

“We’re not data analysts”: Teachers’ perspectives on factors impacting their use of student assessment data

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Education systems worldwide have encouraged data use initiatives with the aim of improving student learning through data-driven decision making (DDDM). Despite this, the adoption of DDDM practices by Australian teachers has been slow. Investigating current organisational activities at a micro level is imperative for any change initiative to gain momentum and adoption. To examine the underlying factors contributing to the minimal change in teachers’ data practices, the study examines primary teachers’ perspectives on issues relating to their ability to collect and analyse student assessment data. The study also adopts an inter-disciplinary lens through the use of a business process change management framework. Drawing on data from twenty-three semi-structured interviews with experienced teachers, sixteen salient factors are identified as affecting teachers’ use of student assessment data to guide instruction. This paper argues that addressing these factors is the precursor to incorporating lasting changes in teachers’ data practices.

Introduction

Education systems have been promoting data-driven decision making (DDDM) at all levels of education and governance to improve student learning (Means, Chen, DeBarger & Padilla, 2011). DDDM pertains to the systematic collection, analysis, interpretation, and application of data to inform practice and policy in educational settings (Mandinach & Gummer, 2015). Continuous educational reform has created new DDDM challenges and accountabilities for teachers, those specifically seen as the primary agents of change regarding student achievement. The importance of using data as ‘evidence’ to inform teaching practices has been acknowledged in both local policy documentation (Masters, 2013) and the broader literature (Mandinach & Schildkamp, 2020). In this context, data generates insight into student learning and guides teachers’ practice.

Specifically, the push for teachers to use student assessment data to guide their practice is a growing global phenomenon, identified in studies from the United States of America (Mandinach & Gummer, 2015; Datnow & Hubbard, 2015), the Netherlands (Schildkamp & Kuiper, 2010), New Zealand (Lai & McNaughton, 2013), Australia (Brown, Lake & Matters, 2011), and England (Downey & Kelly, 2010). Teachers’ usage of data may change their behaviours such as trying new instructional strategies or incorporating differentiated curricula to improve student achievement (Datnow, Park & Kennedy-Lewis, 2012; Rock, Gregg, Ellis & Gable, 2008). While teachers have access to many different forms of data, and data use in the classroom has been shown to have numerous benefits, previous studies revealed that most teachers do not engage with data to its best effect (Datnow, Lockton & Weddle, 2020; Datnow & Hubbard, 2015; Means et al., 2011).

Due to the relatively new emergence of DDDM in education, much of the research focus is concerned with formulating a high-level and all-encompassing view (e.g., the inclusion of policy makers', principals' and teachers' views). Whilst important, targeted investigations are now required to promote data use among classroom teachers. A related argument made by Crossan and Apaydin (2010) stipulated that under the complex organisational environment in which practitioners work, it becomes simplistic and problematic to prescribe what should be done and how practitioners should act. This top-down approach often ignores the practical implications and contextual considerations required for successful changes to existing processes. There is a need for more understanding of the procedural processes of teachers from a micro perspective (Datnow & Hubbard, 2015; Little, 2012).

The aim of this study is to investigate what specific factors appear to influence teachers' processes for assessment data collection and analysis, and to generate an enriched view driven by a teacher-voice perspective. Assessment data can come from various sources, including both formative and summative assessment, and can be qualitative and quantitative in nature. The focus on collection and analysis deliberately targets preceding stages of data use that ultimately lead to the ability to utilise student assessment data to inform teaching. In the traditional "data-information-knowledge-wisdom" (DIKW) approach to data science (Baskarada & Koronios, 2013), collection refers to how the first stage (data) is gathered and stored, while analysis refers to the transition from data to information. This is distinct from other DDDM literature (Mandinach & Schildkamp, 2020) that incorporates all the DIKW stages into a single concept and typically refers to transforming information into knowledge.

In order to address this research aim, a qualitative investigation was conducted using grounded theory (Corbin & Strauss, 2008). This involved in-depth interviews with twenty-three New South Wales (NSW) primary school teachers regarding their data collection and analysis practices, which were examined through constant comparative analysis until data saturation was achieved. This led to the identification of sixteen salient factors influencing the participants' beliefs and behaviours surrounding assessment data use. Consequently, this study's insight into limiting factors in the adoption of DDDM practices, combined with an organisational change management lens, provides a foundation to guide fit-for-purpose change initiatives to foster and augment data use in the classroom.

Background

The past decade of global educational reform has seen a rise in the promotion of data to inform internal school initiatives and external political agendas (Mandinach & Gummer, 2015). As such, the terms 'data use' and 'DDDM' have been flagged because of their perceived contribution to student achievement (Dunn & Rakes, 2011), school improvement (Datnow & Hubbard, 2016), teacher accountability (Daneen & Brown, 2016), and education policy (Hamilton, Halverson, Jackson, Mandinach, Supovitz & Wayman, 2009). Data use, a broad notion in its entirety, suggests that decisions grounded in data are more likely to be effective than decisions based on intuition (Schildkamp &

Kuiper, 2010). There are also several prominent DDDM models prescribing a theoretical procedure for DDDM (e.g., Ikemoto & Marsh, 2007; Means, Padilla & Gallagher, 2010), however emphasis is placed on the later stages of data use, such as decision-making skills and targeted instruction. The activities that precede the ability to utilise data are not well understood. This paper argues that targeting outcomes without understanding the context or procedural mechanisms that produce them yields constrained insight into how to support and enhance teachers’ data use practices.

Only a small number of studies have examined the instructional changes in teacher practice resulting from data use. There is even less focus on how teachers collect and analyse data to subsequently inform their practice. Benchmark assessment data tend to dominate teachers’ workloads because it is prioritised by policy (Datnow & Hubbard, 2015). While this is particularly evident for American teachers, Australian teachers are no different (Polesel, Rice & Dulfer, 2014). Australian studies have also examined teachers’ use of assessment data to inform classroom instruction and found that a significant number of teachers do not change their instruction as a result of using data (Pierce & Chick, 2011). Similarly, a comparison of primary and secondary teachers’ views on assessment found that primary teachers believed that assessment data improves teaching more so than secondary teachers did (Brown et al., 2011), while the latter group felt that assessment data is used for student accountability over their own learning. These studies indicate there may be significant issues with the beliefs and processes of assessment data use in Australia. Further qualitative exploration is required to better understand why this may be and what teachers’ individual data practices entail. Without the processes, skills, and belief in data collection and analysis, teachers may be overwhelmed by the requirements of effective data use and therefore are less likely to apply effective data practices. For this reason, this study seeks an in-depth qualitative view of classroom teachers’ perspectives concerning assessment data collection and analysis.

Furthermore, teachers also need to know how to use data effectively to inform their practice, and the research literature emphasises a need to build practitioners’ data literacy (Mandinach & Gummer 2015; Kippers, Poortman, Schildkamp & Visscher, 2018). The current literature on data literacy heavily promotes the importance of professional learning as a means of improving data literacy to reduce teacher anxiety related to data activities. However, the over-reliance on professional development alone often does not lead to meaningful changes in teachers’ data use (Datnow & Hubbard, 2015). More research is required to discern organisational influences on teachers’ data use. This study provides a foundation from a teacher perspective on perceived influences impacting efficient data practices.

Method

An inductive qualitative approach (Saldaña, 2016) was adopted in this study to understand the work context of the participants and their views towards it. The primary focus of the analysis was identifying the participants’ main concerns regarding their processes for collecting and analysing student assessment data. More specifically, this study employed

grounded theory methodology, as articulated by Corbin and Strauss (2008), with theoretical sampling, in-depth semi-structured interviews, data saturation, coding, memoing, and theory generating. Grounded theory was selected for its ability to provide in-depth explanations of a process and discover general perceptions towards it (Chong & Yeo, 2015). Additionally, it is a suitable choice when a topic has been given little attention in previous studies (Goulding, 1999). Grounding concepts in data systematically develops themes in terms of their properties whilst at the same time validating the interpretation of the newly established themes by comparing them against incoming data (Corbin & Strauss, 2008).

Participant selection and demographics

Theoretical sampling (Corbin & Strauss, 2012) was used for this study. When adopting theoretical sampling, the researcher simultaneously collects, codes and analyses data and uses this ongoing process to determine future participant selection and question directions in the semi-structured interviews. Twenty-three New South Wales (NSW) primary school teachers participated in the study resulting in 27.7 hours of interview data. A breakdown of participants' years of teaching experience, education, and current teaching levels can be found in Figure 1. Teachers were invited to participate via advertisements posted in school staffrooms and on teacher social media forums. No prior relationships existed with the target sample. All participants were full-time primary teachers in NSW government schools, with at least one year of teaching experience. The selection and interview processes were repeated until data saturation emerged. That is, in the researchers' judgment, whereby no new insights would be obtained by expanding the sample further. Ethics approval was granted by the ethics committee at the host University and by the NSW Department of Education.

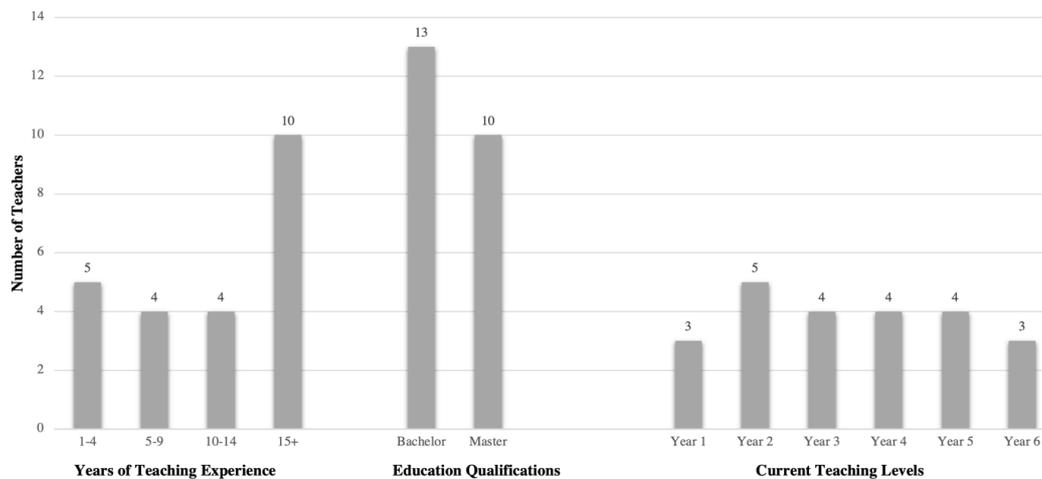


Figure 1. Summary of the 23 participants' teaching background
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Data collection

One-on-one semi-structured telephone interviews were the primary data collection technique. Prior to commencing the interviews, teachers were presented with a list of assessment data options (e.g., observations, whiteboard tasks, tests) and were asked to select which options they have in mind when they think of their data practices. This engaged thinking and discussion around shared definitions between interviewer and interviewee. Then, an open exchange of context-dependent expert knowledge through 24 mapping questions and follow-on mining questions (Ritchie & Lewis, 2002) allowed for a story to unfold. Mapping questions were open ended and designed to explore teachers’ experiences (e.g., *How would you describe your data collection procedures? Do you feel adequately supported with these procedures?*). Mining questions were more reactive and designed to probe for details relating to the meaning participants held in their answers to the mapping questions (e.g., *Could you give some specific examples of how you collect x data? Are these procedures conducive for you?*). A pilot study was conducted to test the interview protocol for clarity and order (Castillo-Montoya, 2016), which promoted amendments to reduce question ambiguity.

Data analysis

Interviews were audio recorded and transcribed verbatim at the conclusion of each interview. Data analysis of the transcripts followed an inductive, bottom-up approach (Saldaña, 2016). More specifically, open, axial and selective coding procedures were adopted (Corbin & Strauss, 2008) with data collection and analysis occurring concurrently until data saturation was reached. Open coding procedures involved generating low level codes by proceeding through the transcripts line by line and extracting verbose sentence descriptors. Codes were created when teacher statements referred to factors that influenced how or why they collected and analysed student assessment data. If a code was mentioned twice by the same participant while referencing the same context, it was only coded once. The aim of this investigation was to uncover salient topics applicable to multiple teachers and to determine the level of agreement between participants rather than to focus on the importance of a topic to an individual participant.

Transcripts were open coded separately, while axial coding synthesised these low-level codes with those from previous interviews to generate mid-level themes. Axial codes were established by grouping two or more similar open codes. Axial codes were then grouped into higher-level themes through selective coding to formalise factors that affect teachers’ data collection and analysis. The constant comparative method was used to analyse the data. Memos were established to capture the emergent concepts and their relationships. As additional interviews were conducted, emerging themes were reconceptualised and the properties that informed each theme were identified. This process continued until data saturation was reached, which was defined as the point where no new axial codes emerged from five consecutive interviews.

Where required, member checking (Yin, 2014) was conducted to maintain accurate representation of information. Here, the research team contacted participants for

clarification of statements that were unclear in the interview transcript. Microsoft *Excel* was used to track the large number of diverse codes and to visualise code and theme saliency, and data saturation through pivot tables.

Theoretical lens

This paper adopts Kettinger and Grover's (1995) business process change (BPC) model as a lens for classifying factors influencing teacher processes for data collection and analysis. Change is crucial for organisations to survive and grow in continuously evolving business landscapes. An education environment is similar. Adopting this ideology, a school is seen as a functioning organisation with inputs (learning), outputs (student achievement), employees (teachers) and clients (students and parents). Change management offers a unique, interdisciplinary constructive lens for conducting organisational change throughout different stages of business processes. Theories of change describe the effectiveness by which organisations are able to modify their processes. Through the BPC model, the formalisation of theoretical dimensions of effective business process change management are considered essential for improved implementation of process changes. Within the model there are seven primary dimensions for change: (a) environmental factors (political and industry forces); (b) management (leadership influences); (c) information and technology (the use of IT to support knowledge sharing and processing); (d) business processes (intra-functional and cross-functional procedures); (e) structure (coordination mechanisms); and (f) people (skills and behaviours). The seventh dimension, the output of the model, includes services and performances that may be measured in terms of cost and quality. In an educational context, this is often measured through student performance. This paper argues more focus is required on those preceding dimensions, particularly existing organisational processes, that lead to the services and performances of any organisation.

The BPC model was applied to the results of the study after the inductive analysis was complete. That is, the understanding of the participants' experiences was derived from the existing data, not *a priori* codes or categories. The main concern was allowing new perspectives and ideas to emerge as abstractions and themes were generated from the data. Corbin and Strauss (2008) emphasised that the application of a theoretical framework post data analysis complements and verifies findings. Using grounded theory, as discussed in the next section, allowed for an initial theory to be created regarding the factors influencing teachers' data use, while aligning this emerging theory to the BPC model generalises the findings in a wider business processes context.

Findings

A total of 396 open codes were reduced to 64 axial codes and then grouped into 16 higher-level themes through selective coding. Each theme is a salient factor among the participants that impacts their data collection and analysis practices. Figure 2 shows the mapping of themes to the six dimensions of the BPC model, as adapted from Kettinger and Grover (1995), along with the individual saliency of each theme. This is measured by

the total number of times open codes within the corresponding theme were mentioned in interview transcripts.

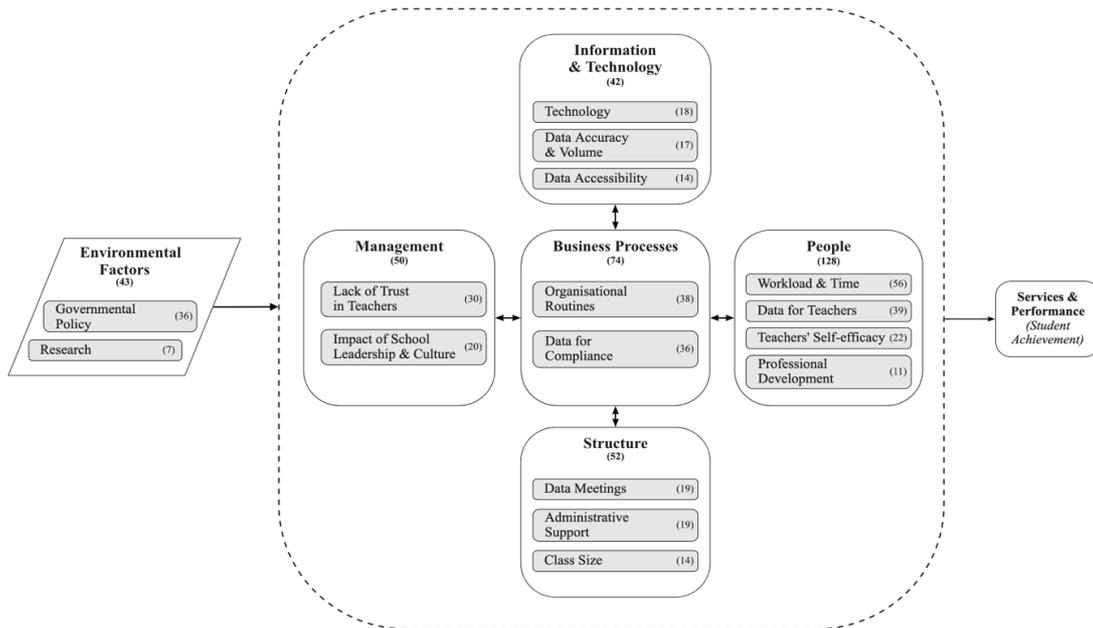


Figure 2: Themes (shaded rectangles) discovered through grounded theory, with the frequency of open codes that make up each theme [use PDF reader 'zoom in' function to facilitate reading]

Environmental factors

Two salient themes emerged relating to the environmental factors dimension: governmental policy (36 open codes) and research (7 open codes). Regarding governmental policy, teachers referred to an overloaded curriculum in NSW, claiming the quantity of curriculum material reduces their ability to adequately use assessment data to guide their instruction. Teacher 20 (T20) expressed, “streamline the curriculum, then I’ll have more time to look at data.”

Standardised national tests, such as Australia’s NAPLAN (National Assessment Program – Literacy and Numeracy, 2016), dominates teachers’ use of assessment data despite teachers’ views that it yields little evidence to meaningfully impact their practice. Test results are received three months later, during which teaching continues in line with the curriculum. However, its importance to policy and school leadership pressures teachers to follow suit. T16 stated, “so much reliance goes into a tiny snapshot in time on a single day... it doesn’t give us anything we don’t already know.”

Participants were concerned by frequent changes to data policies and tools. Due to these changes, important data is considered lost with little time to fully implement and

adequately use the tools. T5 said, “something new is always coming out... just pick one [data policy] already and stick to it long enough for it to be useful.” Frequently prescribed changes reduce the likelihood of teachers adapting their data collection and analysis processes. T19 shared, “it’s like these ideas are coming from people who’ve not been in the classroom and they didn’t even ask us what we thought.” Both participants are referring to the use of an online tool called *Planning Literacy and Numeracy* (PLAN), the change to PLAN2, and the addition of National Literacy and Numeracy Learning Progressions which do not always align with PLAN.

Conversely, teachers echoed the need to be heard within the research community. The participants believe that research tends to advise on best practices, but not always ones that are applicable. Concerns relate to a shared belief in a lack of teacher perspective in research. T6 shared, “research is important, but we’re increasingly being told what to do and I think there is not a lot of real understanding of what’s actually happening in the classroom when these new ideas are being handed down.”

Management

Impact of school leadership (20 open codes) and a lack of trust in teachers (30 open codes) are two themes that emerged relating to the management dimension. School leadership impacts how data is used and for what purposes. Whilst not a new phenomenon that leadership plays a role in shaping an organisational culture, participants specifically referenced certain issues in creating positive data cultures in schools. For example, leaders need to openly disclose how data requests will be used. T11 stated, “they [leaders] don’t tell us what all this data is for, and a lot of it we get told to just do it.” Equally important is the need for leaders to actively mirror positive data behaviours when promoting changes to teachers’ data use. For example, T18 stated, “we’re told to store everything online, but I haven’t yet purely because my supervisor keeps asking me for hard copies.” The volume of data requests and requirements from management weighed against the perceived impact is a concern. Teachers often claim their workload and processes cannot support the demand. T9 specified, “they [leaders] need to realise how long it takes... it’s like teaching is more about data than actually teaching.” This closely ties with the workload theme under the people dimension.

Participants were concerned by the perceived lack of trust in teachers by leadership. Due to the rising need for data as evidence, it appears there is a growing disregard for anything that does not produce hard evidence. T8 shared, “my formal data is driven by the higher ups telling me what to collect, but it’s my observations that I use most, and those should be just as valid because I’m doing them more often.” Teachers feel as though their practice is continuously being monitored by data. Equally, there is a growing sentiment that trust in teacher judgment has become secondary to data, rather than considered a form of evidence. For example, T5 shared, “I’m forced to upload mine [teacher log-book] into Google Drive so that it can be assessed and monitored by the executive staff.” T14 similarly disclosed, “we get judged on our data, if our kids aren’t moving, we get asked why and to explain yourself, so it just makes us feel like data means people are checking

up on us.” This is further emphasised by T11 expressing, “I feel like there's the emphasis on data, and there's a lack of trust in teaching as a profession.”

Business processes

Two themes emerged relating to this dimension: data for compliance (36 open codes), and organisational routines (38 open codes). Using student assessment data to inform teaching practices is advocated at many levels in the education system, including national and state governments and school leadership. However, questions remain regarding whether there is too much data, who uses the data, and whether data is being used appropriately. The data for compliance theme reveals answers to some of these questions from the teachers’ perspectives. Primarily, the majority of participants felt that the data collected serves no real purpose, resulting in data not being used. “Data for data sake” was so prominently repeated by participants it became its own sub-theme. Many participants said the data they are collecting is not meaningful for practice, with T14 advising, “I ask why we need to be collecting all this data, and I just get told it’s one of those hoops we’re told to jump through” with T5 stating, “most of the time the data we get asked to collect is not for us to use, it’s for the department [of education].”

The arbitrary nature in the way data is collected and analysed can be attributed to a lack of prescribed data processes that benefit the teachers’ data use. Organisational routines surrounding data only relate to administrative data, government testing data, or data for auditing purposes. Due to the reactive nature of in-class data use, coupled with the lack of clear process structures, each teacher must create their own set of processes for collecting and analysing data. Similarly, the way data requests filter down to the teachers overloads an already dysfunctional process, again relating to the workload theme under the people dimension. Participants shared a desire for clearer structure and processes. T9 shared that “there is a lot of overwhelm [sic] concerning data, I think we all need to come up with better consistent ways of collecting and analysing data”, with T14 stating, “things need to be ready and set up, it makes for a clearer way of doing things.”

When making changes to data routines, well planned processes reduce the need for continuous requests and changes caused by a lack of consideration for process implementation. Ideally, when adding to an existing process, something else should be taken away. There is a need for revising the routines of data so that when a request is added to a workflow it adds value. T19 shared, “we’re under a lot of pressure, with the policy and research people constantly introducing new things, they need to think whether it’ll help, and more importantly how to implement it, too often we’re told this is good, now do it.”

Information and technology (IT)

Three themes emerged relating to this dimension; technology (18 codes), data accuracy and volume (17 codes), and data accessibility (14 codes). Technology, when utilised efficiently, extends the support structures of organisations and enables teachers to work efficiently. Schools often use data tools to extend the support of their teachers. However,

these tools need to be appropriately commissioned with teachers and their processes in mind.

The use of current technology is causing double handling of data for the participants, adding steps with little gain. The sentiment of using technology simply to scan in hard copies dominates the participants' work with IT. T5 attributed the rigidity of the tools as an additional obstruction to using technology efficiently, stating "after I've scanned things in, I try to manipulate and add comments and it just doesn't allow for that." T2 additionally advised the need for tools to be automated yet flexible, stating "what would be more helpful is a tool that does the analysis for you but allows us to capture comments and anecdotal evidence." Equally important is the need for leaders to embody a strong culture for efficient data technology processes by requesting all teachers follow the same processes. T16 shared, "the problem is it wasn't mandatory, some teachers were collecting all this data and housing it digitally and others weren't."

The need for more data as evidence of teaching has actually limited the ability of teachers to leverage student assessment data effectively. The volume of requested data is impractical, thus leading to data accuracy issues with participants questioning the reliability of data entries under time constraints. T6 stated, "I question the quality of data in these tools, there's just no time to update them properly." Participants shared concerns over the need for additional visibility, and a centralised longitudinal data capturing tool that ideally replaces all other tools, and follows each student, irrespective of school changes and year level advancements. Such a system would reduce repeated data collection activities. T4 noted that, "we need a tool that holds all student data in one centralised place that carries over from year to year so that we can see growth, grades, and observation notes."

Structure

Administrative support (19 codes), data meetings (19 codes), and class size (14 codes) are three themes from the data aligning with the structure dimension. The most common form of administrative support given to teachers in Australia is relief from face-to-face (RFF) where casual teachers are hired to carry teaching loads, enabling the resident teacher to conduct other duties. While important, RFF has become overloaded by the addition of data requirements. T12 asserted, "uploading data into tools is done during my RFF, along with everything else, which is usually more urgent, so then I'll upload and look at the data when I get home." The overreliance on RFF to conduct all other teaching requirements means that using student assessment data to inform teacher practice is seen as a secondary activity. Participants called for a review of the manner in which RFF is planned for and utilised. Specifically, teachers want to be in the classroom with their students, and relief from this activity should not be a primary solution. The two should be inverted; casuals are hired as data administrators or support staff instead of teaching staff. T16 shared, "I'm offered more RFF, which means I get more time to catch up on admin, but teaching is my job, I'd rather be in the classroom teaching than having a casual come just so I can get data entry in." This is reinforced by T22 who shared, "we need more help with the admin and data than teaching... so that we can focus on the teaching more."

Designated data time, separate to RFF, seemingly only occurs during data meetings, which are group meetings designed to assist with data analysis and consistent teacher judgment. Participants found data meetings beneficial in allowing for designated data analysis time and ensuring consistency in approach. However, two key points emerged that affect the efficiency of data meetings; the purpose for the data meetings and their frequency. T6 shared, “data meetings are good when they look at analysing work samples... but a lot of times they aren’t and instead focus on things not related to data”. Furthermore, leadership was mentioned as a primary role for ensuring data meetings occurred more frequently by assigning designated data meeting times.

Lastly, participants linked the number of pupils per class to their ability to adequately utilise data. T12 stated, “with the number of students per class, they need to create a better system for teachers to be able to work with the data.” This was reinforced by T13, “I know class size isn’t supposed to make a difference, but definitely the amount of kids you have is going to make a difference on your ability to manage and analyse data.”

People

Teachers’ self-efficacy (22 codes), professional development (PD) (11 codes), data for teachers (39 codes), and teacher workload (56 codes) are four themes from the data aligning with the people dimension. Self-efficacy relates to an individual’s belief in their capacity to execute necessary behaviours (Bandura, 1997). Participants reported on their lack of confidence and skills in relation to data collection and analysis. A shared statement was “we’re not data analysts”, with many participants arguing they are expected to behave like data scientists on top of their existing teaching duties without the support structures in place. T20 stated “we don’t have the expertise or support, we’re not analysts, I don’t know how to handle this much data let alone analyse it and use it.” To combat their perceived lack of skills, participants mentioned PD as a means for increasing their data confidence. Participants received little training on data collection or analysis. T7 shared, “we haven’t received any training, I think we need more on how to handle and use the data.” This is in contrast to the requirements of the *Australian Standards for Teachers and School Leaders* (Australian Institute for Teaching and School Leadership, n.d.), which require teachers to be proficient in making use of student assessment data to modify teaching practices. Similarly, participants echoed a shared belief for PD programs to allow for contextual considerations. T8 voiced, “PD is good, but it needs to be practical, not just here’s the latest knowledge let’s talk about it, no, let’s talk about how it works for us.”

The issue of teachers’ workload and available time significantly affects data use. Existing organisational routines for collecting and analysing data are too time consuming, with data analysis predominantly occurring as a secondary task and one that befalls after hours. T17 shared, “it’s hard to analyse during school hours, it takes time and with only a few hours of RFF to fit in so much, I do it at home after my dinner.” Current data collection and analysis routines are overwhelming for teachers and should be properly assessed prior to implementation. This is closely related to the business process dimension where participants called for data to be appropriately embedded into teaching in ways that add

value. For example, T9 asserted “data needs to be properly embedded into our teaching and not constantly adding new things that don’t actually help us as teachers.”

Teachers value data and the transparency it provides concerning their students’ progress. However, much of the data currently utilised by participants does not help at a classroom level. Participants expressed a need for practical data use that occurs at their level, referred to as data for teachers, which relies strongly on formative assessments. As T10 explained, “formative data is way more helpful for my teaching, and it’s immediate”. Yet participants suggest that limited support and routines exist to handle formative data. T19 reported that, “informal data drives my teaching, but it’s all manual, there is no tool or process helping me, and it’s not usually the data the leadership team is interested in.”

Discussion

Planning for the implementation of changes to teacher practices is as important as identifying areas of change. Copious DDDM literature focuses on the latter without attending to the former; proposing complex changes to teacher practice without considering the current teacher context, change implantation plan, or factors impeding change. Through the business process change management lens, this paper seeks to identify targeted areas of change that will enable DDDM principles to be effectively embedded in teacher practice. The findings suggest several important conclusions towards this objective.

First, to encourage lasting changes in effective data use, the business process dimension requires further investigation by academic researchers and should be emphasised during DDDM implementations. This dimension, which lies at the centre of the BPC model and is reciprocally connected to all other dimensions, yielded the second largest result. Effective organisational routines are catalysts for change (Crossan & Apaydin, 2010), yet the findings conveyed a haphazard, reactive nature surrounding data use processes. This reactive nature was attributed by participants to frequent policy and tool changes, and no participant stated that data collection or analysis procedures were standardised or optimised, due to the lack of emphasis placed on developing organisational routines for data. With minimal implemented processes concerning data collection, data analysis was found to be even more subordinate. The manner in which data practices are inserted into teaching practices needs to be revised. Data should be embedded with purpose and practicality specific to the user. When adding to an existing process, something else should be taken away.

Second, and closely linked to business processes, is a need for leaders to have a transparent purpose for all data requests. The impact of management on school data use culture has previously been recognised (Coburn & Turner, 2011). The findings reported in the current study reinforce this, identifying the need for leaders to encourage and embody positive data practices themselves. However, the findings also identified the need to address the volume of data requests and their usefulness for teachers. Participants felt the data they were required to collect was not useful to inform their everyday practice, with the data requests serving management more so than teachers in order to comply with

policy requirements or to judge teacher performance. While this form of administrative data is important, it is apparently overwhelming teachers’ experiences with data and is leading to negative data beliefs, cultures, and practices.

Third, teachers cannot be asked to use data adequately when they are not properly trained. It has been demonstrated that teachers lack the knowledge and skills to use data effectively (Mandinach & Schildkamp, 2020; Schildkamp & Kuiper, 2010). There is a distinction between skills needed for data collection and analysis and the subsequent decision-making steps of DDDM, and while there is existing research focusing on the latter (Mandinach & Schildkamp, 2020), little attention is given to the former. The findings of this study add that developing teachers’ data literacy is not just a matter of PD. Adequate organisational support structures are lacking in the areas of data collection and analysis that lead to teachers’ ability to use data to inform their practice. Recognising that the business processes dimension has a two-way relationship with almost all other dimensions is essential. For example, teachers’ workload or professional development opportunities (under the people dimension) are governed by the schools’ organisational routines and data procedures (business process dimension) which is influenced by the management dimension. Similarly, teachers’ ability to utilise data is also influenced by the technology available and this technology should be designed for teachers and standardised at least from a State level. This is congruent with Lai and McNaughton’s (2016) argument for the need for developers of data management tools to be accredited to be fully aware of schools’ data requirements and operating conditions. Professional development (PD) activities should then relate to these specific processes and tools. While the findings showed that teachers appreciated PD, many participants echoed the words “we’re not data analysts”; it is unrealistic to expect every teacher to be an expert in both classroom teaching and data science. It is evident that participants’ current workload and organisational routines will not support this. Targeted PD relating to the data use requirements of the teacher would add more value than general knowledge in data handling.

Fourth, the concept of workload and time appear to be popular reactions among the participants. These issues are not a platitude. Consistent with prior research, time is a prevalent factor (Wood, 2019), and the people dimension within the findings was the most salient. However, time and workload need to be seen as dependent variables that are heavily affected by preceding themes, as seen in Figure 2. More attention should be paid to antecedent dimensions like business processes and technology to reduce the reactive nature of workload. Additionally, a reimagining of RFF, as identified in the structure dimension, would allow for more effective use of teacher time. The results indicate an overreliance on teachers working overtime. Participants shared that influences from governmental policy, research recommendations, managerial reactions to data needs, and the lack of data-oriented routines, makes unpaid overtime an unspoken yet expected process. Ethical researchers should be cautious about making recommendations to improve teachers’ practices that may result in them working unpaid overtime. A noticeable statement came from T23:

A lot of other professions when they work overtime they get paid... they [government and researchers] need to understand that just because we work after hours and it seems a standard practice in this job, doesn't mean they can come to expect more from our private time. (T23)

Closing with this statement is important. It reflects a need to reconsider the broader practical impact of educational research. Assessment and curriculum reforms, and changes to teachers' professional development and data literacy are incomplete and under supported if they do not closely comprehend the micro-environment of the contemporary classroom teacher.

Conclusion and future work

The study aimed to expose, from a teacher perspective, emerging salient factors impacting their capacity to collect and analyse data. In addition to these practical and policy implications, this study also yields areas for further research. The findings act as a foundation for future micro processes investigations. While this qualitative inquiry was limited to NSW primary teachers in government schools, the common themes in participant experiences of different schools contribute to the validity of the findings. It offers a foundation to call for more micro perspectives on processes relating to teachers' data use. Areas for further investigation include: (a) the need for a clearer understanding of Australian teachers' micro procedural processes surrounding assessment data collection and analysis practices; (b) a review of existing data handling technology and the gaps required to build longitudinal data systems for the Australian teacher workflow; and (c) the design and pilot implementation of fit-for-purpose data use processes in a real-world classroom context.

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