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Developing data collection and management systems for decision-making: What professional development is required?

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ABSTRACT

Many school reform initiatives require schools to use data for decision-making. These policies often assume that the data schools use are of 'high quality'; that is, appropriate data is collected, and the data collected is managed in a way that provides schools sufficient evidence for decision-making. Are schools capable of producing such high quality data, and what professional development is required for them to do so? This study reports on the first national evaluation of schools' evaluative capability in schooling improvement initiatives across New Zealand. About two-thirds of school clusters could produce high quality data with support. There is the need for criteria on what counts as 'high quality' data, and training in developing and managing databases.

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Introduction

Many school reform initiatives now require schools to make curriculum, professional development and resource decisions on the basis of data. By 'data', we mean information that is collected and organised from relevant key stakeholders (e.g., parents, teachers, and students) to represent some aspect of schools (Lai & Schildkamp, 2012). (This definition includes all data relevant to decision-making, not just student achievement data.) Recent empirical evidence suggests that data analysis and use can lead to improvements in achievement (Carlson, Borman, & Robinson, 2011; Lai, McNaughton, Amituanai-Toloa, Turner, & Hsiao, 2009). However, improvements are often made in the context of intensive support to schools including teacher professional development, additional resources and the like. In these reforms, the data used was typically student achievement information, although in some instances, other relevant school and teacher data to understand achievement patterns, such as classroom observations and student attendance, were also used (Campbell & Levin, 2009; Lai et al., 2009)

A key implication of these recent reform policies on data use is that schools have the capacity to collect and manage data in a way that produces 'high quality' data. By high quality we mean, the collected data is appropriate for its purpose; is free from major errors (e.g., incorrect student scores); and managed in a way that provides the schools sufficient evidence for decision-making. Data quality is important, as the quality of decision-making and any subsequent changes to teaching and learning is contingent on data quality. For example, if the student achievement scores are incorrectly entered, then the teaching and learning decisions based on that data are likely to be inaccurate, and consequently, any changes made will be less likely to improve teaching and learning as intended. Earl and Timperley (2008) go so far as to argue that if educators are going to be effective in using data, "they must become knowledgeable about judging the value and quality of the evidence" (p. 7). But are schools capable of producing such high quality data, and what professional development is required for them to do so?

Recent studies have highlighted the many issues schools face to produce high quality data, such as access to appropriate data management systems (Wayman & Springfield, 2006), having appropriate user skills and knowledge such as the capability to know recognise what is 'sound' and 'unsound' data (Earl & Timperley, 2008) and support from school leaders (Schildkamp & Kuiper, 2010). Thus, there is a need to increase the quality of data by fostering capacity at a school and district level to collect and use data (Campbell & Levin, 2009). In the review that follows, we examine two factors that influence schools' capacity to produce high quality data that are particularly salient in the New Zealand (NZ) context at the time of the study. These are the development of appropriate data management systems, and the user skills in and knowledge of data management. (Here, we use the term data management systems, rather than the typical terminology of

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student information systems, assessment systems and data warehousing systems (Wayman, 2005), as systems in NZ tend to have multiple uses (e.g., a popular student information system includes analysis and data warehousing functions) and this is term most commonly used in NZ.) Before we discuss them, it is important to emphasise that the aim of having high quality data is so that schools have the best possible evidence for decision-making. Data management systems are only tools which can support users manage data. Consequently, the goal is not to turn school leaders and teachers into data management experts; rather it is to support them develop the capability to produce high quality data for decision-making, which may include outsourcing data management tasks to appropriate experts.

If the aim of having high quality data is to support school decision-making, then it is important to position data collation and management as part of the process of using data. In most models of data analysis, data collation and management follows from developing a shared purpose for using the data. (See Lai & Schildkamp, 2012, for a summary of different models.) This means that the decision of what data to collect and how to manage that data depends on the purpose for collection. Without a clear purpose, it is easy to collect a lot of data that is not useful for decision-making, or to collect data that is readily available rather than data that should be collected (Earl & Katz, 2002; Lai & Schildkamp, 2012). Therefore, if the data collected does not meet the purpose, or if the purpose is not well articulated, then no matter how efficient the data management process, schools cannot use the data effectively to improve their functioning.

Data management systems, and user skills and knowledge

Schools require multiple forms of data over time for decision-making, such as collecting student achievement scores and students' attitudes to reading over a number of years to see patterns in reading achievement and attitudes over time. This can include matching different forms of data which can be stored in different data management systems, for example, matching student achievement scores stored in a student management system with responses from student attitude surveys stored on excel spread sheets. Collating such data for analysis is a time-consuming administrative task that can hinder teachers and school leaders from using data. Firstly, it can reduce teacher motivation to analyse and use the data, particularly if teachers have to enter and collate the data themselves. It can also exacerbate some teachers who already feel data analysis is not a priority or feel that they have insufficient time to analyse data. Conversely, with better data systems, teachers feel more efficacious, respond better to student needs, and are more likely to examine their own practice and collaborate with others (Wayman & Springfield, 2006). Secondly, it can result in inaccuracies in data entry, if data is entered quickly rather than accurately and if there are no quality assurance processes to check the accuracy of the data entered (Wayman, Jimmerson, & Cho, 2012). Finally, these aforementioned issues can result in data being entered late, which in turn affects the timeliness and availability of the data for decision-making (Schildkamp & Kuiper, 2010), for example, collated data being available for analysis long after it is required for decision-making.

New computerised data management tools can make such administrative work less laborious and more efficient (Wayman & Springfield, 2006). In NZ, for example, a recent standardised online assessment, the asTTle (Assessment for learning), marks most of the test and produces teacher and student versions of analysis reports, therefore reducing the amount of time for data entry and collation and reducing the possibility of entry and collation errors (Brown, in press). The asTTle tool further illustrates that an efficient data management system can increase access to data and use of data in classrooms as both teachers and students have immediate access to what was previously less accessible data. This in turn has the potential for more data to be used by teachers and students to improve classroom practice. As such, data management systems do not just make the process of data collation and management more efficient; they transform how data is preserved, distributed and applied to by allowing more people greater access to better forms of data to support decision-making (Wayman et al., 2012).

However, some data management systems only focus on one type of data in a single time point and cannot collate and report on data over time unless it is exported to another system. Researchers in the USA found that it is common for schools and school districts to use multiple and separate data systems for the collection of attendance and achievement data (Means, Padilla, DeBarger, & Bakia, 2009). There are multiple problems associated with a variety of data collection systems – there are difficulties with discriminate access to types of information due to different databases having different access rights, inefficiencies with having to work across different systems and inaccuracies in data entry, as entering the same data into multiple systems increases the likelihood of errors (Wayman et al., 2012). In addition, although schools are urged to base their decisions on data, these existing systems have not always been designed with their requirements primarily in mind. Data systems are often constructed to address uses other than school wide data informed decision making (Means et al., 2009). These problems in turn, create discrepant and inconsistent data about schools, teachers, and students, and make it difficult to use appropriately for decision-making (Campbell & Levin, 2009).

As such, some education systems have adopted district-wide or state-wide data collation and management systems to support teachers and school leaders use multiple sources of data over time, such as the New York state grow network and the Ontario School Information System. The latter, for example, includes a web enabled system set up for collecting multiple sources of data from schools and their boards (i.e., data on students, teachers, courses, classes, and school and board administration), and a data warehouse to house, integrate and depersonalize data to provide rapid and more efficient access to the data (Campbell & Levin, 2009). All data that is collected is validated and verified with the aim of improving data accuracy and quality.

If there is an existing large-scale data collection and management system, then the skills and knowledge school users need are those related to using the system and ensuring that the data entered into the system is accurate. However, if there is no existing large-scale system, then there are two inter-related sets of core skills and knowledge required. The first set of skills and knowledge is around the development and management of an appropriate database, and the second is around the protocols to manage the data. To set up an appropriate database requires knowledge of the purpose for collecting the data, as well as what analysis might be undertaken to meet the purpose. For example, if the purpose is to track the impact of student attitudes towards reading on student reading achievement over time, the database will need to be set up to include both attitudinal data and achievement data at multiple time points, and to easily track the same students over time (e.g., through the use of a unique student ID). This requires in turn, technological skills and knowledge to know the strengths and limitations of different databases (e.g., flat files vs. relational databases) and to select those appropriate for their needs. Similar technological skills are required for on-going management of the databases including essential spread sheet and database techniques such as filtering, organising, and constructing various tables and graphs (McIntire, 2002).

The second set of skills and knowledge is around the development of protocols to quality assure the accuracy of

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