge (2006) spoke of unearthing "shared mental models" (Senge 2006). Similarly, teachers in Wayman and Stringfield's

(2006) study felt more comfortable with their data use because they felt they now shared a common language. These two examples highlight how common understandings can not only serve to provide formal alignment for a district's data initiative (e.g., stated district policies), but can create a potentially larger informal alignment that Senge and other researchers might argue is even more important.

8.5.4.3 Principal Leadership

Principal leadership has been shown to be critical to the success of any data initiative. In fact, Wayman asserts that data use lives and dies in the principal's office (Wayman et al. 2007; Wayman and Stringfield 2006).

Principals need to know how to use data, but perhaps more importantly, must employ a variety of leadership behaviors that support their faculty in using data. Studies suggest that teachers build capacity quickly when their principals are good data leaders and that they enjoy data use more (Archer et al., this book; Copland 2003; Deike 2009; Hamilton et al. 2009; Lachat and Smith 2005; Wayman and Stringfield 2006; Wayman et al. 2006).

Studies such as those referenced above suggest that necessary principal leadership behaviors are numerous. For instance, principals are largely responsible for the success of collaboration and the building of common understandings previously discussed. Principals must be creative at finding ways to allow time for their staff to use and discuss data. Principals are responsible for ensuring that staff are continually learning ways of using data that support improved classroom practice. Not only is it necessary to engage in leadership behaviors such as these, but principals must forge effective structures to ensure that these strategies are employed, even in their absence.

If the above seems daunting for principals, it is. In fact, many scholars have suggested that one principal cannot possibly lead an effective data initiative alone. Consequently, these scholars have supported forms of collaboration in administrative positions to distribute this load. As an example, Copland (2003) studied distributed leadership for data use, where various teachers around a school took on data-related tasks typically handled by the principal. Wayman et al. (in press) recommended administrative teams, where the principal and their administrative staff were mutually responsible for effective data use.

8.5.4.4 Professional Learning

Most studies of data use note the importance of helping educators learn more about how to use data (e.g., Datnow et al. 2007; Ingram et al. 2004; Lachat and Smith 2005; Wayman et al. 2007), but these same studies offer little guidance on how to support it. New research is considering helping educators learn to use data in terms of "professional learning" (Jimerson 2011; Wayman et al. 2012).

Professional learning for data use is conceived of broadly. It includes common forms of professional development but also includes elements such as informal

mentoring opportunities, support from instructional coaches, and collaborative reflection. Structures for this conception of professional learning involve ways to make it "job-embedded." Wayman et al. (2012) conceived of three ways job-embedded professional learning structures should be created for teachers: (1) embedding professional learning in the *workday*, such that teachers learn about using data during their daily tasks rather than at external professional development sessions; (2) embedding professional learning in the *content* taught by the teacher, relevant to the scope, sequence, and skills relevant to that content; and (3) embedding professional learning in *relationships*, establishing structures to enable many different types of connections between educators (e.g., grade-level teams, professional learning communities, coaching).

It is easy to see that this view of professional learning is truly a capacity-building support. However, it is important to note that the other topics discussed in this section (collaboration, common understandings, principal leadership, technology, and time) are all critical supports for professional learning. In fact, without these other supports, it is unlikely that the form of professional learning described here is possible.

8.5.4.5 Technology

Computer data systems are present in some form in nearly every district in the United States (Means et al. 2010). These systems take student data of varying forms and organize them so they may be used by educators for educational decisions.

In their most effective form, these systems take data from disparate sources and integrate these data into a "one-stop shop" for educator data use (Wayman 2005; Wayman et al. 2004, 2010; Dunn et al, this book). Data systems should be user-friendly, provide rapid response time, and offer a comprehensive store of data that includes elements such as student test histories, tests, quizzes, demographic information, disciplinary information, and more (Means et al. 2010; Mieles and Foley 2005; Wayman 2005; Wayman and Cho 2008; Wayman et al. 2004, 2010).

Such systems are important to a well-aligned, district-wide data initiative. First, they facilitate information flow from the district level to the school level to the classroom level. Second, effective data systems connect and align individuals and roles. By providing a common platform from which to share information, these systems facilitate the sharing of knowledge between different district entities (e.g., teachers, schools, or areas of the central office). In fact, Wayman et al. (2012) suggested that one of the most important functions of a data system is to connect various people within a district. Pooling knowledge and connecting people are important if a district is to create a well-connected environment.

8.5.4.6 Time

Perhaps the strongest correlate of effective data use is sufficient time to explore the data and consider practical changes (Lachat and Smith 2005; Wayman et al. 2007;

Schildkamp and Kuiper 2010; Young 2006). This same literature base is unanimous that time must be structured by leadership and be consistently available.

Wayman et al. (2009) observed the importance of the principal role in providing time. The authors cautioned that formal structures were critical, given the temporary nature of the informal structures they observed. Accordingly, research has described a variety of ways that principals have structured time: principals in the Datnow et al. (2007) and Young (2006) studies often structured time for their teachers to use data in collaboration with the principal or assistant principals. One principal in the Wayman and Stringfield (2006) study described creative reworking of teacher contract time to provide regular data use sessions. Other principals took all or most of their teachers' common time and infused data use into it (Lachat and Smith 2005; Wayman and Stringfield 2006).

Obviously, allowing time to use data will be critical if a district is to view data use in the broader sense and aim to build educator capacity to use it. But in considering how districts may better align themselves to respond to the requirements of NCLB, we also note that some researchers suggest the district should take an intentional role in structuring time for school-level educators to use data. In observing that principals often could not justify structuring time from other tasks to use data, some researchers have suggested that the district could send a clear message about the importance of data by mandating structured, dedicated time for using data (Moll 2009; Wayman et al. 2007).

8.6 Conclusion

NCLB gave districts and schools a difficult task with negative consequences for failure but did not illuminate a clear path to success. We illustrated this in the case of Mrs. Pujols who worked under two distinctly different data use environments under the same policy. Our observation is that there is a large gap between NCLB policy and actual practice in most districts. However, there are some districts that resemble Mrs. Pujols' second district, where data are used to inform instruction and the mandates of NCLB operate as one piece of the overall district educational plan. There is a need to understand the NCLB/practice gap as it relates to data use and to identify effective practices that can foster positive practice under NCLB. Using Cohen and Moffitt's framework (2009), we examined this gap and infused research on effective data use to describe ways districts and schools may effectively close this gap.

To be fair, some of the difficulties created by this gap were due to a general lack of knowledge about effective data use when the policy was passed in 2001. Policymakers had no additional wisdom on data use other than the intuition that it was critical to drive student achievement. Educators had no additional wisdom on data use other than their intuition as professionals. In a sense, the ambiguity of the policy sparked so many different experiments with data use at the local level that the field has advanced substantially since then. As a result, we were able to use this burgeoning research base to show how districts, schools, and educators may effectively use data within

NCLB. Our stance is that, while NCLB offers little support in using data effectively, it also contains few additional barriers. Given the knowledge base recently amassed on effective data use, we see no reason why any district or school should use NCLB as an excuse for poor data use.

Even with this in mind, we also believe it is irresponsible for policymakers to perpetuate the lack of support that characterizes NCLB. As this chapter is written, lawmakers are considering how to craft the reauthorization of NCLB. We hope this reauthorization, along with future policies, will reflect the hard-earned insight provided by the research cited here. In particular, we hope future policies offer districts clear assistance in building the physical infrastructure and pedagogical support structures that enable educators to use data in improving student performance. Otherwise, we fear that the negative environment surrounding NCLB and data use will endure.

8.7 Reflection Questions

Questions for Practitioners

1. The authors suggest ways for effectively using data within an existing ambiguous national policy. Think about their suggestions in relation to your country/state/district's policy where you would be expected to use data. How can you use data effectively within your country/state/district's existing policy?
2. The authors described a number of supports that can facilitate effective data use. How many of these supports exist in your context, and how well are they implemented?

Questions for Policymakers

1. The authors have outlined the lack of support offered by NCLB relative to what is needed to use data effectively. However, these supports are numerous and extensive. Should these supports be the purview of policy?
2. The authors described how incentives and disincentives under NCLB are mismatched with expected outcomes under an effective data initiative. How may policy incentives realistically be authored to fit with these expected outcomes?

Questions for Researchers

1. While the authors described many supports that could facilitate data use, they also offered that many of these supports are not commonly in place. How can schools or districts be better structured to implement these supports?
2. The authors relied on extensive correlational research to support their recommendations. How might a study be designed to show whether the authors' suggested supports actually cause increased student achievement?

Acknowledgments The authors would like to thank Kim Schildkamp, Mei Kuin Lai, and Lorna Earl for their insightful comments in improving their chapter and for the opportunity to participate in this volume.

References

Ashby, C. M. (2006). No Child Left Behind Act: Education's data improvement efforts could strengthen the basis for distributing Title III Funds. Report to Congressional Requesters. GAO-07–140. *Government Accountability Office*.

Cohen, D. K., & Moffitt, S. L. (2009). *The ordeal of equality: Did federal regulation fix the schools?* Cambridge: Harvard University Press.

Copland, M. A. (2003). Leadership of inquiry: Building and sustaining capacity for school improvement. *Education Evaluation and Policy Analysis*, *25*(4), 375–395.

Deike, M. A. (2009). *The principal as an instructional leader within the context of effective data use.* Unpublished doctoral dissertation, University of Texas at Austin.

Datnow, A., Park, V., & Wohlsetter. (2007). *Achieving with data: How high performing school systems use data to improve instruction for elementary students*. New Schools Venture Fund.

Hamilton, L., Halverson, R., Jackson, S. S., Mandinach, E., Supovitz, J. A., & Wayman, J. C., National Center for Education Evaluation and Regional Assistance (ED), et al. (2009). Using student achievement data to support instructional decision making. IES Practice Guide. NCEE 2009–4067. *National Center for Education Evaluation and Regional Assistance*.

Haycock, K. (2006). No more invisible kids. *Educational Leadership*, *64*(3), 38–42.

Ingram, D., Louis, K. S., & Schroeder, R. G. (2004). Accountability policies and teacher decision making: Barriers to the use of data to improve practice. *Teachers College Record, 106*(6), 1258–1287.

Heilig, J. V. & Darling-Hammond, L. (2008). Accountability Texas-style: The progress and learning of urban minority students in a high-stakes testing context. *Educational Evaluation and Policy Analysis. 30*(2), 75–110.

Honig, M. I., & Coburn, C. (2008). Evidence-based decision making in school district central offices: Toward a policy and research agenda. *Educational Policy*, *22*(4), 578–608.

Jacob, B.A. & Levitt, S.D. (2003). Rotten apples: An investigation of the prevalence and predictors of teacher cheating. *The Quarterly Journal of Economics*, *118*(3), 843–877.

Jimerson, J. B. (2011). "Doing data": Addressing capacity for data use through professional learning. Unpublished doctoral dissertation, University of Texas at Austin.

Jimerson, J. B. & Wayman, J. C. (2011, November). *Data-related professional learning: What teachers need vs. what teachers get.* Paper presented at the 2011 Annual Convention of the University Council for Educational Administration, Pittsburgh PA.

Koretz, D. M. (2002). Limitations in the use of achievement tests as measures of educators' productivity. *Journal of Human Resources*, *37*(4), 752–777.

Lachat, M. A., & Smith, S. (2005). Practices that support data use in urban high schools. *Journal of Education for Students Placed At Risk 10*(3), 333–349.

Loeb, H., Knapp, M., & Elfers, A. (2008). Teachers' response to standards based reform: Probing assumptions in Washington state. *Education Policy Analysis Archives*, *16*(8), 32.

Massey, D. S., & Denton, N. A. D. (1993). American apartheid: Segregation and the making of the underclass. Cambridge: Harvard University Press.

Means, B., Padilla, C., & Gallagher, L. (2010). Use of education data at the local level from accountability to instructional improvement. US Department of Education.

Meier, D., Kohn, A., Darling-Hammond, L., Sizer, T., & Wood, G. (2004). Introduction. In D. Meier & G. Wood (Ed.), *How the No Child Left Behind Act is damaging our children and our schools: Many children left behind.* (pp. vii–xv). Boston: Beacon.

Mieles, T., & Foley, E. (2005). *Data warehousing: Preliminary findings from a study of implementing districts*. Philadelphia: Annenberg Institute for School Reform.

Moll, K. A. (2009). Central office data use: A focus on district and school goals. Unpublished doctoral dissertation, University of Texas at Austin.

O'Day, J. (2002). Complexity, accountability, and school improvement. *Harvard Educational Review*, *72*(3), 293–329.

Opfer, V. D., Henry, G. T., & Mashburn, A. J. (2008). The district effect: systemic responses to accountability in six states. *American Journal of Education*, *114*, 299–332.

Orfield, G., Bachmeier, M. D., James, D. R., & Eitle, T. (1997). Deepening segregation in American public schools: A special report from the Harvard project on school desegregation. *Equity and Excellence in Education, 30*(2), 5–24.

Orfield, G. & Gordon, N. (2001). *Schools more separate: Consequences of a decade of desegregation*. Cambridge: Civil Rights Project, Harvard University.

Ravitch, D. (2010). *The Death and Life of the Great American School System.* New York: Basic.

Rorrer, A. K., Skrla, L., & Scheurich, J. J. (2008). Districts as institutional actors in educational reform. *Educational Administration Quarterly*, *44*(3), 307–358.

Schildkamp, K., & Kuiper, W. (2010). Data informed curriculum reform: Which data, what purposes, and promoting and hindering factors. *Teaching and Teacher Education 26,* 482–496..

Senge, P. M. (2006). *The fifth discipline: The art & practice of the learning organization*. New York: Currency Doubleday.

Spillane, J. P. (1998). State policy and the non-monolithic nature of the local school district: Organizational and professional considerations. *American Educational Research Journal, 35*(1), 33–63.

Stringfield, S., & Land, D. (Eds.). (2002). *Educating at-risk students.* Chicago: National Society for the Study of Education.

Sunderman, G. L., & Orfield, G. (2007). Do states have the capacity to meet the NCLB mandates? *Phi Delta Kappan, 89*(2), 137–139.

Supovitz, J. A. (2009). Knowledge-based organizational learning for instructional improvement. In A. Hargreaves, A. Lieberman, M. Fullan, & D. Hopkins (Eds.), *Second international handbook of educational change* (Vol. 23, pp. 707–723). Dordrecht: Springer Netherlands.

Supovitz, J. A. (2006). *The case for district-based reform: Leading, building, and sustaining school improvement*. Cambridge: Harvard Education.

Supovitz, J. A., & Klein, V. (2003). *Mapping a course for improved student learning: How innovative schools systematically use student performance data to guide improvement*. Philadelphia: Consortium for Policy Research in Education-University of Pennsylvania.

US Department of Education. (2004, February 10). *No Child Left Behind Act: Overview: Executive summary.* Retrieved from http://www2.ed.gov/nclb/overview/intro/execsumm.html. Accessed 17 July 2012.

US Department of Education, National Center for Education Statistics. (2010a). Table 90: Number of public school districts and public and private elementary and secondary schools: Selected years, 1909–1970 through 2008–2009. In US Department of Education, National Center for Education Statistics Digest of Education Statistics (2010 ed.). Retrieved from http://nces.ed.gov/programs/digest/d10/tables/dt10_090.asp. Accessed 17 July 2012.

US Department of Education, National Center for Education Statistics. (2010b). Table 91: Number and enrollment of regular public school districts, by enrollment size of district: Selected years, 1979–1980 through 2008–2009. In US Department of Education, National Center for Education Statistics (Ed.), *Digest of Education Statistics* (2010 ed.). Retrieved from http://nces.ed.gov/programs/digest/d10/tables/dt10_090.asp.

Valli, L., & Buese, D. (2007). The changing roles of teachers in an era of high-stakes accountability. *American Education Research Journal*, *44*(3), 519–558.

Wayman, J. C. (2005). Involving teachers in data-driven decision-making: Using computer data systems to support teacher inquiry and reflection. *Journal of Education for Students Placed At Risk, 10*(3), 295–308.

Wayman, J. C., & Cho, V. (2008). Preparing educators to effectively use student data systems. In T. J. Kowalski, & T. J. Lasley (Eds.), *Handbook on data-based decision-making in education* (pp. 89–104). New York: Routledge.

Wayman, J. C., & Stringfield, S. (2006). Technology-supported involvement of entire faculties in examination of student data for instructional improvement. *American Journal of Education, 112*(August), 549–571.

Wayman, J. C., Stringfield, S., & Yakimowski, M. (2004). *Software enabling school improvement through analysis of student data* (No. 67). Center for Research on the Education for Students Placed At Risk.

Wayman, J. C., Midgley, S. & Stringfield, S. (2006). Leadership for data-based decision-making: Collaborative data teams. In A. Danzig, K. Borman, B. Jones & B. Wright (Eds.), *New models of professional development for learner centered leadership.* Erlbaum.

Wayman, J. C., Cho, V., & Johnston, M. T. (2007). *The data-informed district: A district-wide evaluation of data use in the Natrona County School District.* Austin: The University of Texas.

Wayman, J. C., Cho, V., & Shaw, S. M. (2009). *First-year results from an efficacy study of the Acuity data system.* Austin: Authors.

Wayman, J. C., Cho, V., Jimerson, J. B., Spikes, D. D. (in press). District-wide effects on data use in the classroom. *Education Policy Analysis Archives, 20*, 25.

Wayman, J. C., Cho, V., & Richards, M. P. (2010). Student data systems and their use for educational improvement. In P. Peterson, E. Baker & B. McGraw (Eds.), *International Encyclopedia of Education* (Vol. 8, pp. 14–20). Oxford: Elsevier.

Wayman, J. C., Jimerson, J. B., & Cho, V. (2012) Organizational considerations in establishing the data-informed district. *School Effectiveness and School Improvement, 23(2), 159–178.*

Young, V. M. (2006). Teachers' use of data: Loose couple, agenda setting, and norms. *American Journal of Education*, *521–548*.

Chapter 9
Towards Data-Informed Decisions: From Ministry Policy to School Practice

Robert Dunn, Sonia Ben Jaafar, Lorna Earl and Steven Katz

It is Tuesday morning at Langley School. Chandra, Theo, and Monique are meeting to prepare the material that they will be presenting and discussing at their school-level professional learning community (PLC) session on Friday. These teachers and their principal make up one of the data teams from their school district who are attending a series of data use sessions hosted by the Professional Network Centre (PNC; a network of school districts working together to use data for school improvement). The Langley data team has been working together and with other data teams from across the network of school districts for several sessions. In the joint first session, all of the data teams spent time reviewing the data that they have from the provincial assessments and from the assessments that they do locally to isolate the areas where their students were struggling. From their work together, they decided that the data indicated that the school improvement focus for all of the schools in the network should be reading comprehension, particularly making inferences. The Langley team felt good at the end of the session and thought they were ready to go back to the school and start work on reading comprehension. They were surprised when the facilitators gave them two tasks as homework: (1) working through the data and their deliberations with the rest of the staff at the school to come to some consensus that this was a focus that was likely to really make a difference for their students and (2) get agreement from the staff that this would be a focus for teacher learning that everyone would participate in over the next few months.

Their homework proved to be a challenging assignment. At the next meeting of the PNC, they reported that the staff had not been very responsive to being told what they would focus on and many of them felt that they already knew how to teach students to make inferences. If students didn't get it, that was their problem. The data team was somewhat demoralized but they remembered how much discussion they had gone through at the PNC in the first meeting to understand the school's data.

For their next school-level professional learning community session, the data team structured a number of activities so that everyone spent time looking at the data and formulating some hypotheses about what was going on and why they were seeing the patterns that were

L. Earl (✉)
Aporia Consulting, Toronto, Canada
e-mail: lorna.earl@utoronto.ca

S. B. Jaafar
EduEval Educational Services, United Arab Emirates

R. Dunn
York Region District School Board, Toronto, Canada

S. Katz
University of Toronto, Toronto, Canada

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_9,

emerging. The objective of the meeting was to formulate two or three potential areas of focus for the school to work on and to identify what other information they needed in order to establish a school-wide focus that could be specific and high leverage. At the end of that session, there was agreement among the staff that students were indeed having difficulty making inferences, but considerable disagreement about what that meant and how to approach it as a school focus. The data team pushed hard to get the rest of the staff not to jump to action but to focus on what else they needed to know. The final decision was that before the next meeting, each grade-level group of teachers would teach a lesson on making inferences to their students and spend some time, as a group, looking at the students' work and answering three questions: How do we know students are able to make inferences (or not)? What evidence do we see of students developing this skill in our students' work? What might a rubric for "making inferences" look like at this grade level? The teachers were asked to bring the "making inference" lesson plans, some examples of student work, and their answers to the three questions to the next meeting.

This brings us to the Tuesday morning meeting of the data team. They are planning their report for the upcoming network meeting with data teams from other schools and districts and trying to digest all that happened at their school professional learning community meeting. The whole professional learning community had been surprised at how many different interpretations of the concept of "making inferences" had emerged from the grade-level teams. One of the teachers suggested that she would be willing to look at all of the lesson plans and rubrics to see if she could combine them and isolate some common themes and some points of difference among them. Another teacher announced that he no longer felt he knew what inferences were or how to make sure that his students became proficient at making inferences. He said he would look for some professional learning material and maybe contact the district reading consultant[1] for some suggestions. The team wanted to describe this process to the others at the PNC. As they discussed a number of ways to showcase the work that they had been doing and how successful it had been, Chandra paused and said: "We don't have to have it right. We just have to be on the way. That's what we need to do. We need to tell the story, without an ending, and ask for help in thinking about what we need to know next."

9.1 Introduction

In the move from an industrial era to a knowledge era, educational systems are increasingly using data to support policy and practice decisions (Silins and Mulford 2002; Gifford and Agah 2009; Paavola et al. 2004; Peroune 2007; Subramaniam and Youndt 2005). In an era of sophisticated data systems, the focus on building capacity to use all of the available data in thoughtful and effective ways becomes very important. Using data for decision making in education involves much more than consideration of large-scale assessment data. It is also about examining system and classroom practice in a systematic manner and creating the conditions for leaders and teachers to identify the areas of student need and areas where they as professionals require new learning to support enhanced student learning. Learning networks and professional learning communities can provide the context for educational leaders and teachers to work through a series of iterative processes of data-informed decision making (Katz and Hands 2007) to learn how to manage and use data, interpret results, connect the findings to teaching and learning, and monitor emerging student and teacher learning needs for attention and improvement.

[1] An expert in literacy who works for the district and is available for support to all of the schools.

This chapter describes how the province of Ontario, Canada structured a large-scale initiative to ensure that all schools in the province had access to high-quality data and to develop a culture of inquiry, in which there is widespread capacity to work with data and where using data becomes a routine part of the operation of the educational system at all levels. This initiative—the Managing Information for Student Achievement/Professional Network Centres (MISA/PNC) was created to support development in school districts to establish data systems and build capacity for using data. This chapter traces the influence of this initiative from ministry policy through its implementation at one regional MISA/PNC and into one of the school districts in the PNC to exemplify its influence at the district and school level. The chapter closes with a brief discussion of the lessons learned from this large-scale innovative effort for moving data-informed decision making from policy to practice.

9.2 Ontario's Public Education Context

Education in Canada is a provincial-level responsibility. With 40 % of Canada's 33.6 million residents, Ontario is the most populous province in Canada. Ontario is also a diverse and mobile community as 60 % of the 225,000 immigrants arriving in Canada each year settle in Ontario. The geography of Ontario covers one million square kilometers of land ranging from the largest city of Toronto, through suburban communities, to rural and remote areas.

Ontario's education system involves four (publicly funded) governance systems : English public; English Catholic; French public; and French Catholic (Campbell 2009). Within Ontario, there are 2.1 million students in about 5,000 schools administered through 72 district school boards with student populations ranging from under 25,000 to over 300,000 students.

School districts, with locally elected trustees and a central administration, have the responsibility for delivering educational programs and services for students, promoting student achievement and well-being, and stewardship of board resources. They are responsible for setting annual budgets, setting local policy, implementing provincial policy, hiring, promoting and dismissing teachers and administrators, supervising the operation of schools and their teaching programs, helping teachers improve their teaching practices, teacher performance, building and equipping schools, ensuring schools abide by the Education Act and its regulations, and managing grants from the provincial ministry of education.

Schools within each district have direct responsibility to the district and principals are responsible for the organization and management of individual schools, including any budget assigned to the school by the school board, the quality of instruction at their school, and student discipline.

9.2.1 Ontario's Reform Approach and Data Use

The Ontario government has been actively involved for over 10 years in systemic reform. This reform has been focused on improving elementary school literacy and

numeracy outcomes and increasing high school graduation rates through a focused and sustained effort by all parts of the education system and its partners (Levin and Fullan 2008). They have established three goals that direct all decisions within the Ministry of Education: (1) increased student achievement, (2) reduced gaps in performance, and (3) increased public confidence. In this effort, the government has been committed to combining high support and high challenge in raising the capacity at all levels of the system to engage in and pursue continuous improvement.

As part of the large-scale reform in the province, the government has established a large-scale provincial assessment system that focuses on literacy (grades 3, 6, and 10) and numeracy (grades 3, 6, and 9). These assessments are low-stakes for schools and there is considerable support for use of the assessment data in schools for program improvement.[2]

The ministry has also had a major focus on using all kinds of evidence for educational decision making:

> As a key strategy in advancing its goals, the ministry is committed to developing and implementing policies and programs that are evidence-informed,[3] research-informed and connected to the priority educational goals (Ontario Ministry of Education 2010a, p. 2)

The Ontario approach is further elaborated by Campbell et al. (2011):

> Rather than the sometimes narrow conception of evidence-based decision-making, primarily at the start of the policy process, [the ministry is committed] to the use of evidence from research, evaluation and data, throughout a range of decisions and actions including informing policy options and decisions, contributing to program development, implementation and review; supporting operational and strategic planning processes, identifying and leverage effective practices, and supporting professional capacity building provide evidence for communications, reporting and issues management. . . . [Within this framework,] the government put the primary emphasis on building professional capacity, with accountability in a support role.
>
> Using data is not an end in itself. Instead, the large-scale assessment system and the focus on using data in Ontario are small parts of a much larger reform effort to help policy makers and educators make informed decisions, especially in relation to the primary goals of improving student achievement. In the next section, we describe the process that the Ministry put in place to support not only having technically robust and high-quality data systems but also developing local capacity in districts and schools to use data effectively (p.3).

9.3 Ontario's MISA/PNC Initiative

The MISA initiative was designed to support the provincial education reform agenda through building coherence around using data-informed decision making in support of student achievement. The MISA initiative provided the policy framework for the investment of targeted budgetary and human resources to enhance data collection, information systems, and the capacity to use, understand, and apply data at the provincial, district, and school levels.

---

[2] For more information, go to http://www.eqao.com.

[3] Although we use data-informed throughout this chapter for consistency within the book, the Ontario Ministry uses the term evidence-informed.

The MISA/PNC initiative consists of two major components; a data management system to collect and store data at the local level, some of which is routinely uploaded to the provincial data system,[4] and a capacity-building component to utilize the data for decision making.

Each school district received funding to develop their data systems and for building local capacity. For the most part, this funding was used locally to build comprehensive data bases in each district that met the ministry requirements. The ministry also provided funding for seven MISA PNCs across the province: six regional and one French-language center. These networks are intended to help school districts and schools learn to manage and use data to support improved student achievement. Each network is composed of 8–16 school districts, with an Executive Lead from one district who is responsible for coordinating activities within the PNC and communicating with the Ministry. This initiative was intended to focus primarily on capacity building rather than the technical aspects of developing data systems.

Practically, the Ministry provides support to PNCs in the form of funding, opportunities for sharing, and common MISA implementation guidelines. From 2005 to 2010, the Ministry hosted PNC meetings and joint sessions, released approximately 50 memos to the PNCs to ensure a common understanding, facilitate common core processes, promote informative reporting, and offer responsive capacity building. Ministry communiqués included guidelines and templates for building their warehouse, using data, and communicating results. The Ministry facilitated access to all the memos, templates, guidelines, and supportive resources for PNCs through the MISA online Collaboration Space. District leaders in all the PNCs have access to the space and are encouraged to contribute to it. This space is a dynamic virtual meeting area that archives all of the memos, templates, meeting notes, event announcements, news, and links to all seven PNC websites. In addition, it provides links and documents that explicitly connect the MISA/PNC work to other Ministry initiatives and programs such as those in Literacy and Numeracy Secretariat, Student Success/Learning to 18, and Curriculum and Assessment Policy Branch. These efforts archived in the MISA Collaboration Space promote a sustained shared effort to achieve policy coherence (Honig and Hatch 2004).

Perhaps the most important guide for the MISA work both in getting data systems in place and in building capacity for using data as a routine part of decision making came from the rubric that is central to the initiative called the *Common Core Continuum*. The Core Continuum is composed of three components: (1) human resources and training, (2) data management, and (3) technology. This Core Continuum (Ontario Ministry of Education 2007; displayed below) defines criteria those allow districts to assess their own progress in building their capacity in each of the three components (Tables 9.1–9.3).

[4] The provincial data system, titled the Ontario Student Information System (OnSIS) includes comprehensive data on each student and teacher in the province. This system informs all budget decisions as well as furthers the provincial improvement strategy. http://www.edu.gov.on.ca/eng/policyfunding/misa/faq.html.

Table 9.1 MISA common core continuum: data management

Data management	Preimplementation	Early implementation	Building capacity	Sustaining capacity
Data holdings	Very little data are being collected in accordance with the student achievement-related data categories of the core capacity guidelines. Few data are being stored at the board/school level	Some data are being collected in accordance with the student achievement-related data categories of the core capacity guidelines. Some collected data are being stored at the board/school level	Most data are being collected in accordance with the student achievement-related data categories of the core capacity guidelines Most collected data are being stored at the board/school level, electronically when appropriate	All relevant data are being collected in accordance with the student achievement-related data categories of the core capacity guidelines All collected data are being stored at the board/school level, electronically when appropriate
Data cleansing	The board/school authority/school has not yet completed a "data cleansing" cycle to ensure that the quality of the data stored is adequate	The board/school authority/school reviews its data inconsistently to ensure that its quality is adequate, i.e., complete, accurate, not duplicated, and stored in a format that supports both internal and external reporting requirements	The board/school authority/school completes "data cleansing" cycles often to ensure that the quality of the data stored is adequate, i.e., complete, accurate, not duplicated, and stored in a format that supports both internal and external reporting requirements	The board/school authority/school always completes "data cleansing" cycles to ensure that the quality of the data stored is adequate, i.e., complete, accurate, not duplicated, and stored in a format that supports both internal and external reporting requirements
Data mapping	The board/school authority/school has unofficial documentation describing how and where data are collected, stored, and accessed	The board/school authority/school has incomplete documentation describing how and where data are collected, stored, and accessed	The board/school authority/school has provisional documentation describing how and where data are collected, stored, and accessed	The board/school authority/school has permanent documentation describing how and where data are collected, stored, and accessed that is available for stakeholders
Data integration and analysis	Few individual student data can be linked using the OEN[a] as the primary key	Some individual student data can be linked using the OEN as the primary key	Most individual student data can be linked using the OEN as the primary key	All individual student data can be linked using the OEN as the primary key
Data access	School administrators, board staff, and teachers do not have access to appropriate information to assess student learning	Some school administrators, board staff, and teachers have access to some information, including correlated data to assess student learning, monitor student progress, and identify patterns over time to set strategies for improving student achievement	Most school administrators, board staff, and teachers have access to appropriate information, including correlated data to assess student learning, monitor student progress, and identify patterns over time to set strategies for improving student achievement	All school administrators, board staff, and teachers have access to appropriate information, including correlated data to assess student learning, monitor student progress, and identify patterns over time to set strategies for improving student achievement

[a]A unique student identification number.

Table 9.2 MISA common core curriculum: technology

Technology	Preimplementation	Early implementation	Building capacity	Sustaining capacity
Implementing a student management system (SMS)	A student management system for recording student registration, assessment, and achievement information has not been initiated at the board/school level	A student management system for recording student registration, assessment, and achievement information has just been implemented in place at the board/school level This system is not centralized so that school and board staff cannot access it The student management system does not house the data elements described in the core capacity guidelines Student management and related systems do not exchange data with the Ministry through Ontario student information system (OnSIS) using the OEN and the ministry educator numbers as primary keys The student management and related systems do not store/exchange data with Education Quality and Accountability Office (EQAO) using the OEN as the primary key	A student management system for recording student registration, assessment, and achievement information is starting to operate at the board/school level This system is beginning to be centralized so that school and board staff can access it The student management system is beginning to house, at a minimum, the data elements described in the core capacity guidelines Student management and related systems are beginning to exchange data with the ministry through OnSIS using the OEN and the ministry educator numbers as primary keys The student management and related systems are beginning to store/exchange data with EQAO using the OEN as the primary key	A student management system for recording student registration, assessment, and achievement information is established This system is effectively centralized so that all school and board staff can access it The student management system is efficiently able to house, at a minimum, the data elements described in the core capacity guidelines Student management and related systems are successfully able to send data to the ministry through OnSIS using OENs and ministry educator numbers as primary keys The student management and related systems are effectively able to store/exchange data with EQAO using OENs as the primary key
Local analysis and reporting tools	A reporting tool is not in place to draw data from the student management system and other data sources for analysis and reporting of student. Technologies such as data warehousing and decision support tools are not included	The reporting tool in place inconsistently draws data from the student management system and other data sources for analysis and reporting of student achievement-related data, either at the individual student or aggregate levels i.e., the user must enter the data manually. Board staff are researching technologies such as data warehousing and decision support tools	The reporting tool is beginning to draw data from the student management system and other data sources for analysis and reporting of student achievement-related data, both at the individual student and aggregate levels Technologies such as data warehousing and decision support tools are beginning to be implemented for use by board staff and senior administration	The reporting tool consistently draws data from the student management system and other data sources for analysis and reporting of student achievement-related data, both at the individual student and aggregate levels Technologies such as data warehousing and decision support tools have been effectively implemented and are available to teaching and administrative staff

Table 9.3 Common core continuum: human resources

Human resources	Preimplementation	Early implementation	Building capacity	Sustaining capacity
Data collection, storage and inventory creation	Board staff are not capable of collecting, storing, and inventorying student achievement-related data due to lack of time, training, resources, tool, etc.	Board staff inconsistently collect, store, and inventory student achievement-related data due to limited time, training, resources, tools, etc.	Board staff often collect, store, and inventory student achievement-related data due to regular allotment of time, training, resources, tool, etc.	Board staff actively collect, store, and inventory student achievement-related data due to effective use of time, training, resources, tools, etc.
Data correlation, analysis, and looking for patterns	Board staff correlate, analyze, or look for patterns in data to support the development of strategies for improved student achievement on an ad hoc basis	Board staff infrequently correlate, analyze, and look for patterns in data to support the development of strategies for improved student achievement	Board staff often correlate, analyze, and look for patterns in data to support the development of strategies for improved student achievement	Board staff always correlate, analyze, and look for patterns in data to support the development of strategies for improved student achievement
Data-based reports that are simple and comprehen-sive	Board staff do not produce reports for use by teachers, school administrators, ministry staff, and the public	Board staff produce a limited number of simple and comprehensive reports for use by teachers, school administrators, ministry staff, and the public	Board staff produce a general range of simple and comprehensive reports for use by teachers, school administrators, ministry staff, and the public	Board staff produce an extensive range of simple and comprehensive reports for use by teachers, school administrators, ministry staff, and the public. Users can modify the reports by adjusting parameters, sorting criteria, etc.
Data-based dialogue related to student achievement strategies	Support for administrators and teachers to engage in dialogue concerning student achievement strategies based on integrated data analysis is limited	Administrators and teachers sometimes engage in dialogue concerning student achievement strategies based on integrated data analysis	Administrators and teachers often engage in dialogue concerning student achievement strategies based on integrated data analysis	Administrators and teachers consistently engage in dialogue concerning student achievement strategies based on integrated data analysis
Engaging staff in gathering, analyzing, and discussing appropriate data	Administrators rarely engage staff in the gathering, analysis, and discussion of appropriate data, including demographic, perceptual, student learning, and school process data	Administrators sometimes engage staff in the gathering, analysis, and discussion of appropriate data, including demographic, perceptual, student learning, and school process data	Administrators often engage staff in the gathering, analysis, and discussion of appropriate data, including demographic, perceptual, student learning, and school process data	Administrators continuously and thoroughly engage staff in the gathering, analysis, and discussion of appropriate data, including demographic, perceptual, student learning, and school process data

Annually, school districts are required to use the Common Core Continuum to engage in an structured self-assessment of their current work, to measure the impact of the work and to support building the next year's district improvement plan.

9.3.1 Electronic Data Management

Before MISA was instituted, data about students and schools had been housed locally in school districts sometimes electronically and sometimes as hard copy files. The Ministry made a commitment to build a provincial electronic reservoir for data (a data warehouse) that would contain data those could be aggregated to the district level or the provincial level. They established the Ontario Student Information System (OnSIS) data system and specified the data elements that every school district must include in their local electronic system, with the facility to upload these elements to the provincial system. The OnSIS includes comprehensive data on each student (e.g., gender, provincial assessment scores, course taken, grades, attendance) and teacher (e.g., certification, teaching assignment) in the province. There is also information about schools and programs. The data are collected and verified within the school districts, with the Ministry providing guidelines, support, and funding to build the district data warehouses and systems. This data warehouse means that schools and districts have immediate access to data those are timely and accurate. When the data are uploaded to the Ministry, they can be used to create indicators and complex analyses to allow policy makers to pose questions and consider data related to a wide range of policy decisions.

Building a comprehensive and accurate data system was something that the Ministry saw as an essential first step to a data-informed culture. It was a necessary but not sufficient step in the process. Having the data meant that they now needed to become adept at analyzing, interpreting, and using the data for wise decisions. Once the system was in place, the work of the networks (PNCs) focused on building capacity for using the data effectively.

9.3.2 Capacity Building

The overall goal of the networks of districts (PNCs) was to promote the development and sharing of effective practices in relation to data systems and data use. The MISA PNCs were structured to create a space to help people in their districts and schools consider the data, share their tacit and professional knowledge, and together move to more effective decision making. Creating the space for these social practices is essential because educator professional knowledge grows from a process of considering their current beliefs in relation to new knowledge (often from data), reflection on data, and constructing a new way of thinking about an issue (Murray and Moses 2005; Paavola et al. 2004; Patrick and Dotsika 2007; Yazici 2005).

MISA/PNCs were intended to build capacity in school districts and schools not only to use data from their own data systems and from research, but also to develop ways to share their learning with all of the schools in their districts (some of which are very large) by learning about data-informed decision making in education—with each other, from each other and on behalf of colleagues in their districts. Each PNC has the responsibility of developing and implementing activities that support the work of PNC member districts, with some funding to support their work, monthly meetings via teleconference and a provincial conference to share their work.

9.4 One PNC in Action: The Greater Toronto Area Professional Network Centre

Each of the PNCs established an approach that was appropriate to their context and needs, within the expectations of the Core Continuum. In this section, we focus attention on one of the MISA PNCs—The Greater Toronto Area Professional Network Centre (GTA PNC), to provide an example of how one of the PNCs organized their work to refine local systems in accordance with provincial expectations and to build capacity for using data. The GTA PNC is made up of nine districts and one school authority, including several of the largest school districts in Ontario. The school districts in this PNC range from the Toronto District School Board, the largest in Canada with over 500 elementary and secondary schools serving over 250,000 students to Wellington Catholic School District with 20 schools serving over 8,000 students.

Upon its formation in late 2005, the GTA PNC chose to focus their collective efforts on the capacity-building component of the MISA goal. Although they sometimes worked together to discuss their data management systems, they felt that this part of the mandate could be accomplished locally and that capacity building to use data was a pressing issue that they wanted to tackle together. Consequently, the GTA PNC strategically focused on developing common understandings across its membership about various components of data-informed decisions making. Their emphasis was specifically on two of the dimensions in the Core Common Continuum:

- Data-based dialogue related to student achievement strategies.
- Engaging staff in gathering, analyzing and discussing appropriate data.

As a starting point, the PNC undertook a research project designed to describe the existing state of affairs around data use among the member districts by documenting the existing landscape with respect to key issues in the area of data-informed decision making for school improvement at the district level. This initial needs assessment identified that data use in schools (and even districts) was very limited and that there was considerable interest in the districts in becoming more adept at using data (Katz and Hands 2007). It also focused the collective attention, efforts, and thinking of the member school districts and promoted a sense of joint ownership of the process (Mejía et al. 2007; Ringer 2007; Katz et al. 2008, 2009).

Data use for improvement is much more than a technical activity. It requires people to change their thinking and their practices and is sometimes a challenging undertaking (Earl and Katz 2006). The GTA PNC developed a series of processes to engage people from all of the PNC districts in job-embedded professional learning related to using data for school improvement.

9.4.1 Using Professional Learning Networks and PLCs to Foster Data-based Decision Making

In order to focus on using data for school improvement, the GTA PNC decided to engage networks of schools from across their districts in targeted professional learning activities to learn together and share their learning with colleagues at home. Over a number of years, the GTA PNC developed a series of workshops based on the work of Earl and Katz (2006) to support schools in engaging in a cycle of school improvement using data as a tool for determining their directions and their progress. Data use at the district, school, and classroom levels defined the *content* of the workshops, but there was also serious attention to the *process* of creating the conditions for meaningful job-embedded professional learning.

The first series focused on the data teams from schools, working together to learn to use data and to move their learning back to the PLCs in their schools. School data teams made up of three individuals (an administrator and two teachers from school-based PLCs) from four schools in each of the participating districts were invited to participate in a year-long initiative designed to build capacity in data-informed decision making for school improvement. The process was anchored by 3-day-long dedicated working sessions, with the majority of the work happening between sessions. The workshop sessions focused on using data to establish a school improvement focus, collecting or identifying data to learn more about what is known in this focus area, interpreting various data sources to make sense of what the data might mean, and reflecting on using what they were learning.

The schools, within each of the districts, were already using the concept of the PLC in their schools. The GTA PNC was aware that PLCs do not necessarily have the desired impact if they do not result in focused professional learning that changes thinking or practices (Hatala and Lutta 2009; Scarbrough 2003; Sung-Ho et al. 2007; Zarraga and Garcia-Falcon 2003). They wanted to capitalize on the existence of local PLCs and provide them with professional learning experiences that would make their work more focused and more data-informed. Consequently, the workshop sessions were structured to facilitate teams working through how they would use their learning from data to engage in conversations with the rest of the staff in their schools. As teams worked with the data in the workshops, they also spent time determining the professional learning needs of the teachers in their schools. When they returned to their schools, they used their time in the school-based PLCs to help their colleagues examine data about their existing practices and to learn more about how teaching and learning works in their selected focus. This collaborative inquiry was the engine for

knowledge creation and learning for the PLC and was intended to move the learning of all of the teachers forward in a way that was collectively understood and shared.

The school data team attended all of the anchor sessions and their homework assignments (like the one described in the scenario at the beginning of this chapter) were structured to give them processes for engaging colleagues in their schools in considering the data and in new learning as well. At the end of the year, these school data teams consolidated the work in their schools and showcased it through a range of displays. These took the form of both presentations and posters that highlighted, for example, how teams identified and used categories of indicators to refine and monitor their school improvement foci.

As the process was implemented, it became clear that the PLCs in schools needed more than having several of their colleagues attend workshops to embed data use into their practices. The data teams reported that the process was working but they felt uncertain about their own expertise and wanted ongoing support on their journey. In the next year, new school data teams from the network districts participated in the same process described above but the PNC's capacity-building emphasis now also included attention to the role of those who "facilitate" school teams in their work with data. Each district within the PNC designated a key person to support the school teams in their work between sessions. This person was someone familiar with the district's data context (requirements, initiatives, data sets, access procedures, etc.) and the intent was for this person to be an important conduit between the formal capacity-building "anchor sessions" and the PLCs in schools and were in the position to work with the data teams and start to share the project within their districts. The facilitators themselves became a network and worked together in advance of each of the anchor sessions and were supported by critical friends in their work as capacity builders for data-driven school improvement in their boards. Together the facilitators and the workshop leaders worked to describe what facilitation *entails*—rather than the facilitation *role,* so that they could facilitate creating the conditions within local professional learning communities in which data allowed them to challenge existing thinking and practice.

More recently, the PNC began a workshop series specifically for facilitators dedicated to building capacity in what it means to facilitate focused professional learning within a learning community context. The facilitators in this group were diverse—including a principal who works with a team of teachers, a curriculum consultant who works with a school team, a district superintendent who works with a group of principals, a program principal who works with a group of curriculum consultants, and so on. The focus of the workshops was how to create the conditions for the kind of focused professional learning in a PLC that will build understanding and change practice. Participants identified a learning community with whom they are already working to serve as a "learning case" to ensure the capacity-building opportunity is job-embedded and authentic. This work continues to unfold at the time of this writing.

9.5 One District's MISA/PNC-Related Activities

The implementation of the PNCs set an expectation for school districts to work and learn together, and increased the opportunities for them to share among one another. The Ministry expectation that all school districts have improvement planning processes coupled with the MISA Common Core Continuum provided the support, resources, and direction; and the work that the districts did together during the data use capacity-building sessions provided them with a model for engaging the rest of the schools in each district to enhance their data literacy.

The ministry did not intend districts to slavishly follow a particular formula for more sophisticated use of data. Instead, they expected districts to build systems that were compatible with each other and with the provincial system and to build widespread capacity and expertise to use data in the service of better decision making in the district. Each of the districts proceeded in their own way in relation to the MISA implementation, depending on the size of the district and existing structures for data management and data use, while at the same time learning from and supporting one another in their activities. This section provides an example of how one of the districts integrated the work from the GTA PNC into their existing structures and processes.

York Region District School Board is one of the larger districts in the PNC, with 151 elementary and 32 secondary schools. York Region had already been involved in a process of school improvement through professionals "learning how to learn" before the MISA initiative. In 2002, the Board had initiated a capacity-building strategy called the Literacy Collaborative. Their intention was to build teacher capacity through professional learning opportunities in large-scale settings. By 2006, this strategy had evolved to encompass learning networks of principals in the district who came together with a focus on creating professional learning communities in their schools in order to build capacity in a job-embedded environment in schools networked together, following the process described by Katz et al. (2009). In this model, while schools were the locus of enhanced student achievement, learning networks were the locus of capacity building, working within a knowledge creation and sharing environment, intended to shift classroom practice to support student achievement.

The Province's expectation that each school district submit an annual plan and build capacity to use data effectively has led to a significant shift in data use that was reflected in a revised plan for the York Region District School Board. As a district, York Region formulated a multifaceted district improvement plan that focused on using data in a variety of ways.

9.5.1 Refining and Extending the District Data System and Data Warehouse

MISA and the MISA PNC was the impetus for making the school improvement process in York Region more focused on using data. The MISA funding allowed the York

Region District School Board to build and refine its data warehouse and provide easy access to the data required to create effective data-informed improvement planning processes.

Once the warehouse was in place, they had the capacity to develop data sets, which reflect both evidence of student achievement and evidence of classroom practice represents a significant milestone for the schools and district. The process to build the capacity of school administrators to gather those data uses a collaborative inquiry model where groups of administrators observe classrooms, focused on a set of indicators selected by the school to represent the focus for their capacity building.

9.5.2 Analyzing District Data for Trends and Relationships

The comprehensive data warehouse allowed York Region to use part of the MISA funding to engage in predictive analysis research studies to determine which data sets were most effective in identifying later student success.[5] The research studies tracked large cohorts of students (from 6,300 to 8,000 over 2 years) and examined their subsequent achievement, identifying the data that best predicted this achievement using logistic regression analysis. These studies were only possible due to the existence of a rich, comprehensive Data Warehouse. These studies led to the identification of *leading indicators*, including classroom-level data such as running records and analysis of student writing, which would be used in the school improvement planning process to identify at-risk students. Planning processes were developed to engage all the school staff in discussions that identified student learning needs based on the data and the explicit classroom strategies, which were needed to support their improvement. These same studies served to support the identification of *trailing* indicators, those after the fact indicators, which could be used by schools and senior Superintendents to assess the impact of the improvement focus. These indicators included trend data from provincial assessments, cohort data that tracked cohorts of students over several years, and attendance data. The identification of a core data set of leading and trailing indicators provided a consistent data set across schools as they worked to develop school plans and monitor their impact. These research studies also supported the design of a series of data reports developed to be understandable by principals and teachers. The clearly articulated intent was to develop an influential school improvement planning process, supported by clear, data-informed indicators, which lead to increased student achievement and the ability to track improvement over time.

[5] "Student Cohort Tracking Studies: Impacts of Gender, SES and Early Achievement on Students' EQAO Performance," unpublished research study, York Region District School Board, August 2006. "Secondary Student Outcomes: Graduates, Leavers and Continuers" unpublished research study, York Region District School Board 2009.

9.5.3 Building Data Use Capacity in District Networks

The PNC process established by the Ministry through the MISA initiative *expected* school districts to network to support collective learning. A number of school-based learning communities from York Region participated in the GTA PNC data use workshop sessions and district personnel were involved in the facilitator development process. Subsequent to these sessions, teams returned to their schools and led the process of developing school improvement plans in their schools and networks of schools within York Region. The facilitators are all Leadership Development staff, with responsibility for facilitating the development of school leaders through school improvement planning. The facilitators also drew on the GTA PNC sessions to support the implementation of the learning networks that were being established in the district.

Having the data warehouse and a Board plan focused on measuring the implementation of targets for changes in classroom practice has shifted the role of the principal in the school. As an instructional leader, the principal in each school has responsibility for facilitating discussions about the school's data. In York Region, this has been formalized as dialogues in which the entire staff engages in a data-informed collaborative inquiry three times a year. Teachers share data about students in their class and collaboratively set targets for improvement. These targets are monitored through a continuous process and revisited formally twice during the year to assess the impact of the classroom work on the students.[6] Currently, the district is building an application, which will allow teachers to enter classroom-level data on an ongoing basis, supporting an assessment for learning environment, and building the capacity to continuously monitor student achievement against set targets. As well, principals with their critical friends monitor the changes in classroom practice, which grow from the capacity-building focus of the networks.

9.5.4 A Focus on Student Learning

York Region again provides some insight into the extent to which and the ways that the data are being used locally, as well as the evolving impact of the educational reform agenda. In the York Region Strategic Plan, the focus is on student achievement and well-being. On provincial assessments, York Region consistently scores above the provincial average. The District Improvement Plan includes specific targets for improvement, which are then reflected in the school plans. The focus of the District plan reflects the cohort studies in that the district identified specific targets for exceptional students and English Language Learners, some of the underachieving groups identified in the research being done within the district. There is also a target

[6] The school year calendar identifies professional development days when these activities will occur, providing the time for school staff to engage in this full-school collaborative inquiry-based target setting process.

for grade 3 literacy improvement, which reflects the district research and the work of others[7] that students not achieving to standard in reading by the end of grade 3 are more vulnerable[8] tracking our improvement at the school level is possible because we have a robust data warehouse and reporting tools, which allow us to monitor improvement against our defined trailing indictors.

In the last planning process, 93 % of elementary school administrators had logged onto the data warehouse application to download the required data. In all networks, data are used to assess the impact of their capacity-building focus, both on classroom practice and, more importantly, on student achievement. In the last provincial assessment, 77 % of the students in York Region were performing at or above the provincial standard in an aggregated literacy score. In some areas of literacy, there was an improvement of 6 % of students attaining or exceeding the standard, in a 1-year period. Although this cannot be directly linked to the work of the MISA/PNC, it is likely that the focus on data use and the support it provided to districts contributed to this gain.

9.6 Conclusions/Lessons Learned

So often policy changes have little or no effect. The effect of a storm on the ocean is that the 'surface is agitated and turbulent, while the ocean floor is calm and serene (if a bit murky). Policy churns dramatically, creating the appearance of major changes. . . while deep below the surface, life goes on largely uninterrupted (Hattie 2009, p. 254).

The Ontario reform agenda is both simple and complex. The focus on student achievement and success is clear and has been sustained over a number of years (Levin 2010). At the same time, the ministry has established a wide range of integrated policy initiatives with the intention of moving the reform agenda deep into the fabric of districts, schools, and classrooms. The MISA initiative does not stand alone. It is part of a large-scale reform agenda that relies on having good data for making decisions about both policy and practice. Taken together, the elements of the reform agenda have been very successful, with increases in the percentage of students reaching the standard on provincial assessments in grades 3 and 6 reading, writing, and mathematics, as well as grade 9 mathematics (EQAO 2010). About 18,000 more kids in Ontario graduated from high school last year than from a similar size cohort 5 years earlier (Levin 2010).

The MISA funding and focus provided the resources and direction for individual school districts to build the infrastructure of accessible data and the local capacity to use the data to inform decision making in the service of improvement. MISA was not intended to be a stand-alone initiative; instead, it was designed to provide the

[7] Hernandez, "Early Warning! Why Reading by the End of Third Grade Matters," Annie E. Casey Foundation 2010.

[8] Ibid York Region District School Board 2006.

tools and the expertise to support data-informed decisions about policy and practice. The direction and focus was connected to other Ministry initiatives to ensure that the whole province was connected by a data system that they could trust and use in decision making.

The Managing Information to support Student Achievement/Professional Network Centres (MISA/PNC) initiative has served to illustrate the possibility of designing policy and processes to build coherence across a range of policies and to build the capacity to embed data-informed process for supporting student achievement into this larger system. The MISA initiative allowed the Ministry of Education to gather macrolevel data on which to base grants, track improvement at the school district level, and construct responsive solutions to support its improvement agenda. This level of data-informed decision engages *all levels* of the school system so that valuable knowledge is recognized, transformed, and reconstructed into something of greater future value (Bergman et al. 2004).

Data as Part of a Systemic Reform Agenda Data use in Ontario does not stand alone. Instead, the focus is on having the capacity both in data systems and in people to use data for considering issues and questions from a range of perspectives, in order to make better and more defensible decisions. The use of data provincially, in districts, and in schools is closely tied to the provincial goals and embedded within the major initiatives.

From the beginning, the MISA/PNC provided direct and targeted support to districts, coupled with specific requirements for compliance with expectations. The Common Core Continuum articulated the vision for all districts in the province, with specific deliverables for them to address. The province defined the data access issues, expecting school districts to build data warehouses, which provided clean accurate data. These data informed the budget process, which drove each school district's budget allocation from the province.[9] Provincial targets for improvement are set based on the province-wide assessments, which occur at grade 3, 6, 9, and 10.

As the data system was established, the Ministry began to focus on using the data to inform policy decisions. For example, they identified elementary "schools on the move" initiative that celebrates schools that are making significant and sustained progress in student achievement, and connecting them with other schools that have similar backgrounds and challenges. The goal is for schools to share effective strategies and learn from one another. Another example of using data is the "student reengagement strategy" whereby Ministry provided data to all school district in the province giving them the number of students who had potentially dropped out of school after the fourth year of high school without graduating and tying this information to the secondary school reform imitative. To support this work, the Ministry defined specific data-informed indicators including credit accumulation, compulsory course pass rates, and annual school leaver rate. These indicators allow

[9] In Ontario, School Districts are funded centrally by the province on a per pupil grant basis plus some defined funds for specific areas of focus. School Districts cannot use a local tax levy to provide additional funds. All of the funding is driven by the data provided to the OnSIS, the provincial data warehouse, which is fed by the data warehouses in the individual school districts.

school districts and the Ministry to monitor and assess the success of the activities that school districts undertook to support the student Success/Learning to 18 initiative. In addition to monitoring the success of school districts within this initiative, the Ministry also initiated specific data-based programs. An example of this type of Ministry response to data was the recent *student reengagement strategy* whereby the Ministry informed *each* school district of the number of students who had dropped out after year 4 (about 66 % of students in the province graduate after 4 years with the remainder returning for a fifth year). School districts then identified each of these students using their data warehouses. The Ministry provided earmarked funding to have school districts contact *each* of these students and plan a pathway to graduation.

A Comprehensive and Accurate Data System Locally and Provincially In order to participate in evidence-informed decision making, schools, school districts, and the Ministry require an accessible, comprehensive set of accurate, clean data. Evidence-informed decision making cannot be embedded into practice without this infrastructure. The MISA initiative and its clarification in the Common Core Continuum recognized the importance of data management; the holding, cleansing, mapping, integration and analysis of data, and dealing with issues of access as well as a focus on the technology to support this access. These data systems include elemental data for individual students related to demographics, educational history, grades, provincial assessments, special education, etc., as well as biographical data about educators. As a result of this initiative, data warehouses are available in all school districts to support school improvement planning and the data are routinely uploaded to the Ministry to provide them with quality data to support planning, budgeting, and policy development.

A Focus on Capacity Building to use Data Wisely The ministry recognized that access to a comprehensive, quality data set was crucial but insufficient to create an evidence-informed environment (Chinowsky et al. 2007; Murray and Moses 2005; Sammarra and Biggiero 2008; Zboralski 2009). Consequently, the MISA initiative included a strong focus on human resources and training as well, building the capacity to use data to inform practice, to turn data into information and knowledge (Syed-Ikhsan and Rowland 2004).

The PNCs were created to build capacity and embed that learning in practices in schools. The GTA PNC's focus on managing information for student achievement has allowed member districts to build capacity to develop data-informed school improvement planning models, which build capacity to develop professional learning centers within and among schools, for school improvement planning that actually has an impact on student achievement.

Building the collective capacity for systematic evidence-informed decision making has been a cornerstone of this initiative. The PNCs were designed to build networks of learners among school districts. The PNC design focused on creating learning networks to build capacity and share the learning in a model of learning with, from, and on behalf of others. In this case, the "others" are school districts. This model has had a direct influence on the practice of all 72 school districts in the province and is beginning to realize some of its potential. The PNCs also serve

to build an understanding of the impact that learning networks could have within school districts as a process designed to build lateral capacity, supporting a model for knowledge creation, and sharing.

Establishing Learning Networks as an Approach to Scale Up The PNC initiative is the scale-up strategy contributing to building teacher capacity to use data for collaboration within professional learning communities. The next stage is using data to monitor the impact of professional learning on changed classroom practice and on student learning. Building a process to use indicators of professional practice to both assess practice and the impact of professional learning on that practice in a continuous monitoring process represents the next step in building an evidence-informed decision-making model. This model will serve to build the capacity to deepen professional knowledge and refine skills in the service of supporting the knowledge and skills, which students need to contribute in the knowledge-based world of the twenty-first century.

9.7 Reflection Questions

For Researchers and Students

1. How does policy affects your research? For example, how does policy affect the research questions you are studying as well as the interpretation of your findings?
2. How does policy at different levels of the system (e.g., government, district, municipal, board) affects data use? Are these policies coherent and well aligned?

For Policy Makers

1. Which policy measures are in place in your country (at the different levels of the system: e.g., government, district, municipality, board level) that either support or hinder effective data use? How do they allow your country to "go to scale" in the effective use of data to support student achievement?
2. How coherent and aligned are the different policies in your country?

For Practitioners

1. Refer to the common core continuum and try to rate your organization on each of the indicators:
    a. For the indicators on which you rate your organization less than on the "sustaining capacity " level, try to think of ways to reach the "sustaining capacity" level.
    b. For the indicators on which you rate your organization on the "sustaining capacity" level, why do you think your organization is on this level?

References

Bergman, J., Jantunen, A., & Saksa, J.-M. (2004). Managing knowledge creation and sharing—scenarios and dynamic capabilities in inter-industrial knowledge networks. *Journal of Knowledge Management, 8*(6), 63–76.

Campbell, C. (2009). *From knowledge generation to knowledge integration: Analysis of how a government uses research*. Paper presented at the American Educational Research Association Annual Meeting.

Campbell, C., Fulford, D. & Theberge, R. (2011). *Evidence for a Change*. Paper presented at the American Educational Research Association Annual Meeting.

Chinowsky, P. S., Molenaar, K., & Bastias, A. (2007). Measuring achievement of learning organizations in construction. *Engineering, Construction and Architectural Management, 14*(3), 215–227.

Earl, L. & Katz, S. (2006). *Leading in a data rich world: Harnessing data for school improvement*. Thousand Oaks: Corwin.

Education Quality and Accountability Office. (2010). Annual Report 2009–2010.

Gifford, C. M., & Agah, A. (2009). Sharing in teams of heterogeneous, collaborative learning agents. *International Journal of Intelligent Systems, 24,* 173–200.

Hatala, J.-P., & Lutta, J. G. (2009). Managing information sharing within an organizational setting: a social network perspective. *Performance Improvement Quarterly, 21*(4), 5–33.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York: Routledge.

Honig, M. I., Hatch, T. (2004). Crafting coherence: How schools strategically manage multiple, external demands. *Educational Researcher, 33*(8), 16–30.

Katz, S., & Hands, C. (2007). *Research report: Scaling up from one network to many: The establishment of networked learning communities within the district.* Markham: York Region District School Board.

Katz, S., Earl, L., Jaafar, S. B., Elgie, S., Foster, L., Halbert, J., et al. (2008). Learning networks of schools: The key enablers of successful knowledge communities. (Journal Articles; Reports—Evaluative DER: 20080101). *McGill Journal of Education, 43*(2), 111–137.

Katz, S., Earl, L., & Ben Jaafar, S. (2009). *Building and connecting learning communities: The power of networks for school improvement*. Thousand Oaks: Corwin.

Levin, B. (2010). How to change 5,000 schools. In A. Hargreaves, A. Lieberman, M. Fullan & D. Hopkins (Eds.) *Second international handbook of educational change*. London, New York: Springer.

Levin, B. & Fullan, M. (2008). *Learning about system renewal. Educational management administration & leadership*. London, Los Angeles, New Delhi & Singapore: Sage.

Mejía, R., López, A. & Molina, A. (2007). Experiences in developing collaborative engineering environments: An action research approach. *Computers in Industry, 58,* 329–346.

Murray, P., & Moses, M. (2005). The centrality of teams in the organisational learning process. *Management Decisions, 43*(9), 1186–1202.

Ontario Ministry of Education. (2007). MISA Common Core Continuum. MISA Memo #28 Mar 14 2007.

Ontario Ministry of Education. (2010a, February). Overview of Education. Paper presented at the Ontario Educational Research Forum.

Paavola, S., Lipponen, L., & Hakkarainen, K. (2004). Models of innovative knowledge communities and three metaphors of learning. *Review of Educational Research, 74*(4), 557–576.

Patrick, K., & Dotsika, F. (2007). Knowledge sharing: developing from within. *The Learning Organization, 14,* 395–406.

Peroune, D. L. (2007). Tacit knowledge in the workplace: the facilitating role of peer relationships. *Journal of European Industrial Training, 31*(4), 244–258.

Ringer, T. M. (2007). Leadership for collective thinking in the work place. *Team Performance Management, 13*(3/4), 130–144.

Sammarra, A., & Biggiero, L. (2008). Heterogeneity and specificity of inter-firm knowledge flows in innovation networks. *Journal of Management Studies, 45*(4), 800–829.

Scarbrough, H. (2003). Knowledge management, HRM and the innovation process. *International Journal of Manpower, 24*(5), 501–516.

Silins, H., & Mulford, B. (2002). Schools as learning organisations: The case for system, teacher and student learning. *Journal of Educational Administration, 40*(4/5), 425.

Subramaniam, M., & Youndt, M. A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal, 48*(3), 450–463.

Sung-Ho, Y., Young-Gul, K., & Min-Yong, K. (2007). Do we know what really drives KM performance? *Journal of Knowledge Management, 11*(6), 39.

Syed-Ikhsan, S. O. S., & Rowland, F. (2004). Knowledge management in a public organization: a study on the relationship between organizational elements and the performance of knowledge transfer. *Journal of Knowledge Management, 8*(2), 95–111.

Yazici, H. J. (2005). A study of collaborative learning style and team learning performance. *Education + Training, 47*(3), 216–229.

Zarraga, C., & Garcia-Falcon, J. M. (2003). Factors favoring knowledge management in work teams. *Journal of Knowledge Management, 7,* 81.

Zboralski, K. (2009). Antecedents of knowledge sharing in communities of practice. *Journal of Knowledge Management, 13*(3), 90–101.

Chapter 10
Conclusions and a Data Use Framework

Kim Schildkamp and Mei Kuin Lai

10.1 Introduction

Data-based decision making continues to receive ample attention in education. As stated in the first chapter, data can be defined as systematically collected information on students, schools, school leaders, and teachers, which can be obtained from qualitative (e.g., classroom observations) and quantitative (e.g., assessment results) methods. Data-based decision making (i.e., "data use") can be defined as the use of data by teachers, school leaders, and even students to make decisions that improve schooling.

In this book, we brought together research on data use conducted in seven different countries: New Zealand, the Netherlands, England, South Africa, Belgium, United States, and Canada. Different questions were addressed. Why is data use important and what does it look like in schools? How does policy influence data use? Which factors can enable (e.g., encouragement by the school leader) or hinder (e.g., ineffective data management systems) effective data use? What are the intended effects (e.g., increased student achievement) and unintended effects (e.g., teaching to the test) of data use? However, we did not focus on the politicized discourse that is actually going to be encountered by policymakers and practitioners using data. While we acknowledge that the politics around using data will no doubt influence their use, we feel that focusing on politics will detract from our original intentions for writing the book—that is to focus on the strengths and weaknesses of various forms of data, the use and misuse of data in practice, and the responsibility of policymakers and educators to gather and use data wisely. Also, we would like to stress that although knowledge by comparing data use in different contexts can be very enlightening, this does not mean that what works in one country will also work in other countries. For example, the use of data in South Africa is so contextually shaped that there are

K. Schildkamp (✉)
Faculty of Behavioural Sciences, University of Twente,
Enschede, The Netherlands
e-mail: k.schildkamp@utwente.nl

M. K. Lai
Woolf Fisher Research Centre, The University of Auckland, Auckland, New Zealand
e-mail: mei.lai@auckland.ac.nz

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_10, © Springer Science+Business Media Dordrecht 2013

limitations to how much we can apply what we have learned from this setting in another setting. It is, for example, not likely that the top-down approach of data use, which seems to work very well in some South African schools, will work in Dutch or New Zealand schools. Teachers in these schools are not likely to appreciate it if a school leader comes into their classrooms and tells them what to do (based on data). In fact, we suggest that what works in one country could be adapted (using data) to the context of another country, and that the book generates dialogue about how data use is shaped by a country's context.

For this chapter, we have examined all the studies exemplifying different aspects of using data in countries around the world. We constructed a data use framework, based on these studies, which will be used to synthesize the key issues on data use raised by the different countries.

10.2 Lessons Learned: A Data Use Theoretical Framework

Based on the chapters in this book, we constructed a data use framework to help the reader conceptualize the different lessons learned from reading this book. The framework takes into account all the different aspects of data-based decision making, ranging from how policy may influence data use, to the different enablers and barriers of data use, types of data use, and possible outcomes of data use (Fig. 10.1).

The figure (loosely based on Schildkamp and Kuiper 2010; Comenius project using data for improving school and student performance 2011) displays the policy context on the side. The policy context influences the enablers and barriers to data use and how data are used, which in turn influences stakeholder (e.g., teacher and school leader) learning and student learning outcomes. Enablers and barriers (organization and context, data and data system, and user characteristics) influence the use of data, hence the arrow points from the lowest box towards the box on data use. However, the relationship is two-way because the way data are used can in turn influence these enablers and barriers. For example, if schools do not choose to use a particular student management system, even though it is the best analysis tool available, then the student management system might be taken off the market, and this narrows the range of analyses that schools can conduct. Another example here is that when certain teachers use data instrumentally (e.g., taking action to improve education based on data) (the middle box), and actually see the results in terms of increased student achievement, this may lead to a changed attitude towards data (e.g., a user characteristic in the lowest box). Finally, we outline the two outcomes of data-based decision making, namely the impact on stakeholder learning and student learning. In the following paragraphs, we will discuss the framework in depth.

10.3 Data Use

All the chapters in this book describe data being used in different ways. In our view, we mostly look for data use in schools that is most likely to improve outcomes. This has been described as *instrumental* use of data. Instrumental use of data involves the

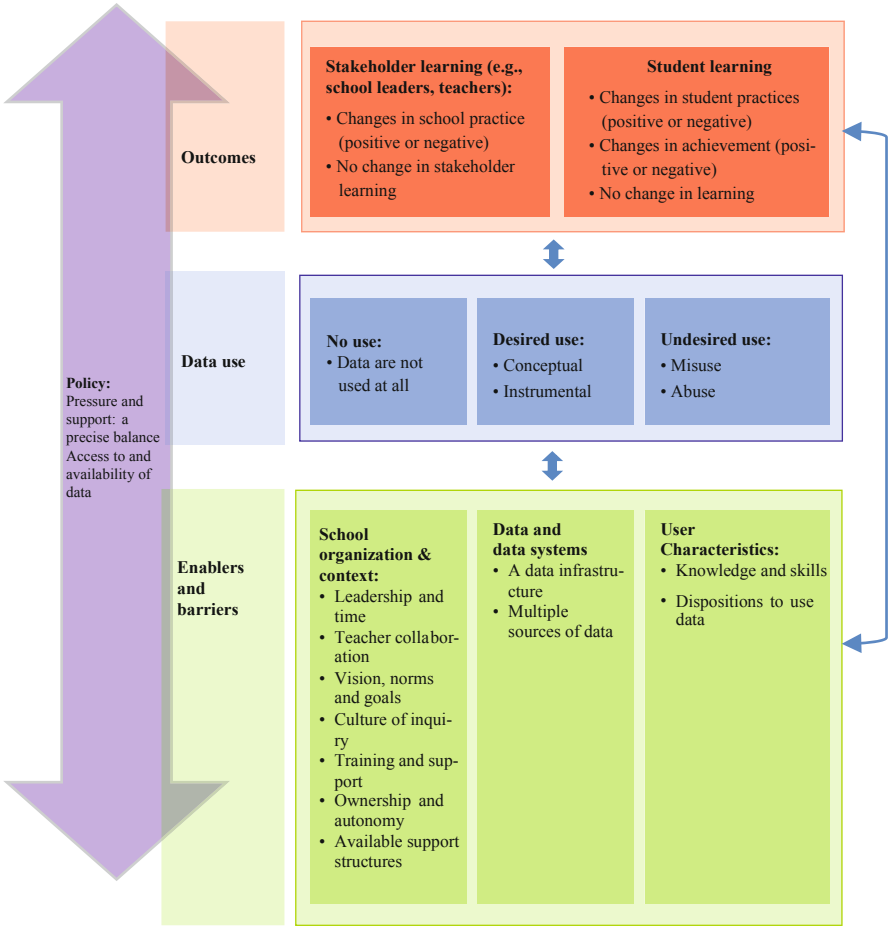

Fig. 10.1 A data use framework

analyzing and interpretation of data as well as the use of data to make decisions and to take actions to improve (Weiss 1998; Rossi et al. 1999). The New Zealand, South African, and Canadian chapters all reflect an instrumental use of data, demonstrating instrumental use with teachers, schools, and across teachers and schools. The New Zealand chapter exemplifies how this type of use with teachers and schools can lead to improved student achievement. Data in the schools were analyzed, interpreted, and used to change teachers' practices and school functioning as part of literacy interventions. These interventions led to improved student achievement over time and across a range of different schools.

However, instrumental data use is often difficult to achieve and might take some time. Usually, the first thing you find in schools is the *conceptual* use of data. The conceptual use of data refers to a more indirect type of data use. Although data use

in this case does not directly lead to actions, the data influence the teachers' and/or school leaders' ideas about their functioning and the functioning of the school. This may, in the long run, influence their actions in important ways (based on Weiss 1998). The best example of this type of use can be found in the Flemish chapter. School leaders in this chapter were supported in how to analyze and interpret data, which got them thinking about their school's functioning and how they might use the data in their own context to improve the school's functioning.

A danger that can happen, but was not actually described in any of the chapters, is the *misuse* of data. In several of the chapters, for example, in US, Flemish, and Canadian chapters, it is stated that often school staff lack data use knowledge and skills. School staff with a lack of data literacy competences run the risk of analyzing and interpreting data in the wrong way and come to false conclusions, and may take inappropriate actions as a result. In the English chapter, although many school staff reported that they believed they possessed the skills to access, utilize, and interpret data, this was juxtaposed by clearly articulated responses outlining further training and development needs.

Another undesirable type of data use is *abuse* of data, something that is likely to happen in the United States with the large amount of pressure from the accountability system and lack of support. Abuse of data can, for example, include focusing only on a specific type of students who can help improve your status on accountability indicators, distorting data to improve status on the accountability indicators, encouraging low-performing students to drop out, teaching to the test, or excluding certain students from a test (Hamilton et al. 2009). As stated by Ehren and Swanborn (2012), this type of use is considered to be undesirable as schools ignore opportunities to improve and the data do not reflect the actual performance of students and, as a result, the outcome of schools.

Finally, a lot of schools are *not using* data. One of the examples in the Dutch chapter talks about how teachers are not using data. Also, from the English chapter it becomes clear that not all school staff are at all comfortable with using data in the way they perceive they are expected to (related to dispositions of school staff towards the use of attainment and progress data, e.g., a lack of belief in the use of such data), as becomes very clear by the expression of one of the deputy head teachers in this chapter: "I disagree that we should be spending so much time analyzing data... To look at underachievement or overachievement. You're spending a lot of time looking at data and not enough time in the corridor checking what the children are doing on a day-to-day basis." In a lot of schools around the world, data use is not common (yet; Schildkamp and Teddlie 2008; Schildkamp and Kuiper 2010; Verheaghe et al. 2010). Therefore, more knowledge is needed on the enablers and barriers of data use. This knowledge can be used to develop interventions to support schools in the use of data.

10.4 Enablers and Barriers to Data Use

10.4.1 School Organization and Context

The school organization and context can influence data-based decision making in a large degree. Several factors have to be in place in order to enable data use in schools, including leadership and time for data use, teacher collaboration, vision, norms and goals for data use, a culture of inquiry, training and support, ownership and autonomy, and the availability of support resources.

Leadership and time for Data use In all of the chapters, leadership plays an important role. School leaders should structure time for data use, for example, by facilitating data teams with time as is happening in the Netherlands. However, providing time to use data is not enough. The Dutch, Flemish, Canadian, and English chapters, for example, indicate that school leaders should not only encourage data use, and demonstrate effective data use their selves, but that they should also work together with teachers in the use of data: collaboratively collecting, analyzing, interpreting, and taking action based on data.

From other research (e.g., Leithwood et al. 2006; Levin and Datnow, 2012), we also know that school leaders are critical to the success of school improvement planning processes, and are also considered to be critical in the process of data use for school improvement. School and system leaders play an essential role in promoting the use of data in schools. School leaders can encourage and support data use, be enthusiastic about using data, and convey this enthusiasm to staff. School leaders can model data use, and plan and scaffold teachers' learning about using data including providing time and opportunity to learn about and use data (Earl 2005; Schildkamp and Kuiper 2010; Wayman and Stringfield 2006a; Wohlstetter et al. 2008; Young 2006).

Teacher Collaboration Another factor that is important to promote data use within schools is teacher collaboration, as described in the New Zealand (Lai and McNaughton 2012), Dutch (Schildkamp and Ehren 2012), Flemish (Vanhoof et al. 2012), Canadian (Dunn et al. 2012), and US (Wayman et al. 2012) chapters, but also in other studies (Schildkamp and Kuiper 2010; Wayman et al. 2005; Wohlstetter et al. 2008; Young 2006). A large amount of research is available on teacher collaboration (or teacher teams or professional learning communities or teacher learning communities). Collaboration is essential for sustainable school improvement: it is important for reducing the isolation of the teaching profession, for enhancing individual teacher's professional growth, and it can have a positive impact on schools and students (Handelzalts 2009; Lai et al. 2009; Louis and Marks 1998). However, only collaborations that focus on improving student learning have an impact on teaching and learning (Lai and McNaughton 2008). A promising form of teacher collaboration for data use is teacher collaboration in data teams, as described in the Dutch chapter (Schildkamp and Ehren 2012). Research indicates that these data teams can increase data use in schools, and that in can lead to school improvement (Schildkamp and Handelzalts 2011).

Vision, Norms, and Goals for Data use The chapters in this book also show that schools that want to use data effectively have a vision, norms, and goals for data use. They focus on continuous inquiry, learning and improvement based on data, openly discussing data without fear of repercussions, rather than a focus on using data to blame. Other research (Datnow et al. 2007; Earl and Katz 2006; Feldman and Tung 2001; Kerr et al. 2006; King 2002; Sharkey and Murnane 2006; Tolley and Shulruf 2009; Wayman and Stringfield 2006b ; Wayman et al. 2007; Wohlstetter et al. 2008; Young 2006) also stresses the importance of having a clear goal for data use.

For creating a clear vision and developing norms for data use, it is important to establish measurable goals at the system, school, classroom, and individual student level (for example, 85 % of the students will be proficient in reading). Only if a school has measurable goals, school staff can use data to check whether or not they are reaching their goals, and improve their functioning based on data, if they are not reaching their goals. The English chapter (Downey and Kelly 2012) points to another important aspect of goal setting. A problem in English schools is that the goals of data use, according to most school staff, are primarily external (data use for accountability). However, effective data use, in our opinion, can only be achieved if the goals are primarily internal: for example, data use to increase student achievement on mathematics with at least 5% in one school year.

Culture of Inquiry In this book, Canadian, New Zealand, and Dutch chapters, each provide examples of schools with a culture of inquiry where teachers buy-in to the use data. In contrast, some of the schools in the English chapter appear to lack such a culture of inquiry in the opinion of certain teachers within those schools. By buy-in, we mean school staff feeling a need to look critically at data and reflect on their own functioning and being open to changing their practices when the data reveal a need to do so. Schools with a culture of inquiry constantly assess their own functioning based on data, have the knowledge and skills needed to do so, and try to improve accordingly. The impetus for change should be driven from one's own desire to use data, rather driven by others. Teachers working within a school where leaders are enthusiastic about how data may enhance teachers' understanding of children's learning are more likely to use the data.

Training and long-term Systematic (External) Support Training and support for data management and data use may also lead to an increase in data use, as shown in this book and other research (Breiter and Light 2006; Schildkamp and Kuiper 2010; Wayman and Stringfield 2006b; Wohlstetter et al. 2008). Using data effectively requires certain skills and a different way of thinking, which not all teachers and school leaders possess. We cannot blame school leaders and teachers for this, as using data was for most school leaders and teachers not part of the education they received to become a teacher or school leader. They simply never learned how to collect, analyze, and use data in their daily practice. There are a couple of aspects of training and support we would like to address here.

Firstly, the importance of using a structured, long-term approach may support the use of data. For example, in the Netherlands (Schildkamp and Ehren 2012) data teams engage in data use by following an eight-step procedure: (1) problem definition,

(2) formulating hypotheses concerning what causes the problem, (3) data collection to test the hypotheses, (4) data quality check, (5) data analysis, (6) interpretation and conclusions, if hypothesis is wrong go back to step 2, if hypothesis is correct continue with step 7, (7) implementing improvement measures, and (8) evaluating the effectiveness of these measures. Schools need these kinds of structured approaches and cycles, since most school staff are not familiar with how to use data.

Secondly, training in the use of statistical terms (e.g., value added, learning gains), forms of representation (e.g., bar and circle diagrams, growth curves, cross-tables) is needed, as shown in the Flemish (Vanhoof et al. 2012) and South African chapters (Archer et al. 2012). Up until now, data use (external as well as internal classroom data) was not part of the curriculum of the teacher training colleges, although in several countries, such as in the Netherlands, this is slowly changing.

Moreover, different types of support or combinations of support can enable data use, ranging from help desks (Flanders), training by pedagogical advisors and content knowledge experts (Flanders), peer consultations (Flanders), online and electronic resources (Canada and South Africa), and external experts (Flanders). These external experts can be of great value if not essential, as is demonstrated in the Dutch, Flemish, South African, and New Zealand chapter. In New Zealand, for example, external experts of a university engaged with schools in the entire process of data use in an interdependent partnership. The goal of this intervention was to improve reading comprehension of 9–13 years old. Together with school staff, researchers collected student (achievement) data as well as classroom observation data, analyzed, discussed, and used data to uncover student learning needs and improve student achievement. Together, school staff and researchers examined whether patterns of student achievement could be explained by patterns of classroom teaching. Based on these analyses, teachers improved their classroom teaching, and subsequently student achievement improved.

Ownership and Autonomy Ownership is discussed in, for example, the South African and the Dutch chapters. Ownership is important, especially in the case of teachers' data use (Datnow et al. 2007; Feldman and Tung 2001; Huffman and Kalnin 2003; Kerr et al. 2006; Sutherland 2004; Wayman and Stringfield 2006b; Wohlstetter et al. 2008; Young 2006). Ownership implies that teachers and school leaders should (partly) be collecting their own data from their own contexts because they are curious about things that only they can discover. Although the process of collecting these data can sometimes be frustrating and time consuming, collecting one's own data can lead to context-specific programs that address the unique needs of staff and students; increased buy-in of any new program or intervention by teachers; and effective professional development that improves student outcomes (Robinson and Lai 2006).

It is also important that teachers and school leaders can make decisions and changes based on the data (e.g., autonomy or distributed leadership: several people in the school have the power to take decisions). In the Netherlands, for example, sometimes school leaders cannot make certain decisions without the approval of the

school board. Teachers and school leaders need a certain amount of decision-making authority or autonomy to be able to make decisions based on data. However, several aspects of autonomy need to be taken into careful consideration. The first is that the teachers in the school should be ready to take this decision-making power. The South African chapter shows that this is not always the case. In some of the South African schools, for example, teachers are still learning how to teach. Collecting, analyzing, and taking decisions based on data is one step too far for these teachers. In these schools a top-down data use approach is preferred, in which the school leader with the necessary data literacy skills analyzes the data and tells school staff what to do.

Another important aspect of autonomy concerns teachers using data to make instructional changes, without determining the impact of these changes. When teachers use data to make (instructional) changes they should monitor the intended as well as unintended consequences these changes may have (e.g., engage in an ongoing cycle of inquiry).

The Availability of Support Resources The Dutch and New Zealand chapters both show that school staff need support resources to structure data use in their schools. Examples of these support structures include role positions, daily schedules, faculty meetings, meeting agendas, work sheets, data use manuals, etc. The use of these support structures can help shape data use practices. In the Dutch data team example, these support structures included a (short) manual describing the eight-step data team procedure describing the content and sequence of activities, and different work sheets (for example, to write the hypotheses on, to note down opinions on the quality of the collected data). These support structures gave teachers something to hold on to, it provided them with structures and they knew what to do next. In New Zealand, the support structures had the same function.

10.4.2 Data and Data Systems

Effective data use also requires a good data infrastructure and easy access to multiple sources of (student and teacher) data (e.g., *data and data system* enablers). However, we want to stress here that these are just preconditions, and that having access to timely, relevant, and reliable data, does not ensure effective data use.

A Data use Infrastructure From, for example, the Dutch and US chapters, it can be derived that schools need easy access to reliable and valid data in a timely manner. Schools that have a good functioning information management system, and access to relevant, reliable, and valid data are more likely to show increased level of data use than schools, which do not have easy access to relevant, reliable, and valid data (Breiter and Light 2006; Schildkamp and Kuiper 2010; Visscher 2002; Wayman and Stringfield 2006b; Wohlstetter et al. 2008).

Data use in many schools is hindered by ineffective data systems, which make it hard to gather and analyze the data needed. Technology tools, which facilitate the analyses and reporting of data, can support school leaders and teachers to make

timely identification of at-risk students and interventions to meet their needs, which can result in improved performance (Chen et al. 2005).

Without adequate technology, it is difficult for teachers and school leaders to obtain the necessary data in a timely manner to inform their decision making, which is clearly demonstrated in the different chapters of the book. In the Dutch chapter (Schildkamp and Ehren 2012), for example, it was shown how ineffective data systems (three different systems, which are not aligned) can hinder effective data use. However, having an effective data system is merely a precondition. It does not automatically lead to effective data use, as shown in the US (Wayman et al. 2012) and English (Downey and Kelly 2012) chapters. The availability of "fancy" data systems in both countries led to access to sophisticated data, but not necessarily to sophisticated data use. In some countries, the availability of data may sometimes even lead to "information overload": it is impossible to make sense of all these data and incorporate it.

In some of the countries discussed in this book, the availability of a data system led to an increase in data use, but in these countries (Canada, Flanders, South Africa) the system was coupled with a form of support or professional development (Dunn et al. 2012; Vanhoof et al. 2012; Archer et al. 2012). Other countries do not have national information management systems and individual schools or clusters of schools need to develop their own systems for collecting data. In New Zealand, for example, there is strong resistance to anything that might allow the government or media to compare schools using a "league table." This belief means that is very difficult to build a national information management system, but conversely schools struggle with trying to develop their own systems, which are appropriate for producing the relevant data in a timely way.

Whether these systems are made available by the Government or whether schools purchase or develop their own system, there are a couple of important characteristics of these systems to take into account. These systems have to be user-friendly, accessible, and fast. It should also be possible to make changes (for example, add or remove different types of data at different levels), as schools are constantly changing (Datnow et al. 2007). Moreover, it should be possible to aggregate data at different levels (Lachat and Smith 2005). A teacher should be able to access individual student data or data on groups of students. A school leader should be able to aggregate these data to the entire school. Also, it should be possible to link different types of data (e.g., gender to achievement, achievement to teacher observation results). In England, such sophisticated databases exist and are made freely available to all schools, with the capacity for all teachers to conduct such exploratory analyses. The organizations, which produce these databases (the Government Department for Education and the Charitable Fischer Family Trust) make it possible for access to be granted to all staff, but such access is often in the control of senior leadership and staff-wide access is not often granted (Kelly et al. 2010), presumably because it is deemed not to be appropriate or beneficial, or because of the feeling that staff may lack the necessary skills to use it successfully.

The use of Multiple Sources of Data Almost all the chapters stress it is important to collect data those are useful for decision making and not just data those are readily available. Yet, often data the schools actually need are not available or easily accessible. For example, an important source of data is what teachers do in the classrooms. For example, how are teachers teaching vocabulary and how does that influence students' ability to learn new words? Teachers often find that the most relevant data are data on their own teaching practices and students in their own classrooms. Other data (e.g., aggregated data for the whole school or data for the district) are often seen as less useful, although these data might be more readily available than data on their own teaching practices and classrooms. It is impossible to prescribe exactly which data schools must use, but as stated in almost all the chapters it is essential that school do not rely on one single source of (achievement) data, but that they use multiple data sources: for example, the use of different sources of student (achievement) data and teacher (observation or survey) data (see Lai and McNaughton 2012; Schildkamp and Ehren 2012; Vanhoof et al. 2012; Dunn et al. 2012; Archer et al. 2012; Wayman et al. 2012). This is what researchers call triangulation.

10.4.3 Data Users

In Sect. 10.3, we talked about the importance of a culture of inquiry, where school staff, for example, have positive dispositions towards the use of data and the necessary knowledge and skills to use data. School staff are made out of individual persons. Some of these persons might have the necessary knowledge, skills, and attitude to use data, whereas others may not. Therefore, we also think it is important to look at these factors at the individual *data user* level. The chapters in this book clearly show that often school staff lack the required knowledge and skills (data literacy) to use data properly. As discussed above, training and support should foresee in this gap. In addition to knowledge and skills, personal dispositions may also influence data use to a great extent. If school staff are not motivated to use data, do not believe that it is important, and do not believe that they can impact student learning by changing their instruction, data use is not going to happen. The school leader can (partly) influence these dispositions by trying to encourage and motivate data use, but these personal dispositions are very hard to change in schools.

Knowledge and Skills (see also Training and Support and Culture of Inquiry) Schools have a great deal of formal and informal data available. School staff has to decide which data are appropriate and useful for their purposes, ensure the quality of the data, and conduct the correct analyses and appropriate interpretations. The data have to be transformed into information the school can use. As described above, this process requires a great deal of skills and knowledge (e.g., data literacy) to interpret the data and the pedagogical content knowledge to know what practices to change based on the data (Earl and Katz 2006; Mingchu 2008; Sharkey and Murnane 2006; Wohlstetter

et al. 2008; Young 2006). Not surprisingly, most schools need support in all these areas of collecting, analyzing, interpreting, and using data (Lai and McNaughton 2008; Robinson et al. 2002; Schildkamp and Kuiper 2010). The chapters in this book make clear that teachers and school leaders in New Zealand, the Netherlands, Flanders, Canada, South Africa, United States, and England all lack proper data literacy skills to some extent. Therefore, we need to invest in proper training and support, as described above.

Dispositions to use Data (see also Culture of Inquiry) Effective data use also requires certain dispositions to data use, such as belief in the use of data, motivation to use data, and an internal locus of control (Datnow et al. 2007; Mingchu 2008; Schildkamp and Kuiper 2010; Sutherland 2004; Wohlstetter et al. 2008). One of the barriers to implementing data-based decision making can be the lack of buy-in to the process. School staff can be resistant to change their practice and they might not see the need to look critically at data and reflect on their own functioning (Feldman and Tung 2001). There should be interest and motivation to engage in data-based decision making and commitment to change. Also, an internal locus of control is needed: teachers and school leaders need to attribute success or failure to themselves (Tokar et al. 1998) and believe that they can influence student learning (sometimes also referred to as self-efficacy). As demonstrated in the New Zealand, Dutch, and Flemish chapters, in this light the school leader can influence these dispositions to some extent, by making absolutely clear that data will not be used to shame and blame, and only to improve. The school leader can also try to encourage and motivate school staff to use data, as also described above.

10.5 Policy

Policy also influences these enablers. A country's policy can influence the types of data those are available and accessible to schools, and can pressure as well as support schools in the use of data.

Access and Availability of Data In this book, we argue that it is important not to rely on one single data source, but instead use multiple data sources. Policy can largely influence what data sources are available in terms of availability but also in term of accessibility. The Canadian chapter is an example of how policy can enable data availability and access. The Ontario Ministry of Education made sure that there is a data system available to all schools, and the data infrastructure is set up in a way that enables access to data for schools.

Another type of access to data is the extent to which classroom observation data are available. From the New Zealand chapter, it became clear that classroom observation data in combination with assessment data are important data in the process of data-based decision making. In New Zealand, this is no problem, as researchers have access to classrooms. In other countries, conducting regular classroom observations might be less common.

Pressure and Support for Data use: Finding a Balance A combination of pressure and support may promote data use. The US chapter (Wayman et al. 2012) shows that in the United States there is too much pressure and too little support. This may lead to detrimental results, such as teaching to the test and a narrowing of the curriculum to only the subjects (or assessments) that are included in the yearly progress measures (Ehren and Swanborn, 2012; Diamond and Spillane 2004). Results from a study conducted by Diamond and Spillane (2004), for example, show that too much pressure in combination with too little support can lead to a narrowing of the focus of schools to comply with policy demands and to focus on improving the achievement of only certain students (e.g., students that are just below the benchmark who only need to perform a little bit better to make the benchmark, and thus increase the school's overall percentage of students who made Adequate Yearly Progress).

Policy makers in Ontario, Canada also put pressure on schools (hand in data, compare data to certain benchmarks), but in this country it is combined with support, support in terms of a good functioning data system and data infrastructure for all schools to ensure access to data, and support in terms of funding Professional Network Centers, which can provide professional development in the use of data (Dunn et al. 2012).

10.6 Outcomes

In our book, we argue that data use should lead to school leader and teacher learning and eventually student learning (instrumental use of data). All the factors described previously have a big influence on the extent of data-based decision making in schools: the extent to which school staff collect qualitative and quantitative data in a structured manner, analyze and interpret these data, and make decisions based on these data to improve education at student, classroom, and school level. The chapters in this book, for example, the US, Dutch, and New Zealand chapters, demonstrate that focusing only on one or two of these factors will probably not lead to effective data use and consequently not to stakeholder and ultimately student learning (e.g., increased student achievement). All these enablers are related to each other (e.g., the school leader can address personal dispositions; knowledge and skills can be improved by training; access to relevant data can enable vision development and goal setting, etc.), and have to be addressed simultaneously and in coherence. Only then can data-based decision making lead to the desired outcomes and ultimately to school improvement.

There are two chapters in particular that illustrate the potential of data use to improve outcomes. The Ontario, Canada chapter best illustrates the potential of an education system to develop a coherent and aligned province-wide system of analyzing and using data for improving achievement. Although it is hard to attribute achievement improvements in the province to data use alone, there have been improvements in achievement as measured through international comparisons (PISA) and in the latest Thomson Report.

The New Zealand chapter best exemplifies how the use of data can lead to changes in instruction and increases in student achievement (as measured through quasi-experimental methodologies replicated over schools and over time). These changes happened through the analysis and discussion of student achievement data and data about teaching practices. Although the use of data was in the context of an intervention, which included literacy professional development, it demonstrated that data could be used as part of interventions to change teachers' instruction in the classroom, and improve achievement. Recent evidence in the United States suggests that interventions focused solely on data use also show improvements in achievement. Carlson et al. (2011) studied the effect of a data-based reform initiative in over 500 schools within 59 districts and found that this initiative led to significantly improved student mathematic achievement. Important aspects of this initiative included consultants working with districts to implement quarterly student benchmark assessments and providing school leaders with training on how to analyze, interpret, and use data to guide reform.

This US example, like the New Zealand example, does not only point out the potential of data-based decision making for school improvement, it also points out the importance of more research into the effect of using data on teacher practices and student achievement, as well as the potential of using data as part of school and teacher interventions and professional development. We believe that data-based decision making is the way forward, but we also have a long way to go if we want to realize the full potential of data-based decision making.

10.7 Reflection Questions

Researchers and Policy Makers

1. What has been the impact of using data on teacher and school practices, and on student outcomes? How can we better design studies that examine these impacts?
2. What are the enablers and barriers likely to impact on the use of data in your setting, and how can you address or mitigate the barriers?

Practitioners

1. In this chapter, we describe different types of data use: no data use, strategic data use, misuse, abuse, conceptual use, and instrumental use. Which type(s) of data use are present in your school?
2. Take a look at the enables and barriers of data use identified in this chapter.
   a. Which enablers are present in your school?
   b. What barriers to data use can you identify in your school? How could you overcome these barriers in order to enable school staff to come to instrumental data use?

References

Breiter, A., & Light, D. (2006). Data for school improvement: Factors for designing effective information systems to support decision-making in schools. *Educational Technology & Society, 9*(3), 206–217.

Carlson, D., Borman, G., & Robinson, M. (2011). A multistate district-level cluster randomized trial of the impact of data-driven reform on reading and mathematics achievement. *Education and Evaluation and Policy Analysis, 33*(3), 378–398.

Chen, E., Heritage, M., & Lee, J. (2005). Identifying and monitoring students' learning needs with technology. *Journal of Education for Students Placed at Risk, 10*(3), 309–332.

Comenius project using data for improving school and student performance. (2011). Comparative analysis data use in Germany, the Netherlands, Lithuania, Poland and England. Retrieved from: http://www.datauseproject.eu/home/documents. Accessed 4 Jan 2012.

Datnow, A., Park, V., & Wohlstetter, P. (2007). *Achieving with data. How-high performing school systems use data to improve instruction for elementary students*. San Francisco: Center on Educational Governance University of California.

Diamond, J. B., & Spillane, J. P. (2004). High-stakes accountability in urban elementary schools: challenging or reproducing inequality. *Teachers College Record, 106*(6), 1145–1176.

Earl, L. M. (August 7–9, 2005). *From accounting to accountability: Harnessing data for school improvement*. Paper presented at the ACER research conference, Melbourne.

Earl, L. M., & Katz, S. (2006). *Leading schools in a data-rich world. Harnessing data for school improvement.* Thousand Oaks: Corwin.

Ehren, M. C. M., & Swanborn, M. S. L. (2012). Strategic data use in accountability systems. *School Effectiveness and School Improvement, 23*(2), 257–280.

Feldman, J., Tung, R. (April 10–14, 2001). *Whole school reform: How schools use the data-based inquiry and decision making process.* Paper presented at the American educational research association conference, Seattle.

Hamilton, L. S., Stecher, B. M., & Yuan, K. (2009). *Standards-Based Reform in the United States: History, Research, and Future Directions*. Santa Monica: RAND Corporation. Retrieved http://www.rand.org/pubs/reprints/RP1384. Accessed 15 Nov 2011.

Handelzalts, A. (2009). *Collaborative curriculum development in teacher design teams*. Enschede: Universiteit Twente.

Huffman, D., & Kalnin, J. (2003). Collaborative inquiry to make data-based decisions in schools. *Teaching and Teacher Education, 19*(6), 569–580.

Kelly, A., Downey, C and Rietdijk, W. (2010). *Data dictatorship and data democracy: Understanding professional attitudes to the use of pupil performance data in English secondary schools*. Reading: CfBT Education Trust.

Kerr, K. A., Marsh, J. A., Ikemoto, G. S., Darilek, H., & Barney, H. (2006). Strategies to promote data use for instructional improvements: Actions, outcomes, and lessons from three urban districts. *American Journal of Education, 112,* 496–520.

King, M. B. (2002). Professional development to promote schoolwide inquiry. *Teaching and Teacher Education, 18*(3), 243–257.

Lachat, M.A., & Smith, S. (2005). Practices that support data use in urban high schools. *Journal of Education for Students Placed at Risk, 10*(3), 333–349.

Lai, M. K., & McNaughton, S. (2008). Raising student achievement in poor, urban communities through evidence-based conversations. In L. Earl & H. Timperley (Eds.), *Evidence-based conversations to improve educational practices* (pp. 13–27). Netherlands: Kluwer/Springer Academic.

Lai, M. K., McNaughton, S., Amituanai-Toloa, M., Turner, R., & Hsiao, S. (2009). Sustained acceleration of achievement in reading comprehension: The New Zealand experience. *Reading Research Quarterly, 44*(1), 30–56.

Leithwood, K., Jantzi, D., & McElheron-Hopkins, C. (2006). The development and testing of a school improvement model. *School Effectiveness and School Improvement, 17*(4), 441–464.

Levin, J. A., & Datnow, A. (2012). The principal role in data-driven decision making: using case-study data to develop multi-mediator models of educational reform. *School Effectiveness and School Improvement, 23*(2), 179–202.

Louis, K., & Marks, H. (1998). Does professional learning community affect the classroom teachers' work and student experience in restructured schools? *American Journal of Education, 106*(4), 532–575.

Mingchu, L. (2008). Structural equation modeling for high school principals' data-driven decision making: An analysis of information use environments. *Educational Administration Quarterly, 44*(5), 603–634.

Robinson, V. M. J, & Lai, M. K. (2006). *Practitioner research for educators: A guide to improving classrooms and schools*. Thousand Oaks: Corwin.

Robinson, V. M. J., Phillips, G., & Timperley, H. (2002). Using achievement data for school-based curriculum review: A bridge too far? *Leadership and Policy in Schools, 1*(1), 3–29.

Rossi, P. H., Freeman, H. E., & Lisey, M. W. (1999). *Evaluation: A systematic approach.* Thousand Oaks: Sage.

Schildkamp, K., & Kuiper, W (2010). Data-informed curriculum reform: Which data, what purposes, and promoting and hindering factors. *Teaching and Teacher Education, 26,* 482–496.

Schildkamp, K., & Teddlie, C. (2008). School performance feedback systems in the USA and in the Netherlands: A comparison. *Educational Research and Evaluation, 14*(3), 255–282.

Schildkamp, K., & Handelzalts, A. (2011, April). *Data teams for school improvement.* Paper presented at the American Educational Research Association Conference, New Orleans, USA.

Sharkey, N. S., & Murnane, R. J. (2006). Tough choices in designing a formative assessment system. *American Journal of Education, 112,* 572–588.

Sutherland, S. (2004). Creating a culture of data use for continuous improvement: a case study of an Edison project school. *The American Journal of Evaluation, 25*(3), 277–293.

Tolley, H. & Shulruf, B. (2009). From data to knowledge: the interaction between data management systems in educational institutions and the delivery of quality education. *Computers & Education, 53*(4), 1199–1206.

Verhaeghe, G., Vanhoof, J., Martin, V., & van Petegem, P. (2010). Using school performance feedback: Perceptions of primary school principals. *School Effectiveness and School Improvement, 21*(2), 167–188.

Visscher, A. J. (2002). A framework for studying school performance feedback systems. In A. J. Visscher & R. Coe (Eds.), *School improvement through performance feedback* (pp. 41–72). Lisse: Swets & Zeitlinger B.V.

Wayman, J. C., & Stringfield, S. (2006a). Data use for school improvement: School practices and research perspectives. *American Journal of Education, 112,* 463–468.

Wayman, J. C., & Stringfield, S. (2006b). Technology-supported involvement of entire faculties in examination of student data for instructional improvement. *American Journal of Education, 112*(4), 549–571.

Wayman, J. C., Midgley, S., Stringfield, S. (April 11–15, 2005). *Collaborative teams to support data-based decision making and instructional improvement*. Paper presented at the American educational research association conference, Montreal.

Wayman, J. C., Cho, V., & Johnston, M. T. (2007). *The data-informed district: A districtwide evaluation of data use in the Natrona County School District*. Austin: The University of Texas.

Weiss, C.H. (1998). Have we learned anything new about the use of evaluation? *American Journal of Evaluation, 19*(1), 21–33.

Wohlstetter, P., Datnow, A., & Park, V. (2008). Creating a system for data-driven decision-making: Applying the principal-agent framework. *School Effectiveness and School Improvement, 19*(3), 239–259.

Young, V. M. (2006). Teachers' use of data: Loose coupling, agenda setting, and team norms. *American Journal of Education, 112,* 521–548.

Chapter 11
Data Use: Where to from Here?

Lorna Earl and Karen Seashore Louis

It is not possible in the twenty-first century to ignore data. We are surrounded by it in every form and at every turn. From analyses of "live twitter feeds" to complex problems of microphysics, people everywhere are using data to help them understand their world better. The information explosion is revolutionizing society, with data and information at the heart.

Educational systems around the world are caught in the data frenzy, proclaiming from central offices to schools to classrooms that they are "data-driven" organizations (Marsh et al. 2006). Implicit in this shift is the assumption that having data is a "good thing" and that educational policy makers, leaders, and practitioners will:

> collect and analyze various types of data, including input, process, outcome and satisfaction data, to guide a range of decisions to help improve the success of students and schools (Marsh et al. 2006, p. 1).

Data use, however, is not a singular process and it does not have a particular "value valence" associated with it. Data, by themselves, are benign, or at least neutral. And data, by themselves, don't answer questions. Rather, it is the interaction between data and people that results in decisions that creates harm or beneficial effects. Whether we view this process as organized and strategic, or a consequence of an unpredictable confluence of people, problems, data, and decision opportunities (March and Olsen 1986) makes a difference. However, both strategic and nonrational models assume that using data is a thinking activity that draws on personal views but also on capturing and organizing ideas in some systematic way, turning the information into meaningful actions and making the interpretation public and transparent (Senge 1990).

In this volume, the editors and authors have captured a picture "at a point in time" of the ways in which data are becoming part of the world of education and educational decision-making. They give a rich and sometimes poignant picture of the evolution and challenges associated with using data to make educational decisions. Some of

L. Earl (✉)
Aporia Consulting, Toronto, Canada
e-mail: lorna.earl@utoronto.ca

K. S. Louis
University of Minnesota, Minneapolis, Minnesota, United States

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3_11, © Springer Science+Business Media Dordrecht 2013

these chapters point to the limits on rational models or at least to the ways in which we must account for critical environmental conditions. Others suggest interventions and supports that can create a more hospitable setting for making the best possible use of data to improve schools and classrooms. As we have read these chapters, we have been struck by several issues that we think are important for researchers, policymakers, and practitioners to pay attention to as they embark on, and continue on, their data journeys.

First, using data is part of a larger policy and political context in any jurisdiction and ignoring that context can be problematic. How is data use understood and incorporated into decision-making at national and at local levels? What theories and assumptions lie behind institutional data use? Who will benefit from the using the data?

The next issue is quality, both the quality of data and also of the decisions that are made and the actions that are taken. This process raises critical questions about the transformation of data into good consequences. How do data become information and knowledge and how do they get transformed into decisions? What is involved in moving from data to wisdom? What are the questions that need decisions? What counts as data? Are some data sources privileged over others? What about validity? What does it all mean?

Many of the chapters talk about how data and ideas from data are communicated, shared and turned into action. In our view, this is a huge issue that may rest at the heart of understanding data use. How is knowledge shared and mobilized for action? Who has control over what gets shared?

Finally, we raise some questions about the impact of data use on schools and other educational organizations. How do we know that using data makes a difference? What kind of difference?

These issues are very much intertwined but we have chosen to consider them separately to highlight some important considerations for policy makers, educational leaders, and practitioners, as they go deeper into using data for decision-making in education.

11.1 Situating Data Use in Education in a Policy and Politics Context

Working with data does not happen outside the political and cultural context of particular societies and schools. It is an integral part of the decision-making process that happens within political and cultural realities. The papers in this volume hint at two perspectives on the politics of data use. On the one hand, data use can be thought of as a policy issue that is typically generated outside the schools as a consequence of the public's desire to hold schools more accountable. In contrast, there is a strong emphasis that the use of data to improve the school is largely an internal problem that is determined by micropolitical interactions between teachers and students, teachers and parents, and teachers and administrators. A major strength of this volume is that is includes chapters from a variety of countries, each of which is using data

to address the "problem" of school improvement and increasing effectiveness from both perspectives. The differences among the chapters are striking, however, and suggest an additional dimension of the data use context that is not fully captured in the model presented in Chap. 10—and which lies outside the purpose of the book. Nevertheless, in our view, it is important to acknowledge that policies related to data use are interwoven with both broader political cultures and the way in which these are expressed in expectations about data use and accountability.

Accountability is a charged word that is both globally salient and deeply embedded in the history and culture of the country. Much of the rhetoric around data use is shared, and emerges from the epistemic community of policy makers who have adapted core ideas from New Public Management (Barbules and Torres 2000). However, the chapters allude to the fact that the language of accountability is filtered through the existing policies, expectations, and decision making processes that remain distinctive in each nation state. This local filtering affects whether data use is a core element of national policy conversations or is merely given lip service.

We highlight just a few examples from the represented countries to suggest the degree to which the meaning of data use and accountability may vary systematically between settings. In Belgium (Flanders) for example, a 1959 "school pact" resolved longstanding conflicts between the Catholic and public school sectors by guaranteeing substantial autonomy for school governing bodies. This has, in effect, created a consistent opposition to national testing for the purposes of accountability (Devos in press). In contrast, The English system has had a tradition of high stakes national tests at various points in a student's career since the 1950s, and was the first in Europe to develop high stakes school accountability associated with the use of data. This emerged during a period in the early 1990s that saw the reduction in power of local education agencies and the emergence of the Inspectorate as a powerful quasi-governmental agency with the power to recommend closures of ineffective schools that has remained unchanged through governments of very different political stripes (Louis and MacBeath in press). This contrast is important because it suggests that, irrespective of particular government platforms, basic policy assumptions are durable across decades of change and the discussions within the EU and OECD about the importance of data use to improve student outcomes. In the case of these two countries, we can easily see that how data use is felt in schools is deeply affected by shared understandings of who "owns" the schools, the shared national history of educational reform, and the consequent embedded understandings about how data are to be used by teachers and local administrators. Belgium/Flanders is not alone in eschewing national tests and public accountability. Austria, where suspicion of excessive power at the national level is high, has paid little attention to the global interest in tests as a mechanism for accountability. There is a test, but the results are not public, and are not, therefore, a significant source of accountability. Germany, probably for similar reasons, also eschews them, at a national level. The absence of comparable data with a focus on comparisons between schools does, of course, affect patterns of data use at the school level, although it does not mean, of course, that data are not used by teachers and administrators (EACEA 2009).

The chapters suggest other issues of national educational policy culture, accountability and data use that are worth further exploration. For example, South Africa may be considered a "new" country in some regards, since most political and social institutions have required significant changes since the ending of Apartheid. Chapter 6 describes, briefly, some of the institutional complexities of this reorganization, and illustrates how important the data are for making large-scale policy decisions as the new South Africa attempts to develop a more unified educational system. The huge cultural differences between the previously separate systems that are still in process of merging suggests some of the issues that face many countries that are making efforts to unify systems that were previously built around the assumption of significant differences. These issues of data use dwarf, in many cases, policy concerns about data use by teachers and schools, but have a deep impact on the way in which data are viewed by school-based professionals.

11.1.1 Prevailing Views of Accountability and the Associated Political Stakes

Irrespective of particular national political interpretations and policies, the notion of accountability has global resonance. Long before the introduction of "No Child Left Behind" in the US, for example, there were discussions about whether it was more important to have a sense of external accountability (to local constituents and stakeholders) or internal accountability (to students and other teachers) (Newmann et al. 1997). The term accountability carries with it expectations for action among various educational stakeholders, whether internal or external. In 1994, Linda Darling Hammond described two different views of educational change and of accountability:

> One view seeks to induce change through extrinsic rewards and sanctions for both schools and students, on the assumption that the fundamental problem is a lack of will to change on the part of educators. The other view seeks to induce change by building knowledge among school practitioners and parents about alternative methods and by stimulating organizational rethinking through opportunities to work together on the design of teaching and schooling and to experiment with new approaches. This view assumes that the fundamental problem is a lack of knowledge about the possibilities for teaching and learning, combined with lack of organizational capacity for change (p. 23).

Both of these images of accountability carry with them a conception about data and how it can contribute to accountability. They are based on external data that is not necessarily connected to the work of individual teachers or schools. We would like to add another perspective on accountability—one that puts educators as professionals at the centre. Wagner (1995) suggests that accountability in education is a responsibility or obligation to account for, explain or justify one's actions to those who are entitled to it. In simple terms, the questions that emerge from this definition are: *Who is accountable? To whom? For what? In what manner?* And*, Under what circumstances?* These are reasonable questions for professionals to ask about their

own responsibilities and roles as they go about their routine work. When accountability is conceived this way, it changes the nature of the data that should be used for decision making. Professionals working in schools need to consider data that are closely linked to the reality of their own teaching and learning conditions.

The countries described in the chapters in this book provide nuance and shading to these polarized views and show the range of perspectives that accountability can take.

11.1.2 Policies Made at Different Levels May Have Different Consequences for Data Use

One critical issue is the influence of accountability and data use initiatives that are made at different levels and intended to affect different units within an educational system. In some countries, accountability is an arrangement that involves a rather tight linkage between the national government and individual schools (for example, in England). While there are Local Education Authorities in England, they serve primarily as a means of organizing support for schools rather than being an accountability actor. In others, such as the US and Canada, the local education authorities (districts) are not only expected to provide support, but are also expected to ensure oversight and accountability for student achievement. Within these two countries (as in others not included in this book), there are enormous differences among states and provinces that bear the primary responsibility for managing their educational systems.[1] In countries where the relationship between schools and the government is looser, such as New Zealand primary schools and all schools in and where the government may "suggest" standards associated with curriculum but does not test results, policies that promote accountability and data use are firmly vested in individual school boards that are often composed of parents or former parents.

Another issue that emerges from the chapters is the balance of accountability versus improvement. Countries with strong accountability oriented policies can put more pressure on schools to actually use data, but this may also lead to undesirable ways of use of data. In the United States and in England, national policies hold schools accountable for results and have resulted, in many cases, in large data warehouses that are intended to provide information to a broad variety of stakeholders, ranging from elected officials to parents and teachers. The expectations placed on both teachers and those overseeing schools are great, based on the investment in assessment data, as well as other data about schools and programs that can be used to determine student and school needs, identify areas for professional development, and provide information to parents. At the same time, there are examples of misuse of the data that

[1] In spite of the media attention given to No Child Left Behind in the United States, the 50 individual states have enormous autonomy in the way in which the law's framework is enacted. In addition, because federal control over education is highly controversial, it appears that "waivers" for states to increasingly diverge will become the norm.

has accumulated because of the high stakes attached to the results. Some schools may replace teaching that emphasizes conceptual understanding with test-driven drill, while others squeeze the curriculum by spending more classroom time on tested subjects at the expense of other nontested subjects. Concern has been raised that more time may be focused on test-taking strategies than on subject content (Marsh and Robyn 2006). Perhaps more disconcerting is the emergence of efforts to assess teachers' individual performance using data that were not designed for this purpose. This form of data use for accountability poses serious issues that have not been well thought through, but are an obvious consequence of the increasing focus on data for decision-making (Glazerman et al. 2011)

11.1.3 How Does School Autonomy Affect Data Use?

The problems associated with excessive use of data for decision making are well-documented in those countries where the emphasis on use has outstripped the utility and quality of the data. Thus, it is not unreasonable to ask whether more autonomy (looser linkage between data and high stakes consequences for schools and teachers) would lead to more data use at the school level. More comparative research is deeply warranted by the papers included in this volume, focusing on a comparison between countries with greater autonomy and those with less autonomy. Assuming that there are clear incentives that support data use (for example, development and coaching), will schools in places like New Zealand, Belgium, and the Netherlands be more likely over the long run to value grappling with data than those in countries that combine pressure, consequences, and support?

11.1.4 Do the Findings of These Cases Generalize to Different Settings?

In addition to this question, the inclusion of South Africa in this volume has piqued our interest, inclining us to ask whether support and incentives for data use may be an effective tool in the hands of policy makers in countries that, like South Africa, are working toward rapid modernization and integration of educational systems to meet "new global standards" for a larger number of students than they have done in the past? In particular, how does an emphasis on data use contribute to professional growth and development in countries where the population of available well-trained teachers is outstripped by the increasing demands for schooling? This issue is, of course, particularly pressing in Africa, but is also relevant to many countries in the ASEAN region.

11.2 Where Good Knowledge Lies

Being part of the knowledge age has focused a great deal of energy on "data" as a necessary element in having and using knowledge well. The promise of data-based decision-making is that the decisions and actions that follow will be better. However, moving from data to knowledge and better decisions is a complex process that involves acquisition, creation, representation, dissemination, validation, utilization, and renewal of purposeful knowledge (Lin et al. 2006; Moteleb and Woodman 2007). Data is really only a small part of the process. As Earl and Katz (2006) maintain, using data is a complicated process of:

- standing back and deciding what you need to know and why
- collecting or locating the necessary data or evidence
- ensuring that the data are worth considering
- being aware of their limitations
- finding ways to link key data sources through organization and analysis
- thinking about what the results mean, and finally,
- systematically considering an issue from a range of perspectives and using the data to either explain, support, or challenge a point of view.

We worry that data-based decision-making has been taken up as a simple (or simplistic) process, without sufficient attention to the complexity and the difficulty of coming to the kinds of deep understanding that leads to wise decisions. The emphasis, in our view, should not be on the data but on the quality of the knowledge that emerges from this process. As we see it, good knowledge is founded by asking good questions, having good data, and engaging in good thinking.

11.2.1 Good Questions

All too often educational decisions are made using data that are available, rather than data that are appropriate. As data become more pervasive, educators run the risk of being enslaved by data rather than being steered by leaders, with data providing information that they can use to engage in thoughtful planning and make reasoned and targeted decisions to move toward continuous improvement (Earl and Katz 2006). There are several chapters in this volume where the only data of interest come from large-scale national assessments that are used for accountability. Others have moved beyond single data sets and single concepts to explore more complex ideas. As we all know, education and learning are not simple. It is naive and even irresponsible to imagine that using single indicators that focus only on student achievement to represent the complexity of schools and students. This means being clear about the vexing issues that need decisions and formulating questions and hypotheses that can be investigated using data, in an iterative process of deepening understanding.

As we look forward, we hope that the current preoccupation with data will shift from a focus on the data to a focus on the questions, with the data as tools for

thinking about the issues that matter. Responding to decontextualised data can be a knee jerk reaction and may feed political agendas, but the real value of data comes when we spend time and to get clarity about what we want to know and formulate important, worthwhile questions that can focus the nature of the data and broaden the conversations beyond the narrow conceptions that are currently in the foreground.

Policy makers and educators make decisions every day. They select options, weigh alternatives, and determine what is best in a particular situation. Data-based decision making means suggests adding additional information to the process, before the decisions are made. The intention is that the options are considered in relation to data that can help educators gain insight into the domain under consideration. Using data effectively does not start with the data. It starts with the questions that are being asked. Once the questions are clear, the data that matter are the data that shed light on those questions.

11.2.2 Good Data

In the past decade, there has been a worldwide explosion in the amount and kind of data that is being generated. In many ways, education is just entering the data world, with educators and policy makers in education running to catch up and adapt to this era of "big data" (Manyika et al. 2011). This volume gives us many examples of unsophisticated data sets, limited capacity, and narrow conceptions of what qualifies as data and almost no capacity to use it well. We worry that the educational community is not prepared for the onslaught of data, some of it with questionable integrity and most of it being analyzed and interpreted by someone outside education. With the pervasive proliferation of data, there is no question that educational decisions will be influenced by data from somewhere. It is critical for education to become more sophisticated very quickly to ensure that data about education is accurate, defensible, and used appropriately. There is a critical need for educators to become adept at understanding the nature of and assumptions behind these large data sets, so that they can be participants in the discussions that arise from these data sets: by challenging positions taken by others, being sophisticated consumers of eternal data, and turning their questions into the appropriate analyses of these "big" quantitative data sets to consider patterns and relationships that matter to them.

At the same time, we can't lose sight of the value of other kinds of data. Although the introduction to this book and the model that has been developed in the prior chapter include other data sources as important dimensions of data use, the country chapters (Chaps. 3–9) in this volume tend to consider formal data (most often student achievement data) collected by outside agencies and provided to schools or school system and usually considered in narrow ways, in relation to particular schools. This is fairly typical in education, where there is a tendency towards a narrow image of what counts as data. Policy makers and educational leaders have embraced student achievement data but have been slow to consider other kinds of data. We would contend (and many of the chapter authors make this point) that using data wisely in

education requires much more than achievement data, as well as more sophisticated approaches to analysis. Schools are complex places and learning is a complicated process. If we are to use data to understand these multi-faceted and dynamic concepts, we will need to develop data sets and models that are equal to the task.

When the questions drive the nature of the data, the data can be quantitative or qualitative and it can represent much more than achievement (e.g., beliefs, behaviors, practices, opinions, perceptions). The questions we need to ask ourselves is: What kind of data would we accept as appropriate to help us make decisions? What will give us deeper insight and allow us to test our hypotheses? Having good data means having the right data to examine important questions, and having the technical knowledge to determine the quality of the data and to analyze it in ways that capture the complexity of the issues. Data can come in many forms (numbers, words, pictures, observations) as indicators of some underlying ideas. There is one notable example in this volume about the use of locally developed data that is closely tied to the questions at hand. In the New Zealand chapter, Mei Lai and her colleagues describe how researchers, working with practitioners, can focus data collection directed at immediate problems of practice and use the data to help them decide what to do next.

Having "big data" sources will increasingly have an influence on education. As can be seen from the Ontario chapter, these data bases are being created in educational institutions as well but the insights from other chapters in this books suggest that education is far behind other sectors in accumulating data about students, teachers, leaders, schools, programmes, etc. that might be relevant to the kinds of decisions that are made by policy makers, educational leaders in schools and districts and teachers in classrooms. Moving into this domain itself opens many questions about the kind of data to include, who has access, what kinds of analyses, and how it will be used.

Finally, making decisions using bad data means we are likely to make bad decisions. Data are symbolic representations of a bigger idea that we want to know more about and they are only as good as their collection, their analysis, and their interpretation. There is a complete science around determining the quality of data. For educators, it is important to know that the data they are considering come from defensible sources, are systematically collected, and are supported by other information. Data moves to usable information when it is analyzed, shaped, and organized to allow us look to for patterns and relationships. In the case of quantitative data, this means statistical analysis, directed by a set of guiding hypotheses or theories. With qualitative data, the analysis can be founded in theory or through an inductive process of organizing the data into themes. Whatever the process, the analysis is what takes the data beyond discrete items and follows the logic of the investigation in order to focus thinking. Using data will require facility with a wide range of analysis techniques in order to sort and organize the data to see patterns through a range of lenses.

11.2.3 Good Thinking

The prime consideration in building good knowledge, not surprisingly, lies in the quality of the thinking about the data. Data do not answer questions; instead they provide us with additional information to think with, as we consider complex educational issues from a range of vantage points. Data provide us with tools that we can use in a complex process of understanding issues better, considering nuance and context, and focusing and targeting their work in productive ways. This is a human activity that requires not only capturing and organizing ideas through data analysis but also making sense of the patterns and determining what they might mean for action (Earl and Katz 2006). Data may provide the measurement of educational concepts, but interpretation where the real expertise comes in. This is the heart of the matter. What does the data mean? What does it add to the understanding? What else do we need to know?

This kind of thinking is not a generalized approach. It is set first by the questions that need answering and then by the policy context, the nature and availability of the data, and the expertise of the participants in the process. It is fundamentally an inquiry process to use data, alongside expertise to understand something better as a prelude to decision-making. Hakkarainen et al. (2004) describe a *dynamic spiral* critical for knowledge creation and sharing containing seven elements through which knowledge is converted and moved from individuals to groups and back again. Although the spiral moves through these stages, it is also iterative, with switchbacks and repeats along the way.

Creating Context: Through explicitly creating a context, the issues being investigated are connected with deep principles of the knowledge domain in question, and anchored in authentic, practical, and complex problems of the external world, or issues that the participants generally care about.

Engaging in Question-Driven Inquiry: An essential aspect of progressive inquiry is generating one's own problems and questions to guide the inquiry; without questions generated by the participants themselves there cannot be a genuine process of inquiry. Questions that arise from one's own need to understand have a special value in the process of inquiry.

Generating Working Theories: Construction of their own working theories guides inquirers to systematically use their background knowledge and become aware of their presuppositions. Progressive inquiry is aimed at the explication of these intuitive ideas.

Critical Evaluation: Critical evaluation underscores the need to assess the strengths and weaknesses of the tentative theories (explanations) produced so as to direct and regulate the evolution of inquiry. It is essential to focus on constructively evaluating the advancement of the inquiry process itself, rather than simply an end result.

Searching for New Information: Searching for and working with "research" is necessary for deepening one's understanding. New information can come from literature, consulting experts, or conducting one's own explorations. Explicit comparison of

the intuitive working theories with the well-established ones makes the limitations of individual and collective knowledge apparent.

Engagement in Deepening Inquiry: A critical condition for progress is that inquirers focus on improving their ideas by generating more specific questions and searching for new information. The dynamic nature of inquiry is supported by the fact that generating working theories and obtaining new research knowledge makes new guiding questions accessible.

Shared Expertise: The agent of knowledge creation is not an isolated individual but an individual embedded in a community, or even the community itself. All of the preceding aspects of inquiry can be shared with other inquirers. Inquiry can advance substantially through relying on socially distributed cognitive resources and collaborative efforts to enhance shared understanding.

Matching Data to the Problem: As implied above, no one type of data (student assessments, inspection or other evaluation reports, teacher-made assessments, etc.) will meet all needs. More attention needs to be paid to the question that is being asked, rather than hoping that the data that already exist can be manipulated to solve all problems that have arisen and will arise. This is particularly crucial when understanding both the strengths and limits of national tests, rapid and regular student assessments at the school level, and broader indicator systems to measure individual and school performance.

Teachers, leaders and policy makers use the data to think about and understand their contexts and situations better as a starting to focus and challenge their thinking. When educators engage in conversations about what evidence means, they can interrupt the status quo and create the space for multiple alternative views to emerge.

11.3 A Cautionary Tale

As the amount and type of data available for educational decision-making escalates, it is important to ask questions about the nature and quality of these data and of purposes for which they are being used. This volume allows a glimpse of various data systems around the world and the orientations that are being used to take advantage of the available data. It also raises many questions about the capacity of educational systems and personnel to engage wisely and well with data as a tool for better decision-making.

Given the economic morass in which the world is currently embroiled, one cannot help but wonder if use of data, sometimes with naive and simplistic interpretations and sometimes with intentional misinterpretation and misuse, has contributed to a massive worldwide misunderstanding of reality and allowed massive manipulation and deception. Understanding and using data for better decisions is not something that can be left to the purview of a few. It has become a necessary skill and way of thinking that needs to be developed by all citizens as part of their civic responsibility.

References

Barbules, N., & Torres, C. (2000). *Globalization and education: Critical perspectives*. New York, London: Routledge.

Darling Hammond, L. (1994). Performance-based assessment and educational equity. *Harvard Educational Review, 64,* 23.

Devos, G. (in press). Regulated anarchy in catholic and public education. In K. S. Louis & B. van Velzen (Eds.), *Global education policy: Political culture and its effects*. Palgrave MacMillan (forthcoming).

EACEA. (2009). *National testing of pupils in Europe: Objectives, organisation and use of results*. Brussels: Education, Audiovisual and Culture Executive Agency.

Earl, L., & Katz, S. (2006). *Leading schools in a data-rich world: Harnessing data for school improvement*. Thousand Oaks: Corwin.

Hakkarainen, T., Paavola, S., & Lehtinen, E. (2004). *Communites of networked expertise: Professional and educational perspectives*. Amsterdam: Elsevier.

Glazerman, S., Goldhaber, D., Goldhaber, D., Raudenbush, S., & Whitehurst, G. (2011). *Passing muster: Evaluating teacher evaluation systems*. Washington: Brookings Institution.

Lin, Y., Wang, L., & Tserng, H. P. (2006). Enhancing knowledge exchange through web map-based knowledge management systems in construction: Lessons learned in Taiwan. *Automation in Construction, 15,* 693–705.

Louis, K. S., & MacBeath, J. (in press). The more things change, the more they stay the same: The English case. In K. S. Louis & B. van Velzen (Eds.), *Global education policy: Political culture and its effects* (forthcoming).

Manyika, J., Chui, M., Brown, B., Bughin, H., Dobbs, R., Roxborough, C., & Byers, A. H. (2011). *Big data: The next frontier for innovation, competition and productivity*. McKinsey & Co.

March, J. G., & Olsen, J. (1986). Garbage can models of decision making in organizations. In J. March & R. Weissinger-Baylon (Eds.), *Ambiguity and command: Organizational perspectives on military decision making* (pp. 11–52). Marshfield: McCutcheon.

Marsh, J., & Robyn, A. (2006). *School and district improvement efforts in response to the No Child Left Behind Act*. Santa Monica: Rand Corporation.

Marsh, J., Pane, J., & Hamilton, L. (2006). *Making sense of data-driven decision making in education*. Santa Monica: Rand Corporation.

Moteleb, A. A., & Woodman, M. (2007). Notions of knowledge management systems: A gap analysis. *The Electronic Journal of Knowledge Management, 5*(1), 55–62.

Newmann, F., King, B., & Rigdon, M. (1997). Accountability and school performance: Implications from restructuring schools. *Harvard Education Review, 61*(1), 47–75.

Senge, P. M. (1990) *The fifth discipline: The art and practice of the learning organization*. London: Century Business.

Wagner, W. (1995). *Accountability in education: A philosophical inquiry.* New York: Routledge.

Further Reading

In this section we propose literature for further reading. We made a distinction between further reading for practitioners, policymakers and researchers. However, you will notice that some of the literature we think is suitable for all target groups.

Further Reading for Practitioners

Boudett, K. P., City, E. A., & Murnane, R. J. (Eds.). (2007). *Data wise. A step-by-step guide to using assessment results to improve teaching and learning*. Cambridge: Harvard Education Press.

Boudett, K. P., & Steele, J. (Eds.). (2007). *Data wise in action. Stories of schools using data to improve teaching and learning*. Cambridge: Harvard Education Press.

Earl, L., & Katz, S. (2006). *Leading schools in a data-rich world. Harnessing data for school improvement*. Thousand Oaks: Corwin Press.

Earl, L., & Timperley, H. (Eds.). (2009). *Professional learning conversations. Challenges in using evidence for improvement*. New York: Springer.

Field, A. (2009). *Discovering statistics using SPSS*. Los Angeles: Sage.

Hamilton, L., Halverson, R., Jackson, S. S., Mandinach, E., Supovitz, J. A., & Wayman, J. C. (2009). *Using student achievement data to support instructional decision making*. Washington DC: Institute of Education Sciences and the National Center for Education Evaluation.

Kelly, A., & Downey, C. (2011). *Using effectiveness data for school improvement: Developing and utilising metrics*. London: Routledge.

Kowalski, T. J., Lasley, T., II. (Eds.). (2009). *Handbook of data-based decision making in education*. New York: Routledge.

Leithwood, K., Aitken, R., & Jantzi, D. (2006). *Making schools smarter. Leading with evidence*. Thousand Oaks: Corwin Press.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis*. Thousand Oaks: Sage.

Robinson, V. M. J., & Lai, M. K. (2006). *Practitioner research for educators: A guide to improving classrooms and schools.* Thousand Oaks: Corwin Press.

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3, © Springer Science+Business Media Dordrecht 2013

Wayman, J. C., Snodgrass Rangel, V. W., Jimerson, J. B., & Cho, V., (2010). *Improving data use in NISD: Becoming a data-informed district*. Austin: The University of Texas (http://edadmin.edb.utexas.edu/datause/).

Further Reading for Policy Makers

Boudett, K. P., City, E. A., & Murnane, R. J. (Eds.). (2007). *Data wise. A step-by-step guide to using assessment results to improve teaching and learning*. Cambridge: Harvard Education Press.

Boudett, K. P., & Steele, J. (Eds.). (2007). *Data wise in action. Stories of schools using data to improve teaching and learning*. Cambridge: Harvard Education Press.

Consortium of Institutions for Development and Research in Education in Europe. (2006). *Schools for quality. What data-based approaches can contribute*. Sint-Katelijne-Waver: Cidree.

Earl, L., & Katz, S. (2006). *Leading schools in a data-rich world. Harnessing data for school improvement*. Thousand Oaks: Corwin Press.

Earl, L., & Timperley, H. (Eds.). (2009). *Professional learning conversations. Challenges in using evidence for improvement*. New York: Springer.

Kelly, A., & Downey, C. (2011). *Using effectiveness data for school improvement: Developing and utilising metrics*. London: Routledge.

Kowalski, T. J., Lasley, T., II. (Eds.). (2009). *Handbook of data-based decision making in education*. New York: Routledge.

Leithwood, K., Aitken, R., & Jantzi, D. (2006). *Making schools smarter. Leading with evidence*. Thousand Oaks: Corwin Press.

Luke, A., Green, J., & Kelley, G. (Eds.). (2010). What counts as evidence in educational settings? Rethinking equity, diversity, and reform in the 21st century? *Review of Research in Education, 34*(1) (*Special issue*).

Further Reading for Researchers

Boudett, K. P., Cidy, E. A., & Murnane, R. J. (Eds.). (2007). *Data wise. A step-by-step guide to using assessment results to improve teaching and learning*. Cambridge: Harvard Education Press.

Boudett, K. P., & Steele, J. (Eds.). (2007). *Data wise in action. Stories of schools using data to improve teaching and learning*. Cambridge: Harvard Education Press.

Earl, L., & Katz, S. (2006). *Leading schools in a data-rich world. Harnessing data for school improvement*. Thousand Oaks: Corwin Press.

Earl, L., & Timperley, H. (Eds.). (2009). *Professional learning conversations. Challenges in using evidence for improvement*. New York: Springer.

Kelly, A., & Downey, C. (2011). *Using Effectiveness Data for School Improvement: Developing and utilising metrics*. London: Routledge.

Kowalski, T. J., & Lasley, T., II. (Eds.). (2009). *Handbook of data-based decision making in education*. New York: Routledge.

Luke, A., Green, J., & Kelley, G. (Eds.). (2010). What counts as evidence in educational settings? Rethinking equity, diversity, and reform in the 21st century? *Review of Research in Education, 34*(1) (Special issue).

Robinson, V. M. J., & Lai, M. K. (2006). *Practitioner research for educators: A guide to improving classrooms and schools.* Thousand Oaks: Corwin Press.

Wayman, J. C., & Stringfield, S. (2006). Technology-supported involvement of entire faculties in examination of student data for instructional improvement. *American Journal of Education, 112*(4), 549–571.

Index

K. Schildkamp et al. (eds.), *Data-based Decision Making in Education,*
Studies in Educational Leadership 17,
DOI 10.1007/978-94-007-4816-3, © Springer Science+Business Media Dordrecht 2013