

Teacher data use and student learning: Insights from a NSW Catholic School system

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Evidence based decision making is essential for enabling improved student learning. Teacher motivations and beliefs about the types and use of data are critical determinants of decision making. Our research explored the types of data teachers use and consider valuable when measuring improvement in student learning. Findings from 294 teachers from 44 schools in the Catholic (non-government) sector in New South Wales (NSW) Australia, found that data are used to inform the sequence of learning and to identify and address student needs. Both quantitative and qualitative data sources are applied to make claims of improvement. Factors such as ability, gender, school role, and school sector (primary or secondary) impact the selection and use of data. Our recommendations include the need to focus on professional learning to develop practising and preservice teachers' data literacy skills, ranging from statistical literacy to the identification and selection of appropriate data to substantiate claims of improvement.

Introduction

The use of data is an imperative of schooling and a teacher's professional responsibility (Schildkamp et al., 2019). The use of data to inform learning can result in positive improvements for students, which in turn provides them with a stronger sense of wellbeing towards learning (Centre for Education Statistics and Evaluation, 2020; Mandinach & Schildkamp, 2021). The use of data, nevertheless, must be purposeful (Schildkamp, 2019), whether that purpose be to set reliable goals and targets for student improvement (Macklin & Zbar, 2017) or to make objective conclusions about school progress (Vanlommel & Schildkamp, 2019). Given this, the ability to use data from valued sources, the purpose with which data are used and the availability of effective tools to record, monitor, and report on progress are fundamental to the appropriate use of data to inform practice. There is, nonetheless, a lack of confidence and perceived reluctance to use data by teachers, particularly when data are associated with numbers and statistics (Sharma, 2017). This is clear when teachers' beliefs about their ability to use data are associated with anxiety, which may or may not have stemmed from their own classroom experiences.

In Australia, it is expected that teachers will collect and analyse a range of data to inform their decision making about student learning progress. This expectation is articulated in Standard 5.4.2 of the *Australian Professional Standards for Teachers* (APST) where teachers are expected to "use student assessment data to analyse and evaluate student understanding of subject/content, identifying interventions and modifying teaching practice" (AITSL, 2011, p. 19). Our paper investigates the data used and valued by teachers in one school system in NSW, Australia, to make decisions about student progress and aims to answer the question: What data do teachers and school leaders use and value to make decisions about student progress and school effectiveness? This is important because it is foundational to

understand the nuances of school improvement and the data used by schools to substantiate their claims of improvement.

The term data is used synonymously with information but in essence data represents the collection of measurements and observations at a particular point in time (Australian Bureau of Statistics (ABS, n.d). Importantly, data becomes information when it is embedded in a context that gives meaning and connectedness (Earl & Katz, 2006). Given this distinction data can be drawn from several sources, including numbers, words and observations, that are collected systematically for a specific purpose (Mandinach & Grummer, 2016, Mandinach & Schildkamp, 2021). In the context of education, this purpose relates to student learning progress (AITSL, 2011; Schildkamp, et al., 2017).

Teachers' use of data

Teachers vary in their approach to use data based on their confidence level, accessibility to data, time availability, and inclination (Schildkamp et al., 2017). Factors such as school sector (primary/secondary) and position on staff also determine the type of data that classroom teachers and school leaders select to inform decisions at the micro (classroom) and macro (school improvement) levels respectively, with adoption rates of data usage varying based on these factors (Darling-Hammond, et al., 2019).

Teachers' motivations to use data

Teachers are motivated to use data to inform practice and to profile student learning needs (Schildkamp, et al., 2017). Clarity of purpose by school leaders is also a key motivator which provides a focus and a rationale for the expectation to use data, but it must be supported by structures and conditions that foster data use (Bernhardt, 2018; Schildkamp, et al., 2019). Without a clear understanding of the purpose of data, teachers may not value its worth and may see the collection of data as a mere exercise in compliance. It is also critical for schools to have an effective way to record and monitor performance data (Scoular, 2018).

The measure of success

In NSW, the level of school improvement in government schools has seen a move away from the attainment of numerically based state and national targets to those that describe more holistic improvement, as indicated in the following statement “we’ll measure success by improving literacy and numeracy outcomes for all students” (Department of Education NSW, 2024a). The same can be said for other states in Australia such as Victoria, where statements about excellence in learning, as opposed to blunt targets, provide insight into their improvement approach (Department of Education Victoria, 2024). However, governments and media place national and international assessments such as the *Australian National Assessment Program - Literacy and Numeracy* (NAPLAN, 2024) and the *Programme for International Student Assessment* (PISA, n.d.) respectively, in the spotlight to highlight shortcomings in the achievement of student outcomes. These approaches by governments exacerbate tensions schools are under to improve, and lead to data being

used for accountability purposes rather than formative purposes (Mandinach & Schildkamp, 2021; Martin, 2015).

Conceptual framework

The conceptual framework for this research is based on the *Theory of Planned Behaviour* (TPB, Ajzen, 1991). In his model, Ajzen stated that beliefs are directly proportional to attitude which in turn influences the intention to achieve expected outcomes. This means that if a person believes in the usefulness of a particular course of action, then this belief will positively influence that action given certain factors. TPB is framed by three types of beliefs, beliefs about the behaviour required to produce a given outcome (behavioural beliefs), beliefs about the factors that influence performance within one's control (control beliefs) and beliefs about expectations from key groups within one's sphere of reference (normative beliefs). Synergies between these beliefs lead to the intention to embark on a particular course of action which then results in the execution of that action (Ajzen, 1991).

The TPB has been used across multiple disciplines for almost 30 years, including health, business, and education (Burns, et al., 2018). In linking beliefs and behaviour, the TPB "is one of the most powerful and widely used frameworks to predict behaviours" (p. 1092). The TPB centres on the affective domain because it investigates conditions that predict behaviour based on individual beliefs about intentions and actions (Ajzen, 1991). Ajzen (1991) stated that the "stronger the intention to engage in a behaviour, the more likely should be its performance" (p. 3).

In the context of data use, factors that would impede or facilitate data use include a person's level of confidence and competence in using data as well as believing in the value of the use of data to improve learning. Very little attention has been paid to how psychological factors such as motivations, attitudes and beliefs influence the intention to use data lead to the actual use of data and for this reason, TPB provides a conceptual framework through which to explore this phenomenon (Prenger & Schildkamp, 2018).

Method

Participants

A case study research design was adopted for the bounded context of the non-governmental Catholic schools. Case study enabled inquiry into a particular issue, data use, that could be explored within a real-life context, such as teachers' use of data in schools (Yin, 2014). The context of the case was data use within 44 selected non-government Catholic schools using four embedded units of analysis: gender (male, female), school sector (primary or secondary), years of teaching (5 years or less, 6 to 10 years, 11 to 15 years, 16 years or more), and school role (classroom/subject teacher, middle leader, assistant principal, principal). In this research, the variable school sector relates to whether the school was a primary (Kindergarten to Year 6), secondary (Year 7 to Year 12) or composite (Kindergarten to Year 12) school. This sector comprised of 36 primary

schools, seven secondary schools, and one school spanning Kindergarten to Year 12. In 2023, there were 1,764 Catholic schools across Australia with 596 of those being in NSW (Australian Bureau of Statistics, 2024). Catholic schools in NSW operate under the auspices of religious institutes. The group of 44 schools for this research are governed by one of the eleven religious institutes in NSW.

Ethics

Ethics clearance to conduct this research was obtained from the Human Research Ethics Committee, The University of Notre Dame Australia, Reference Number 016005S.

Procedure

Data were collected in two phases: survey and interview. Invitations to take part in the survey phase were sent to all schools within the identified system. Participants involved in the interview phase were selected based on their position and their responsiveness to be involved, which was indicated by either their response to the invitation on the survey instrument or by direct contact with the researcher.

The collection and analysis of data followed a convergent design mixed-methods approach (Creswell, 2015). In this model, one data source is not dependent on the other, as the data are collected concurrently and analysed separately. Statistical trends including effect size and significance of results were calculated from quantitative responses. To determine the range and descriptor for these measures, known cut offs for effect size were applied using Spearman's rho (χ^2) and Cohen's *d* (Cohen, 1988; Muijs, 2011). The interpretative analysis of teachers' personal experiences and core beliefs obtained from interview data enabled the researcher to better understand the research problem. This was achieved through a thematic analysis (TA) of interviewee responses to questions posed (Braun & Clarke, 2006).

Instruments

The survey consisted of 14 questions and the interview 13 questions. Survey questions were informed by Ajzen's advice on survey construction which provided the rationale for their alignment to the TPB domains (Ajzen, 2006). Survey questions were also informed by a Pierce & Chick (2011) study which utilised the TPB framework to target questions about teachers' intentions to use data resulting from national assessments. Interview questions were designed with the assistance of school leaders and academics, were informed by the research literature (Schildkamp et al, 2017) and subsequently aligned to the TPB framework.

Survey questions included demographic questions, such as, participants' length of teaching experience, school role, and school setting. The survey also included questions inquiring into participants' motivations to use data and their beliefs about data use. Interview questions were phrased to gather further information about the values, beliefs and

motivations of teachers and school leaders to use data so that the researcher could understand participants' narrative from their reality.

For our paper, a subset of findings from the full research is presented through discussion of findings from two survey questions and three related interview questions. The two survey questions which are the focus of this paper, sought information about teacher practices and beliefs in using five data sources: student assessment data, student attendance data, data obtained from student work samples, student wellbeing data, and information from parents. These data were selected because they represent data that are readily available to classroom teachers (Bernhardt, 2018). The two survey questions inquired into (1) the extent to which respondents agreed on the usefulness of particular data sources; and (2) the frequency with which they used particular data sources. Respondents selected from a 5-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree) to ascertain usefulness, and from a 4-point scale to ascertain frequency (always used, used to a considerable degree, occasionally used, rarely used). These two survey questions were classified as behavioural belief questions within the TPB framework because they emulate behaviours that an individual would engage in for a particular purpose.

Three lead interview questions which are also the focus of this paper, inquired into the data sources used by asking (1) If you were limited to three data sources as your 'go-to' sources, what would they be and why?; (2) What level of importance do you place on student work samples to inform learning?; and (3) Do you feel that there is an expectation from others, and who would they be, to use data to inform student learning? Student work samples were singled out as a point of inquiry in interview question 2 because the literature points to their importance in ascertaining student progress (Australian Education Research Organisation, 2021). The interview questions enabled the researcher to explore further into the range of data sources used and the reasons for their use. Interview questions (1) and (2) were classified as control belief questions within the TPB framework because they emulate actions that are within one's sphere of control. Interview question (3) was classified as a normative belief question because it emulates actions outside of one's control.

Validity and reliability

The survey was reviewed and piloted by several educators, including academic researchers who provided feedback to ascertain face and content validity. Cronbach's alpha was calculated to determine the reliability of the Likert scale used for respective questions resulting in $\alpha=0.7$. Internal validity was achieved by finding patterns in participant responses between survey and interview questions. Inter-rater reliability of qualitative data was obtained through consultation sessions with academic researchers throughout the analysis phase of the research. Construct validity was obtained by following strict protocols for data collection and analysis. These protocols ensured that the study's conceptual framework reflected the concepts being studied, that is, beliefs and practices about data use.

Analysis

The analysis of quantitative data was conducted using both descriptive and inferential statistics for each unit of analysis, those being, gender, school sector (primary or secondary), school role, and length of teaching experience. Both types of analysis were warranted because the research questions were best analysed using mathematically based methods or statistics (Muijs, 2011). The analysis of the qualitative data followed TA protocols (Braun & Clarke, 2006). The selection of this type of analysis was informed by a fit-for-purpose rationale (Cohen et al., 2005) regarding both the function and focus of this study.

Findings

Quantitative findings

Two hundred and ninety-four teachers responded to the survey, forty-three of whom were in school leadership positions. Of those who responded to the survey, 80% were female, 15% were teachers in leadership positions, classified as assistant principals or school principals, and 77% were primary school teachers, with the remaining respondents being secondary school teachers. The sample group was primarily composed of experienced teachers, with 69% indicating that they had 11 or more years of teaching experience.

The analysis of the survey questions considered the relationship between the usefulness and frequency of use placed on the particular data sources. Respondents were asked to comment on five different types of data sources: student assessment data, student attendance data, student work samples, student wellbeing data, and information from parents. A Spearman's rho (R_s) correlation test for the mean response was applied for the whole group to investigate whether the usefulness of a particular data source was correlated with the frequency with which the data source was used.

To test for significance of the mean, a *t*-test was applied regarding gender and school sector. Where significance was found, the effect size of this significance was calculated using Cohen's *d*. In a similar way, an ANOVA test was applied for the significance of means by school role and years of teaching, followed by an eta-squared test to determine the effect size of this significance. A Scheffe post-hoc test was conducted to investigate differences between groups where significance was found. The data shows the dominant group responding to each category, that is, the group aligned to the unit of analysis where the largest percentage was recorded.

Analysis by whole group

The results indicated that the five data sources considered as part of this research (Table 1) were each positively correlated and significant at the 0.01 level.

Table 1: Usefulness and frequency of use of data sources; Spearman's rho (R_s) test

Assessment data	Attendance data	Work samples	Wellbeing data	Information from parents
0.54** (strong)	0.51** (strong)	0.50** (strong)	0.43** (moderate)	0.55** (strong)

** Correlation is significant at the 0.01 level (2-tailed).

This finding suggests that teachers not only use these data sources to inform practice, but they also believe in the usefulness of these sources. Correlations between these data sources ranged from moderate to strong, with student assessment data, student attendance data, student work samples and information from parents being strongly correlated, as R_s is greater than or equal to 0.5. While these correlations are strong, they are only approximately 50% correlated. This means that a teacher's belief in the usefulness of such data sources and the extent to which they are used may be affected by other forces, such as time, access to data and ability to use data. This is supported by comments from respondents such as "time in modern teaching is the factor that prevents teachers engaging with lots of useful data on a regular basis", and "as time poor teachers I would like some professional learning on how to best collect and efficiently use data to improve my teaching and thus the learning for my students". Further, teachers suggested that "more time is needed to prepare and analyse assessment data in the teaching day" and "I feel the key concern regarding the use of data to inform teaching and learning is the teacher's ability to effectively and accurately analyse the data".

Analysis by gender

Usefulness of data source: Significance for gender for usefulness was not found. This means that gender does not influence the likelihood of preferences for the use of one type of data over another to inform student learning.

Frequency of use of data source: A modestly statistically significant effect ($d = 0.054$) was found for gender regarding student work samples and information from parents ($d = 0.324$). The data indicated that females are more likely to use these types of data sources than males for both student work samples ($F = 11.821$, $df = 261$, $sig = 0.001$) and information from parents ($F = 4.221$, $df = 261$, $sig = 0.041$). Using cross-tabs for frequency of responses shows a moderately statistically significant effect for student work samples. This means that females are more likely to use student work samples to inform student progress than males ($\chi^2 = 27.387$, $df = 8$; $pbi = 0.305$, $p = 0.001$).

Analysis by school sector (primary/secondary)

Usefulness of data source: A moderately statistically significant effect was found for student work samples ($d = 0.847$), and a modestly statistically significant effect was found for student wellbeing data ($d = 0.376$). Using the mean as the point of difference showed that primary school teachers value student work samples ($F = 41.308$, $df = 274$, $sig = 0.000$) and student wellbeing data ($F = 7.460$, $df = 272$, $sig = 0.007$) more when compared with secondary school teachers.

Frequency of use of data source: Statistical significance for the mean was found for student work samples and student wellbeing data for the frequency with which data are used. This finding was strong ($d = 1.515$) for student work samples and moderate ($d = 0.419$) for student wellbeing data. Using the mean as the point of difference indicated that for both types of data, primary school teachers are more likely to use student work samples ($F = 5.818$, $df = 263$, $sig = 0.017$) and student wellbeing data ($F = 4.189$, $df = 264$, $sig = 0.042$) more frequently compared with secondary school teachers.

Using cross-tabs for analysing group differences, responses show statistically significant effects for student assessment data ($\chi^2 = 39.083$, $df = 4$, $phi = 0.365$ (moderate), $p = 0.000$), student work samples ($\chi^2 = 83.170$, $df = 4$, $phi = 0.532$ (strong), $p = 0.000$), student wellbeing data ($\chi^2 = 14.432$, $df = 4$, $phi = 0.222$ (modest), $p = 0.006$), and information from parents ($\chi^2 = 36.139$, $df = 4$, $phi = 0.351$ (moderate), $p = 0.000$). The effect of this significance ranged from modest to strong. In each case, teachers from primary schools were the dominant group in terms of the frequency with which the data source was being used. While these data are used in secondary schools, the rate with which the data are used is not as great in comparison to primary schools.

Analysis by school role (principal, assistant principal, middle leader, classroom/subject teacher)

Usefulness of data source: A weak statistically significant effect was found for the usefulness of student assessment data ($F = 3.169$, $df = 3$, $p = 0.025$, $\eta^2 = 0.034$) and student attendance data ($F = 3.139$, $df = 3$, $p = 0.026$, $\eta^2 = 0.034$) between groups. While significance between groups was found, the post-hoc Scheffe test showed that the variance between means was not significant for individual groups.

Frequency of use of data source: Weak statistical significance between groups was found for student assessment data, student attendance data, student work samples, student wellbeing data and information from parents regarding the frequency with which these data sources are used.

Using a post-hoc Scheffe test for differences between groups showed that the difference in means was significant for multiple groups. The analysis showed that: (a) assistant principals are significantly more likely to use student assessment data frequently than middle leaders ($p = 0.045$) and (b) principals are significantly more likely to use student attendance data than classroom teachers ($p = 0.001$) and middle leaders ($p = 0.004$). Groups more likely to use information from parents over other groups are (a) principals over middle leaders ($p = 0.011$), (b) assistant principals over middle leaders ($p = 0.028$) and (c) classroom teachers over middle leaders ($p = 0.001$). While the ANOVA test showed significance for the frequency of use of student work samples and student wellbeing data, significant differences between groups were not found using the post-hoc Scheffe test. A slight pattern in these findings implies that those holding leadership positions as either principal or assistant principal are more likely to frequently use a range of data sources to inform learning and teaching compared with those in other groupings.

Analysis by years of teaching

Usefulness of data source: As was the case for gender, significance for years of teaching was not found. This means that the number of years teaching does not influence the likelihood of preferences for the use of one type of data over another to inform student learning.

Frequency of use of data source: A weak statistically significant relationship was found for the frequency with which student attendance data were used between groups ($F = 2.842$, $df = 3$, $p = 0.038$, $\eta^2 = 0.032$). Upon further investigation using a post-hoc Scheffé test, no significant difference was found for any one group with respect to length of teaching experience. Additionally, no significant difference was found in the frequency of responses using cross-tab analysis.

Qualitative findings

Twenty school leaders from 16 schools within the school system participated in the interview phase of this research. Twelve were from primary and the remainder were from secondary schools. Twelve held the position of school principal (three secondary school and nine primary principals), six were assistant principals (three in primary schools and three in secondary schools), and two were leaders of curriculum in secondary schools. Each was an educator with at least 10 years' experience in a school leadership position. Seven interviewees were male and thirteen were female. Interview data were analysed using a thematic approach to determine common themes, ideas and interpretations. The data were collated in frequency tables and represented as percentages.

Interview question 1: If you were limited to three data sources as your go-to sources, what would they be and why?

Two themes were drawn from the range of responses. The first related to the type of data named and the second to the rationale for its use. Regarding the first theme, 11 interviewees named both qualitative and quantitative data. Qualitative data sources, generally formative data, included student observations, teacher "gut feel", student wellbeing data, and data about a family's context. "Teacher gut feel" was a specific phrase used by two primary principals to indicate the value of a teacher's intuition or feeling about a student's learning progress. Qualitative data sources also included information recorded on student individual learning plans and day-to-day conversations. The first data source that interviewees named predominately related to quantitative data. Generally summative, quantitative data sources included standardised assessment instruments such as the Mathematics Assessment Interview (MAI), National Assessment Program - Literacy and Numeracy (NAPLAN), Higher School Certificate (HSC) and the suite of Progressive Achievement Tests (PAT) assessments.

The top data sources for primary schools were NAPLAN, PAT and MAI and for secondary schools, NAPLAN and HSC data (see Appendix 1 for definitions of terms). Differences between primary and secondary schools were found. Primary school leaders named a more varied range of go-to data sources and included a greater variety of qualitative data sources in their responses. Secondary school leaders named a greater

variety of quantitative data sources than primary school leaders. Table 2 shows the frequencies of the number of times a particular data source (or data term) was named by the interviewee.

Table 2: If you were limited to three data sources as your go-to sources, what would they be and why?

Data category	Data source		Frequency of response (% of sector)		
	Go-to data sources are ...		Primary	Secondary	Group
Quantitative data	1.	NAPLAN	4 (10%)	6 (29%)	10 (16%)
	2.	PAT	8 (20%)	1 (5%)	9 (15%)
	3.	MAI	9 (23%)		9 (15%)
	4.	HSC/RAP analysis		5 (24%)	5 (8%)
	5.	Best Start	2 (5%)		2 (3%)
	6.	Student semester reports		2 (10%)	2 (3%)
	7.	Literacy continuum	1 (3%)		1 (2%)
	8.	Single word spelling test	1 (3%)		1 (2%)
	9.	z-scores		1 (5%)	1 (2%)
	10.	Student surveys		1 (5%)	1 (2%)
	11.	Assessment and reporting data		1 (5%)	1 (2%)
Qualitative data	(1)	Observational survey and related running records	4 (10%)		4 (7%)
	(2)	Teacher observations	2 (5%)	2 (10%)	4 (7%)
	(3)	Student work samples	2 (5%)	2 (10%)	4 (7%)
	(4)	Teacher gut feel	2 (5%)		2 (3%)
	(5)	Notes retained in student management systems	1 (3%)		1 (2%)
	(6)	Student individual plans	1 (3%)		1 (2%)
	(7)	Student self-screeners	1 (3%)		1 (2%)
	(8)	Individual student learning plans	1 (3%)		1 (2%)
	(9)	Conversations with teachers about students	1 (3%)		1 (2%)
Total (may not total exactly to 100% due to rounding)			40 (100%)	21 (100%)	61 (100%)

Note: Mathematics Assessment Interview (MAI), National Assessment Program - Literacy and Numeracy (NAPLAN), Higher School Certificate (HSC), Progressive Achievement Tests (PAT), Results Analysis Package (RAP) (see Appendix 1 for definitions of terms).

An investigation into why a particular data source was used led to the second theme. Interviewees were able to articulate the purpose or rationale for each data source easily, and they gave examples where a particular dataset was used to help the school understand students' needs in terms of how they were progressing in their learning. Specifically, quantitative data sources from standardised assessments provided valuable, reliable, and specific information by student, and qualitative data sources provided valuable information to help understand the whole child and to see what was happening on a day-to-day basis. It also provided valuable information to share with parents.

Regarding quantitative data, standardised test data such as NAPLAN, was not always considered useful. One primary school principal indicated that NAPLAN is a necessary evil but that it provides valuable holistic information about students.

NAPLAN has to be, even though I don't like it, NAPLAN has to be one because it does give you a bigger picture of the types of questions that the children can't answer. (Interviewee E)

One secondary school assistant principal indicated that the Results Analysis Package (RAP) is of value to investigate areas of student weakness with high-mark HSC questions:

I believe RAP [for HSC analysis], because it tells you where you're hitting the mark with your teaching and where you're not. So I think even though it is retrospective data, because it's telling us how a cohort has gone in an exam, it informs where the trends are in your teaching. (Interviewee D)

Regarding qualitative data, one primary school principal was emphatic that this type of data was more valuable than quantitative data because it provided foundational information about students:

Well, I think as a must, akin to a building getting out of the ground, you need to know the foundational stuff, so I would think as an absolute must, you must have running records, particularly in K–2 because you do need to know how kids are learning, how they're sourcing their information and how they're deriving and understanding, and I think running records are the best measure for that. (Interviewee J)

The breakdown of data sources and their rationale for use is shown in Table 3.

Comments made by principals during the interviews also focussed on their own ability and teachers' ability to use data. Of the twenty principals interviewed, 11 principals indicated that they would not rate themselves highly, using words like "low" or "low to medium", "medium" with one principal being unsure of their ability. Only two principals considered their ability to be "very high". Five principals offered comment about their staff members ability to use data, and in each case, the principal's perception of staff resulted in a lower rating than they had rated themselves. Principals indicated that there is a need to make professional learning opportunities available for teachers to upskill in data literacy. Eleven principals indicated that these opportunities should focus on the application of data to classroom practice. Primary school principals indicated the need for professional learning on data analysis to a much greater extent than with secondary school principals.

Interview question 2: What level of importance do you place on student work samples to inform learning?

Two themes emerged. First, data from student work samples were valued by leadership and primarily used to profile student needs and to plan accordingly. Second, while student work samples were valued by school leaders, they may be an underused form of data or an undervalued form of data by teaching staff. These results were consistent across the primary and secondary school respondents. Most responses (nine primary school

respondents and six secondary school respondents) indicated that student work samples were a key data source and were placed high on the list of priorities when inquiring into student progress and to plan according to students' needs (Table 4).

Table 3: Rationale for use of particular data sources

Data category	Data type (listed for those that returned the greatest number of comments) and rationale for use
Quantitative data	<ul style="list-style-type: none"> National Assessment Program - Literacy and Numeracy (NAPLAN): provides information about trends and comparisons; useful to triangulate with other data Mathematics Assessment Interview (MAI): provides information about individual student needs; links to the curriculum and describes logical sequential points in the learning path Progressive Achievement Tests (PAT): provides norm referenced data; is simple to administer; is a reliable, rigorous assessment; gives individual student information; links to the curriculum and describes logical sequential points in the learning path
Qualitative data	<ul style="list-style-type: none"> Running records: provides information to help the teacher understand the student's learning needs as they read Observations: provides useful information about what is happening in the classroom; an excellent data source to use with parents Student work samples: provides information about student performance on a daily basis

Note: Mathematics Assessment Interview (MAI), National Assessment Program - Literacy and Numeracy (NAPLAN), Progressive Achievement Tests (PAT) (see Appendix 1 for definitions of terms).

Table 4: What level of importance do you place on student work samples to inform learning?

Level of importance placed on student work samples is ...	Student work samples are used to ...	Frequency of response (% of sector)		
		Primary	Secondary	Group
Low	profile students and plan learning accordingly	1 (9%)		1 (6%)
Medium	profile students and plan learning accordingly	1 (9%)		1 (6%)
High	profile students and plan learning accordingly	5 (45%)	2 (29%)	7 (39%)
	determine evidence of learning		1 (14%)	1 (6%)
	determine evidence of learning and/or underused/ undervalued form of data	2 (18%)	1 (14%)	3 (17%)
	inform reporting and feedback	2 (18%)	2 (29%)	4 (22%)
Unsure	profile students and plan learning accordingly		1 (14%)	1 (6%)
Total (may not be exactly 100% due to rounding)		11 (100%)	7 (100%)	18 (100%)

While only three interviewees commented that student work samples may be an undervalued or underused form of data, this is important. Two primary school and one secondary school interviewee rated work samples as having a *high* value but also stated that they were undervalued, potentially by staff, and that their worth was underestimated as a reliable source of data. Problems associated with tracking qualitative data were identified as a probable barrier. One response, which was reminiscent of others, indicated that

... qualitative data has been put to the side over the last ten years, and we're poorer for it, so I think student work samples is qualitative data ... but it's vital ... you can't be without it" (Interviewee I; primary principal).

A primary principal summed up the value placed on student work samples:

You as a teacher need to know what to do, what's the next step from that kid, and you'll only get that from what the kid's producing, that is, their work samples (Interviewee J).

Interview question 3: Do you feel that there is an expectation from others, and who would they be, to use data to inform student learning?

One theme resulted in the response to this question, that being, that there are expectations to use data from a range of sources, however while this was true, this expectation does not drive its use. Rather, data is used because of an inherent belief that it is the right thing to do to inform teaching and learning.

Ten interviewees stated that there was an expectation (8 primary and 2 secondary), one secondary school principal did not agree that there was an expectation to use data, the remainder of interviewees were mixed in their opinion about the expectation to use data. One secondary school assistant principal indicated emphatically that there was no pressure to use data from any source. This interviewee also indicated that the need to use data to inform learning and teaching is an intrinsically good thing:

I don't think I feel under pressure ... maybe because I think it's such a good thing to do, so maybe I probably think that we could be doing more of it! So, no, I don't feel under pressure (Interviewee C).

One primary school principal indicated that they use data not as a compliance exercise but to improve learning (Interviewee R). This sentiment was echoed by another primary school principal, who stated that using data "qualifies what they [teachers] are doing ... what they have achieved" (Interviewee L). One secondary school assistant principal stated that

...it's a healthy expectation... it professionalises us... because we are able to show parents the data... because it anchors the conversation and make it [the discussion] unemotional (Interviewee D).

Sources of expectation were grouped in categories naming the school system, the government, parents and the school itself (Table 5).

Table 5: Sources of expectation

Source of expectation is from ...	Frequency of response (% of sector)		
	Primary	Secondary	Group
School system	12 (39%)	5 (25%)	17 (33%)
Government	10 (32%)	6 (30%)	16 (31%)
Parents	5 (16%)	2 (10%)	7 (14%)
School	4 (13%)	7 (35%)	11 (22%)
Total (may not be exactly 100% due to rounding)	31 (100%)	20 (100%)	51 (100%)

The data (Table 5) shows that interviewees perceived the greatest expectation to be from external bodies such as the school system and the government. There were differences between primary and secondary schools with primary schools seeing this expectation coming from the school system and secondary schools from the school itself. School leaders worked with and shared information about the data obtained from standardised tests, for example, NAPLAN and the HSC, and discussed the ramifications of their findings with teachers irrespective of external pressures.

Discussion of findings

Findings concurred with the previously identified underlying conditions in teachers' use of data, stemming from clarity of purpose and a teacher's ability to use data (Bernhardt, 2018; Schildkamp, 2019).

The five data sources (student work samples, assessment data, attendance data, wellbeing data, and information from parents), were considered valuable and were used frequently. School leaders indicated that analysis of quantitative data sources from standardised test data was efficacious given the way they were presented and displayed in user-friendly formats. Quantitative data were able to provide information about student performance at an endpoint. The analysis of the qualitative data from formative sources, was not as prevalent in the comments of interviewees and was reported as being difficult to manage due to issues in recording and tracking such data. Findings substantiated by high means and strong correlations for four of the five data sources (assessment data, attendance data, work samples, and information from parents) suggest that teachers see the purpose in using a wide range of data sources to inform learning and teaching. This finding concurs with the literature that teachers use data to inform practice and to profile student learning needs (Schildkamp et al., 2017).

Valued quantitative data sources focused on standardised external test data such as the Australian NAPLAN and the HSC. The rationale given was that it gives good information about school trends and student growth, and it is data that can be relied upon. Valued qualitative data sources focused on data that provided day-to-day information about student progress such as student work samples. While this research focused on a small sample of schools, the findings align with the literature on data use in schools (Mandinch & Schildkamp, 2021; Schildkamp et al., 2017). The reference leaders made to teacher gut-feel being a valued data source was also corroborated previously (Vanlommel &

Schildkamp, 2019), indicating that teachers often make decisions about student progress intuitively, rather than using objective data sources.

The usefulness of specific data sources were shown to be positively correlated with their frequency of use. The intention to use data was, therefore, coupled with the value teachers placed on it. While teachers valued the use of data to inform the learning “because it is the right thing to do” (Interviewees H and M) since data “gives direction and purpose” (survey respondent), they were also constrained by factors such as time and expertise. These barriers continued to surface as evidenced through participant comments and confirmed in related research (Schildkamp, 2019). Attitudes towards factors within teachers’ control, factors outside their control, factors that determine behaviours and attitudes coalesce, culminating in the extent to which data are used irrespective of the value placed on this.

Student work samples were used to track and monitor performance, to profile student needs, and to inform next steps in the teaching and learning cycle. Both formative and summative data sources were found to be valuable if clarity about the use of these data was evident and systems to access and display these data were available. Teachers were more than willing to use data but felt constrained by their perceived own ability and a lack of time. Findings also found that teachers used data because of an inherent belief that it is the right thing to do; consequently, they are not influenced by external expectations.

While there was a level of confidence with some teachers in their use of data and to make decisions with data, respondents indicated a need to engage in further professional learning to improve levels of self-confidence and competence. The provision of continuing professional learning opportunities for both classroom teachers and school leaders alike was perpetual and highlighted in other studies (Schildkamp, 2019). The challenge for educators is to find ways to continue to work with data in demanding work environments, develop skills in analysing data and make informed decisions from this analysis for improved student outcomes using a range of measures. This challenge is compounded by the desire to bridge the divide between data accessed from big databases and that which is closest to instructional need.

While this research confirmed some previous findings, it further found factors such as gender, school role, and school sector (primary or secondary) impact beliefs and motivations to move from an intention to use data to the actual use of data to inform teaching and learning. The literature had not previously shed any light on findings between genders for aspects of data use; however, school sector and school role, particularly the role of the school leader, is substantiated in the literature as an influencing factor on data (Hayes & Lee, 2018; Schildkamp et al., 2015). The data from this research found that females over males, primary school teachers over secondary school teachers, and those in leadership positions in schools were more likely to use a greater range of data sources because of the value they placed on them.

There is a growing interest in the beliefs and motivations to use data (Prenger & Schildkamp, 2018). This research adds to this body of knowledge by exploring how

factors such as age, gender, length of teaching experience and school sector (primary or secondary) impact beliefs and motivations to move from an intention to use data to actual use of data to inform teaching and learning.

Conclusion

Our paper provided insight into the data teachers and school leaders use and value to monitor student progress. It also provided insight into why particular data was used over other data. While statistically significant differences were found between gender, primary and secondary schooling and school role, what is clear and common across groups is that data are used to monitor and track student progress, to profile student needs and to inform learning sequences.

Findings were consistent with the TPB in that synergies between domains were found, leading to the intention to use data. This was shown in the strong correlations in responses from the two survey questions (behavioural beliefs), and from the three interview questions where principals provided clarity about their preferred data sources (control beliefs) and the expectation to use data (normative beliefs). This means that the behaviour to use particular data is grounded in the belief that the data are valuable to inform the learning, that this data will be used given its relevance and accessibility, and that data use is not impeded by any external pressure to use data.

Data-informed decision-making is becoming more prevalent to create effective evidence-based strategies for school improvement. However, the level of an individual's capacity to use data is a significant determinant in using data. This study explored the viability of teachers accessing and using different data to inform their teaching. Findings showed that teachers and school leaders use data more effectively when favourable circumstances, such as time, access, and ability, are present.

These have both policy implications for school systems, ongoing professional learning for teachers and preservice teacher preparation, and implications for further research. We suggest that school systems focus on supporting teachers in their selection and use of data to implement processes to effectively measure student improvement. Extensive and ongoing professional experience should support teachers and schools in decision-making regarding the selection and use of evidence-based data. Teacher preparation should also allocate sufficient time to prepare teachers for being able to identify, apply, and utilise evidence-based data for effective teaching and learning. It is further recommended that systems invest research funds to ascertain how best to record, track, and monitor qualitative data to complement existing and emerging quantitative data sources.

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Appendices

Appendix 1: Definitions and descriptions

Australian Professional Standards for Teachers (APST)	A listing of mandated professional standards for all teachers in Australian schools [https://www.aitsl.edu.au/standards]
Best Start	A literacy and numeracy assessment administered to Kindergarten during their first five weeks of school in NSW Australia [https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/assessment-resources/best-start-kindergarten]
Literacy continuum	Developed by the Australian Curriculum Assessment and Reporting Authority (ACARA) [https://www.acara.edu.au/home], the literacy continuum provides a scaffold that enables teachers to assess students' literacy skills along a continuum of learning [https://www.australiancurriculum.edu.au/media/3596/general-capabilities-literacy-learning-continuum.pdf]

Higher School Certificate (HSC)	The final year exit credential for students in Year 12 in NSW, Australia [https://www.nsw.gov.au/education-and-training/nesa/hsc/about-the-hsc]
Mathematics Assessment Interview (MAI)	MAI is used in several schools in Australia to assess student ability in mathematics syllabus strands by allocating a <i>growth point value</i> [e.g. https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/maths/assessment/Pages/mathsgrowthpoints.aspx] according to student responses to specific questions [e.g. http://maryannesammutseportfolio.weebly.com/uploads/2/8/7/4/28745555/interview_transcript.pdf] [e.g. https://hive.ceob.edu.au/mai-resources-1]
NSW Education Standards Authority (NESA)	The body in NSW responsible for school registration and accreditation, syllabus development, teacher accreditation and HSC test development [https://www.nsw.gov.au/education-and-training/nesa]
National Assessment Program - Literacy and Numeracy (NAPLAN)	An assessment in literacy and numeracy for Australian school students in Year 3, Year 5, Year 7 and Year 9 [https://www.acara.edu.au/assessment/naplan]. Developed and administered by ACARA [https://www.acara.edu.au/]
Programme for International Student Assessment (PISA)	An international assessment administered by the Organisation for Economic Co-operation and Development (OECD) that assesses students' abilities in mathematics, science and problem solving. It is conducted every three years and is administered to 15-year-old students [https://www.oecd.org/en/about/programmes/pisa.html]
Progressive Achievement Tests (PAT)	The PAT tests, administered by the Australian Council for Educational Research (ACER), are diagnostic tests that assess students' skills and understanding in a range of key learning areas [https://www.acer.org/au/pat]
Results Analysis Package (RAP)	RAP is a database of student responses in HSC examinations. It allows comparison of data by student, course and school [https://www.nsw.gov.au/education-and-training/nesa/hsc/results-and-certificates/school-services/analysis-package]
Single word spelling text	A spelling test assesses the spelling of single words that are part of everyday language. Originally developed in the United Kingdom [https://assessment.tki.org.nz/Assessment-tools-resources/Selecting-an-assessment-tool/Browse-assessment-tools/English/Spelling/Single-Word-Spelling-Test-SWST/]
Student assessment data	Data generated from students as a result of a class assessment that provides information about what they learned
Student attendance data	Data generated from daily attendance records that provides information about students' attendance patterns
Student wellbeing data	Data generated about student wellbeing that provides information their needs
Student work samples	A record of student work that shows their understanding about a concept or idea
Student information from parents	Any information from parents that support a child's learning trajectory
z-scores	A statistical measure used to determine the magnitude of the difference of scores from the mean

Appendix 2: Survey questions relating to practices and beliefs about using data

SQ1: Please indicate the extent to which you agree with the following statements	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
a. Student assessment data is a useful data source in informing learning and teaching					
b. Student attendance data is a useful data source in information learning and teaching					
c. Student work samples are a useful data source in informing learning and teaching					
d. Student wellbeing data is a useful data source in informing learning and teaching					
e. Information from parents on their child's progress is a useful data source in informing learning and teaching					
SQ2: Please indicate the frequency with which you use particular data sources to inform and improve teaching and student learning (4-point scale to ascertain frequency: always used; used to a considerable degree; occasionally used; rarely used).					
a. Student assessment data					
b. Student attendance data					
c. Student work samples					
d. Student wellbeing data					
e. Information from parents on their child's progress					

Appendix 3: Interview questions relating to practices and beliefs about using data

IQ1: If you were limited to three data sources as your 'go-to' sources, what would they be and why?

- IQ2: What level of importance do you place on student work samples to inform learning?
- IQ3: Do you feel that there is an expectation from others, and who would they be, to use data to inform student learning?

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