DATABUSTING FOR SCHOOLS

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HOW TO USE AND INTERPRET EDUCATION DATA

Contents

About the author

Richard Selfridge is a primary school teacher and writer on education. He has written about the use of education data for *The Guardian*, *The Times Educational Supplement* and *Schools Week*, and is a regular speaker at national teaching conferences, including researchED, Northern Rocks and the Festival of Education.

He contributed a chapter on the use of education data to David Didau's 2015 book *What if Everything You Knew About Education Was Wrong?*, and he has been a regular contributor to national discussions about the use of numbers in education. This is his first book for SAGE Publications.

About the website

www.databustingforschools.co.uk accompanies Richard Selfridge's *Databusting for Schools*, providing up-to-the minute information about data use in schools. In the fast-evolving world of education data, it provides valuable information on national testing frameworks and the latest developments in the use of numbers in education.

DATABUSTING FOR SCHOOLS

AN INTRODUCTION TO USING AND INTERPRETING EDUCATION DATA
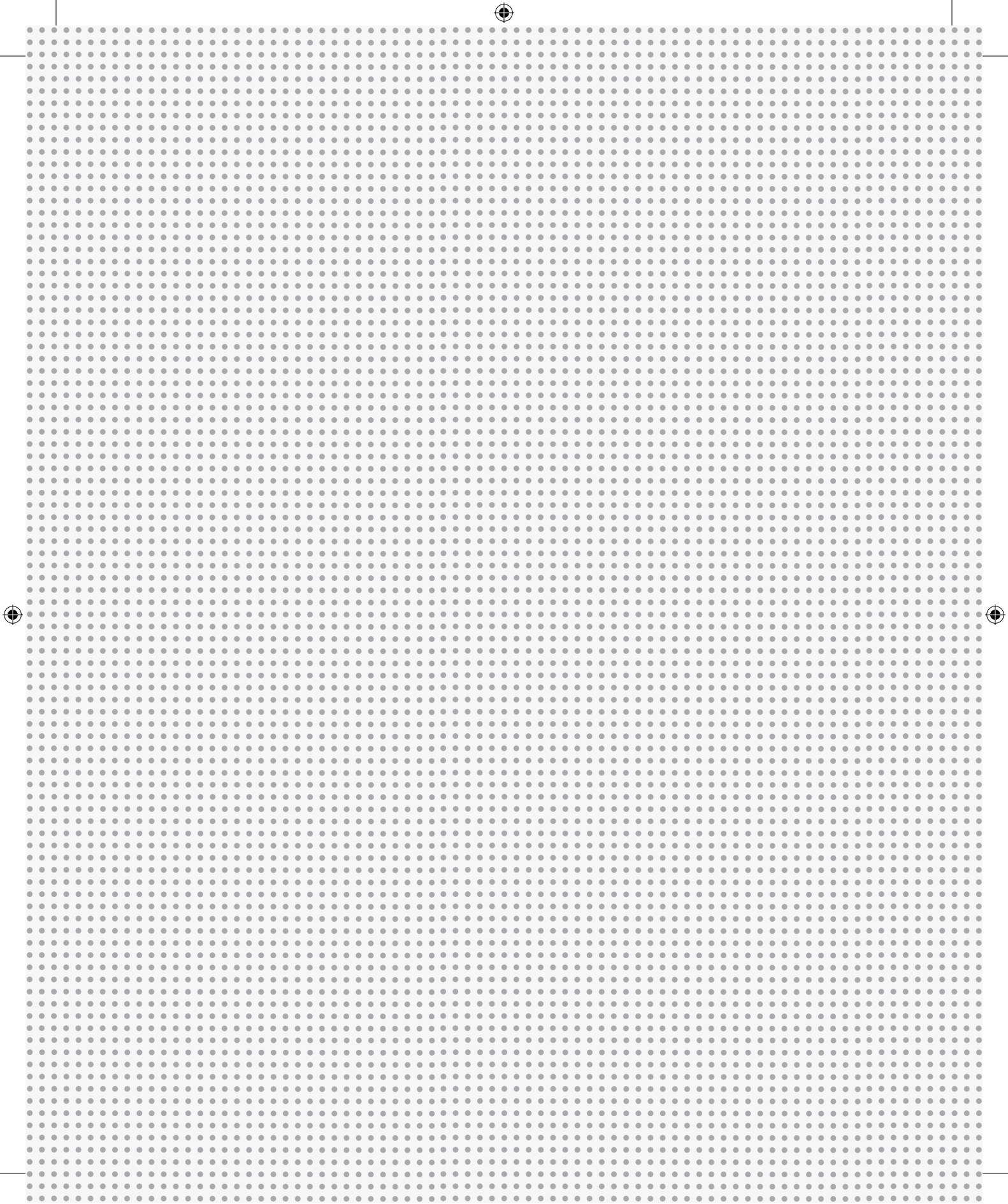
What you will learn from this chapter:

What databusting means
What databusting means for schools
How to become a databusting educator

1.1 Databusting

In *The Tipping Point*, first published in 2000, Malcolm Gladwell explores ways in which complex systems suddenly change. Gladwell makes extensive use of data to show that changes have taken place, and then explores why this might have happened. In his opening chapter, he considers a sudden and dramatic change in crime statistics in New York City:

> New York City in the 1980s (was) a city in the grip of one of the worst crime epidemics in its history. But then, suddenly and without warning, the epidemic tipped. From a high in 1990, the crime rate went into precipitous decline. Murders dropped by two-thirds. Felonies were cut by half. Other cities saw their crime drop in the same period. But in no place did the level of violence fall further or faster. (Gladwell, 2000: 137)

Why did this happen? Gladwell looks at the data which was available and comes to a number of conclusions:

> During the 1990s violent crime declined for a number of fairly straightforward reasons. The illegal trade in crack cocaine … began to decline. The economy's drastic recovery meant that people who might have been lured into crime got legitimate jobs instead, and the general aging of the population meant that there were fewer people in the age range … that is responsible for the majority of violence. (2000: 140)

After these initial observations, Gladwell notes that the situation in New York was, however, 'a little more complicated'. The city's economy hadn't improved in the early 1990s, and if anything welfare cuts had hit the city hard. The crack cocaine epidemic was in long-term decline and lots of immigration meant that the city's population was actually getting younger. And the reduction in violent crime which was being recorded was dramatic. As Gladwell says, 'One would expect (these trends) to have gradual effects. In New York, the decline was anything but gradual. Something else clearly played a role in reversing New York's crime epidemic' (2000: 140–1).

Gladwell then looks at what that something else might have been. He suggests that it might have been what has become known as the 'broken windows' theory of crime: when a window is broken and left in an unrepaired state, it signals to the community at large that the rule of law has broken down, which leads to a declining spiral in the community with unrepaired broken windows. Because many negative aspects of life in New York City were not being addressed, from graffiti and fare-dodging on the subway to tacit complicity in low-level criminal disorder, the city's criminals were acting with impunity.

Gladwell charts the clean-up of the New York City Transit System between 1984 and 1990, as a widespread problem with graffiti was tackled head on. This was followed by a concentrated focus on fare-dodging from 1990 onwards, and then a policy of 'zero-tolerance' policing following the election of mayor Rudy Giuliani in 1994. All of this activity coincided with the dramatic fall in the rate of violent crime, all of which was explained neatly – as far as Gladwell is concerned – by the actions of those in authority.

As with almost any neat explanation of complicated human interaction, with a bit of lateral thinking, someone somewhere will be able to find an entirely plausible alternative hypothesis which casts doubt on the original theory. Suddenly, what seems to be a clear explanation often turns out to be simply one of many possible simple explanations. In the case of the drop in crime in New York, one alternative hypothesis came from Steven Levitt and Stephen Dubner, who popularised their ideas in their book *Freakonomics*, published in 2007.

Donohue agreed with Gladwell up to a point. In an original 2001 academic paper, which was drawn on for the above 2007 book, Levitt and his co-author John Donohue had looked at similar crime statistics to those Gladwell had considered. Their initial findings were similar to Gladwell's:

> Since 1991, the United States has experienced the sharpest drop in murder rates since the end of Prohibition in 1933. Homicide rates have fallen more than 40 per cent. Violent crime and property crime have each declined more than 30 percent. Hundreds of articles discussing this change have appeared in the academic literature and popular press. (Donohue and Levitt, 2001: 379)

Their alternative hypothesis was that, rather than the efforts of the Transit Authority and the effects of zero-tolerance policing, the real reason for the fall in crime was that 'legalised abortion has contributed significantly to recent crime reductions. Crime began to fall roughly eighteen years after abortion legalisation' (Donohue and Levitt, 2001: 379). They stated their hypothesis that 'Legalised abortion appears to account for as much as 50 percent of the recent drop in crime' (2001: 379).

Donohue and Levitt argued that, following the nationwide legalisation of abortion in 1973, poor mothers were much less likely to have children who they would have struggled to raise to become law-abiding citizens. They explored the links between the kinds of crime which had ravaged New York City and the deprived, unstable

backgrounds of those who had been contributing to the high crime statistics. They also looked at the effects in different cities and states of changes to allow localised legalised abortion before the national change brought about by the famous Supreme Court decision in the case of Roe v Wade in 1973.

Donohue and Levitt didn't entirely dismiss the argument made by Gladwell, but they suggested that the effects of legalised abortion were much greater than the alternative theory put forward in *The Tipping Point*. Was Gladwell wrong? Gladwell himself responded to Donohue and Levitt's interpretation of the data, poking holes in their argument by, for example, questioning why the widespread availability – and use – of contraceptive pills from the mid-1960s did not have the same effect as the much less prevalent use of abortion as a form of birth control from the 1970s onwards.

Gladwell, Donohue and Levitt were not the only prominent voices trying to find an explanation for the situation in New York. Steven Pinker, leading academic and writer of books on popular science, wrote about the issue in his 2011 book *The Better Angels of Our Nature.* Pinker noted that the Freakonomics theory seemed 'too cute to be true' and noted that, 'any hypothesis that comes out of left field to explain a massive social trend with a single overlooked event will almost certainly turn out to be wrong, even if it has some data supporting it at the time' (Pinker, 2011: 143).

In Pinker's book, which was about broader declines in rates of violence in human society over time, he explored the Freakonomics theory, drawing on other data to support his arguments. Pinker noted, for example, that the proportion of children born to mothers in the categories Donohue and Levitt had identified as vulnerable should have decreased according to Donohue and Levitt's theory, whereas it had actually substantially increased.

Pinker also suggested that there were compelling arguments to suggest that mothers who avoided having unwanted children were likely to be more responsible citizens than those in similar circumstances who did not, and that therefore the opposite to the Freakonomics claim should have occurred, leaving a generation *more* likely to commit crime. Pinker put forward his alternative theory, based on the same data utilised by Donohue, Levitt and Gladwell. In Pinker's view, the violent crime decline happened because older criminals had laid down their weapons and younger cohorts simply did not follow in their footsteps.

So what did happen to cause the decline in violent crime in New York City in the 1990s? It rather depends on the point at which you enter the debate, whether you have any strong desire to disagree with the general consensus, and your need to question the views of others. The most obvious truth is that, using virtually the same data, different people are likely to come to different conclusions. One explanation may eventually become the accepted narrative, but human actions are complicated and alternative theories may explain the same or similar facts in contrary but logically plausible ways.

A more recent example of this phenomenon, this time in education, is the thorny issue of what has become known as the London Effect. At a point in the early 2000s,

pupils in Inner London's state schools began to record better and better examination results at the age of 16. Starting from a point which was noticeably lower than the average for children across England, GCSE results in Inner London rose inexorably into the 2010s, leaving other regions of the country behind. By 2016, the typical child in an Inner London state secondary school was attaining qualifications at 16 which were 10% higher than the national average. In 1998, Inner London had been the worst-performing region in the country, with results 18.5% lower than the average measure.

The first major theory which attempted to explain this 'London Effect' was put forward by Ofsted, the government's school inspection agency, in 2010. Ofsted explained that an initiative called the London Challenge had:

> continued to improve outcomes for pupils in London's primary and secondary schools at a faster rate than nationally. Excellent system leadership and pan-London networks of schools allow effective partnerships to be established between schools, enabling needs to be tackled quickly and progress to be accelerated. (Ofsted, 2010: 1)

The London Challenge was an initiative introduced into London secondary schools in 2002, and extended to primary schools in 2008. It used outside advisers to support schools which were deemed to be underperforming. Ofsted identified four areas which it suggested had been the cause of the rise in pupil outcomes: clear leadership, experienced external advisers, work to improve the quality of teaching and learning, and the development of robust tracking systems in schools.

This narrative held sway until 2014, when the Institute for Fiscal Studies (IFS) considered the issue, and added some new data, and a new theory, to the conversation. The IFS's conclusion was that, rather than the London Effect being the result of anything which happened in secondary schools, the reason for it was a change in the prior attainment of students who began to enter Inner London secondary schools 15 years earlier.

Key Stage 2 scores had improved in the late 1990s and early 2000s, but the IFS report was unsure why this had happened:

> What caused the improvement in Key Stage 2 test scores that led to the 'London effect' at Key Stage 4 is not clear. However, the explanation will be related to changes in London's primary schools in the late 1990s and early 2000s. This means that programmes and initiatives such as the London Challenge, the Academies Programme, Teach First or differences in resources are unlikely to be the major explanation. (Institute for Fiscal Studies and Institute of Education, 2014: 8)

The IFS then went on to suggest that, since the national literacy and numeracy strategies had rolled out at the right time, these might have been the cause of the rise in GCSE pass rates seen in Inner London a few years later. Even if this was not exactly the case, the IFS suggested that the theory that the London Challenge,

structural changes such as the academies programme, or initiatives such as Teach First were responsible for the London Effect, was unlikely to be true.

A further report was issued at the same time as the IFS report, this time claiming that the improvements were due to efforts being made in secondary schools. This report offered no additional data and relied on narratives generated by those who believed themselves to be responsible for the successes of the schools for which they were responsible (CfBT Education Trust, 2014).

Following these two alternative explanations, a further theory was added to the mix, as the Centre for Market and Public Organisation (CMPO) at the University of Bristol published a report which noted that the improvements in London schools were 'entirely accounted for by ethnic composition'. The CMPO report introduced some further numerical data to the mix, using some detailed statistical analysis which enabled it to suggest that 'if London had the same ethnic composition as the rest of England, there would be no "London Effect"' (Burgess, 2014: 3). In essence, this theory suggested that London was simply becoming increasingly different to the rest of the country, and therefore that like was not being compared with like. The London Effect was interesting, but didn't offer any particular insight into implementing any particular policy initiatives at school level which would improve GCSE outcomes across the country.

As with the various theories about violent crime in New York City, the different theories about what caused the dramatic increase in GCSE results in Inner London are all plausible to some extent. Those who have developed their theories have done so with the best of intentions – we all want to try to explain the phenomena that we observe in a way which fits the data which we have available. We do this to try to decide how to act in future: should we clean up problematic neighbourhoods and introduce zero-tolerance policing, or seek structural changes which allow citizens to make difficult decisions which might be good for society? Or should we simply recognise that longer-term socio-economic factors might be at play?

In the case of the London Effect, what does it tell us about decisions which schools and governments should make about improving exam results? Should we implement policy initiatives similar to the London Challenge in other parts of the country? Or should we recognise that the effects that school-level change might have are minimal compared to wider underlying factors related to educational attainment?

This whole process – gathering data, analysing the data, developing and testing theories, debating and developing ideas, finding ways to act in future – is common to many walks of life, including education. This book is about data and its use and interpretation in educational contexts.

Schools have, of course, gathered data for a long time. The use of numerical data in schools has, however, increased massively in the last 40 years. There are a number of reasons for this, from the increase in affordable computing power to ever-increasing external involvement in the internal workings of schools. Whatever the explanation for the rise in the use of numbers in schools, teachers, senior managers, governors and others working in and with schools are finding that they are

being required to gather, analyse, interpret and act on numerical-based data as part of their role in education.

For many working in and with schools, this has required a level of understanding of numbers, and of statistics based on those numbers, which asks a great deal of busy professionals whose main focus is on education, not data. This book aims to give you a readable grounding in the use and interpretation of educational data throughout the education system. Aimed at the general reader, the book takes as its starting point those teachers, middle leaders and governors who are getting to grips with data. Those senior leaders who entered teaching before the current data-focused era will also find the ideas set out here invaluable in understanding many common misconceptions about numbers, as well as the many ways in which numbers can provide valuable insight into effective (and ineffective) practice in schools.

In the cases of New York's violent crime and London's GCSE results, the gathering, analysis and interpretation of numerical data are key to making sensible decisions about future courses of action. Since the decisions we make in school have an impact not just on our students, but on the whole school community, we need to understand the new educational data landscape so that we can decide how to move forward. In the modern world, databusting has become essential.

1.2 Databusting for schools

Teachers, senior leaders and governors will be only too aware of the amount of data which those working in school work with on a regular basis. We all want to know how our students are progressing in their learning, and to ensure that we are not setting our sights too low or missing areas where children are not making the progress which they should be making. We use data extensively to monitor and evaluate what we are doing to help the children in our care to get the most out of their time at school.

Databusting for Schools begins by introducing two fictional school governors who are attempting to understand the data which is available to them to help them to understand their schools. A great deal of the data they have been given is generated in school, from attendance data, pupil performance data, which is usually based on some sort of written test, to other data which identifies particular groups of children within their school. They have also been given data that is generated by government agencies, and used as part of the accountability system which holds schools to account for the educational progress of the pupils in their care.

As people relatively new to schools, governors often find the sheer amount of data overwhelming, but it is important to understand what is available, before going on to be able to critically assess what the data might be able to indicate about a school. It is also useful to understand how centrally generated data has evolved since it began to be used in schools, particularly as many of those leading schools, and those holding them to account, have often built up their understanding of data

through practices which have developed in ways which are frequently haphazard, un-evidenced and somewhat questionable.

For those in the classroom, the use of data has become an essential aspect of teachers' roles. The 2011 Teacher Standards, which apply to all teachers in English schools, set a clear expectation that teachers should use 'relevant data to monitor progress, set targets, and plan subsequent lessons' (DfE, 2011: 1). As we note in Chapter 3, as with so many things in education, the term 'data' is somewhat unclear. Whilst the word is commonly used to mean 'a collection of information', much of the data teachers are required to use to 'monitor progress, set targets, and plan subsequent lessons' is numerical data rather than narrative information in the more general sense of the word 'data'. Understanding the use of numbers is therefore the main thrust of this book.

Much of the data used in school is a summary of raw numbers. In order to understand what numerical data can tell them about their classes, teachers need to have a good working knowledge of the considerations which have to be made when looking at these summaries. Confusingly, the summaries themselves are often numbers which describe larger sets of numbers. And even more confusingly, not all numbers are the same, and the ways in which numbers can be manipulated depend on the type of number which is being used. Describing differences in numbers is particularly fraught with pitfalls. Many readers with non-mathematical backgrounds may be surprised what they learn as they begin to discover that there is more to numerical data than meets the eye.

Databusting for Schools introduces two fictional teachers to explore numbers in depth, beginning by looking at simple uses of numbers before exploring how equations work and the way in which graphs can bring light – and shade – to numbers. Much of the early part of the book is essential reading for those whose understanding of higher-level mathematics is a little rusty, or those who have not had cause to consider the ways in which more advanced summary data is generated and presented.

Those who have explored basic statistics in some depth will find the main section useful as a refresher in the use of measures of central tendency, and the use of samples to shed light on wider populations. As many of those working in schools will be aware, some understanding of more advanced statistics has become an essential aspect of many roles in teaching, and in the management and oversight of schools. Those working in school leadership and governance need to be able to interpret data which is presented with confidence intervals, for example, and this requires a good understanding of the assumptions and calculations required to create these kinds of data.

Of course, numbers themselves are only one part of the picture. Being able to appraise information in numerical form critically has become a large part of the work both of those leading schools and those holding them to account. The latter part of *Databusting for Schools* explores in depth the ways in which the use of numbers has evolved in our ongoing efforts to understand and change education,

and looks at some of the criticisms which have been levelled at the increasingly data-driven nature of school management and education policy.

1.3 Becoming a databusting educator

The very fact that you are holding this book in your hands indicates that you have questions about the use of numbers in education. This increasing engagement with the how and why of teaching policy and practice has been fuelled by a number of parallel developments. The modern interconnected world has enabled those working in schools to reach out and connect with other likeminded people beyond their classrooms, offices and schools much more easily than was the case just a few short years ago.

Until relatively recently, most of those in school were simply not in a position to explore the wider issues which arise from the use of numbers in education. Teachers, school leaders and governors were presented with complex analysis which many struggled to understand. Those who wanted to investigate education research which relied on regression analysis and sampling theory, to take one example, found that they came up against ideas and terminology far beyond the crowded syllabus of their teacher training.

The rise of social media, and the ability for educators to connect with each other and to share ideas and experience, has enabled an increasing number of us to evaluate critically many of the accepted explanations of complex processes in education. Educators have begun to use services such as Twitter to discuss their experiences and opinions, and to begin to ask questions about the way in which numbers are used and interpreted in education.

At the same time, the growth of the internet has meant that enormous amounts of previously difficult-to-access research into education has become available at the click of a button. The increasing demand for access to educational research has seen more channels opening up, with new bodies such as the Chartered College for Teaching enabling much wider availability and discussion of educational research. Those who popularise research into education, such as Dan Willingham in the USA, Tom Bennett in the UK and Dylan Wiliam across both countries, have become significant figures at the forefront of promoting discussion and understanding of education.

Teachers have come together at grassroots educational conferences such as ResearchEd, founded by Tom Bennett and others, Northern Rocks, Beyond Levels, Primary Rocks Live and Women Ed, with more teacher-led conferences appearing each year. At the same time, Teach Meets – in which teachers gather together to share ideas and practice out of school hours, independent of their schools – have grown exponentially in the last five years.

Each of these events features educators sharing ideas, many of which involve the use of numbers to a greater or lesser extent. As educators look for ways to improve

their practice or their schools, they naturally consider ways to assess the impact of changes to children's educational experiences. Much of this assessment uses numerical data generated by testing or assessing children. As teachers have looked more closely at the issue of assessment, they have discovered that in the rush to generate numbers, important considerations have often been ignored, hidden from view or simply overlooked through ignorance.

Influential voices such as those of Daisy Christodoulou – former secondary teacher and until 2017 Head of Assessment at Ark Schools, and author of *Making Good Progress?* – and Daniel Koretz, Professor of Education at Harvard University, have attempted to increase teachers' awareness of the issues surrounding testing and assessment.

All of these disparate factors indicate an increasing desire for knowledge and understanding of the numbers being used in education, as we move into the age of the databusting teacher.

1.4 The pressing need for databusting teachers and leaders

As the different interpretations of the reduction of New York's violent crime and the increase in London's GCSE results show, the more we consider and discuss ideas, the more we explore the data which is available, the more nuanced the general picture becomes. But, ultimately, we need to decide on a course of action based on the evidence which we have considered.

Simply fixing the broken windows in future, literally and metaphorically, may not in itself reduce violent crime in cities seriously affected by the problem. Similarly, passing legislation now in the hope of improvements in future may not have the intended outcome many years down the line. The factors which caused the decline in violent crime in New York City – which had become the 10th most safe city of 50 cities ranked by *The Economist* magazine in 2015, with crime far below the US average – appear to be complex, and the theories explaining the causes of the decline may not help in planning for the future.

Those shaping policy in a high-crime city like Baltimore, for example, have a difficult task on their hands. Baltimore has crime rates which are far higher than the US average, and has done for a long time (City Data, 2017). Viewers of *The Wire*, a crime drama series based in the city, were left in no doubt of the extent and effects of the crime epidemic in the city. With almost four times the national average level of crime, policy makers have to decide how best to tackle the problem. Those reflecting on what actions should be taken to reduce crime in Baltimore would certainly be well advised to take New York City's experience into consideration, whilst exercising caution given the differing views which have been put forward. Databusting becomes increasingly important in a data-immersed world.

Likewise, to those looking to improve educational outcomes in England, setting up city 'challenges' similar to the London Challenge may have seemed to be a sensible way to boost the GCSE results of cities such as Birmingham and Manchester. Yet, when the UK government set up 'City Challenges' in Greater Manchester and the Black Country, the results were nowhere near as dramatic as those seen in the capital (Kidson and Norris, 2014). This may be because the underlying factors which led to the significant increase in GCSE results in Inner London were, as researchers such as Simon Burgess of Bristol University have suggested, related to changes in demographics and the attainment of children entering the capital's secondary schools a few years earlier.

As with the case of those seeking to develop policy in Baltimore, those responsible for public policy would do well to draw on the perceived lessons from elsewhere. Similarly, those responsible for schools outside the UK's capital should bear in mind what happened in Inner London in the early 21st century when deciding how best to proceed in future. In both cases, the ability to critically evaluate earlier research and experience is vital. Those working in and with schools need to be able to rigorously interrogate the use of numbers in any procedure which attempts to shed light on educational processes and outcomes.

At a local level, teachers and school leaders need to understand the limitations, as well as the benefits, of the numbers generated in school. The rise and fall of the system of *levels* in English schools, as discussed in Chapter 2, is illustrative of this point. In summary, levels were introduced as part of the National Curriculum when it was rolled out in the 1990s. As children progressed through school, they were expected to progress through a series of levels of learning.

Whilst there was much discussion prior to the introduction of the system of levels (Wiliam, 2001), what was introduced was, on the surface, fairly simple to understand. Children were expected to achieve one level of progress every two years, with most starting at Level 1 at age 5, Level 2 at age 7, and so on, until they achieved Level 6 at age 15. Of course, some children start and end at higher levels, and therefore there were actually 8 levels.

A further complication arose as schools began to segment the National Curriculum into a series of 'sub-levels', which split each level into three tiered sections. These sub-levels were then allocated a numerical value, as discussed in Chapter 2. Schools began to develop a series of 'Expected Levels of Progress', with many children (and their teachers) being set targets framed as 'Levels of Progress' or, worse still, 'Points of Progress'. More worryingly, teachers were largely required to assess children they taught using written criteria for each sub-level, creating powerful incentives for assessments to become distorted by the myriad of pressures being placed upon them.

At this point, the problems with this kind of 'datafication' of learning should become clear to a databusting teacher. Unfortunately, it took a long time between the point when more data-and-assessment-literate teachers and school leaders began to highlight the many problems with the levels system, and the point in 2014

when the system of levels was abandoned. When the government eventually published the final report from its *Commission on Assessment without Levels* in 2015, it reiterated comments made in the Carter Review of Initial Teacher Training, which had said that, 'of all areas of ITT content, we believe the most significant improvements are needed on training for assessment' (Carter, 2015: 9).

The Carter Review had identified that teachers should receive training in:

important concepts in assessment (such as validity, reliability, norm and criterion referencing). New teachers should also be taught theories of assessment – for example, why, when and how to assess. Trainees also need to be taught how to use pupil data, including training in basic statistics. (Carter, 2015: 9)

There is a pressing need for those working in school to develop their knowledge and understanding of each of these areas, which are all covered in *Databusting for Schools.*

1.5 Databusting in practice

The rapid rise of the use of numerical information in education has introduced a number of issues which databusting schools have to address. First, and possibly most importantly, is the rise in the use of numbers to inform systems used to hold schools to account for the education which they provide. School governors and leaders need to have a good knowledge and understanding, for example, of the processes involved in creating standardised tests and the important ways these differ to the types of non-standardised tests routinely used in school to assess and develop learning.

Understanding external standardised tests, such as those which are administered each year in Years 6, 11 and 13, and taken by entire cohorts each year, has become an essential part of school leadership. Understanding the way in which these tests are used to create measures of Value Added, for example, is a vital part of understanding the summary measures created for accountability purposes by external agencies. Databusting schools learn to interrogate these measures to ensure that they present an accurate picture of the learning which takes place in their classrooms, and to ensure that decisions for the future are made using justifiable conclusions based on the data which is available.

Primary schools have particular issues to consider, from the difficulty of creating accurate measures of the learning of very young children, to the problem of ensuring that measuring 11-year-olds does not become an end in itself. Understanding the pressures and distortions to which tests are subjected helps those responsible for managing the use and interpretation of test results to make the best decisions they can for the children they educate.

Databusting schools look beyond test results to understand how numbers can help to ensure that every child gets the most out of the educational opportunities in school. In these schools, useful but often neglected data is used to understand how children are progressing. Age within cohort data, for example, is often neglected. The differences in children's physical development across a single year group, particularly in primary school, can be enormous. Too often, those in higher prior attainment groups are simply the autumn-born children, for example. Even in secondary schools, younger children are often at a disadvantage within their cohort; databusting schools work to ensure that all of those in school take into account crucial age data when planning for, teaching and assessing children.

One legacy of levels in school is the all-too-frequent mixing of formative and summative assessment, leading to a situation whereby neither type of assessment is used effectively. The differences between norm-referenced and criterion-referenced tests, likewise, are often glossed over in school, resulting in test preparation which does not work as intended. Databusting assessment enables schools to fully understand the purposes of each type of assessment, and to understand the best ways in which to prepare – and not to prepare – children for end-of-key-stage tests.

For those who are held accountable for school outcome data, the need to understand the complexities involved in creating national comparison measures is crucially important. The use of tests of significance and of confidence intervals in comparative data is controversial, for example, and databusting schools should understand the differing views which are held by those in the academic community about the validity of these measures. This requires some in-depth exploration of the mathematics which underpins this area, and Chapters 5 and 6, in particular, may present a challenge to some readers. This is because the concepts involved are extremely complex, however, and there is no getting around the fact that these ideas are difficult to master. Databusting is, at times, a highly complex task.

Critically appraising data is crucial when looking at analyses of education which use numbers, and Chapter 8 provides a clear outline of the processes required to ensure that you are not mislead by data. *Databusting for Schools* concludes by looking at the history of data use in education, which has been complicated and controversial in equal measure.

1.6 Databusting for schools

The key message of this book is that those working in and with schools need to be extremely cautious when using numbers in education. Used carefully, with due consideration for the many potential pitfalls which occur all to frequently, numbers can help teachers, schools and outside agencies to identify potential strengths and weaknesses within the schooling system. But as the examples of New York and

London demonstrate, numbers are simply the start of any discussion. Databusting is becoming an indispensable skill in the modern world, and the time for *Databusting for Schools* has come.

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