

Rapid Evidence Review Summary Paper

Subject: The Effective use of Data for Improvement in Education

Education Scotland undertook a rapid evidence review of literature on the effective use of data for improvement in local authorities, schools and settings. The review draws upon a relatively small sample of relevant national and international research. It is therefore limited in scope and is primarily intended to support discussion and reflection.

The review focused on finding out how schools and local authorities effectively:

- identify types of data to use for improvement;
- use data for school improvement and improved outcomes for learners;
- train staff at all levels to use data for school improvement;
- create an effective data culture;
- develop and implement effective policy, guidance and processes around the effective use of data; and
- spread and sustain effective data for improvement practice.

Approximately 70 articles or texts were reviewed. These covered the period from 2003 to 2023 and were gathered from the following contexts: Scotland, the wider UK, Europe, Canada, the USA, New Zealand and Australia. Priority was given to peer reviewed articles, identified from the following databases:

- Idox Knowledge and Evidence (Scottish Government library);
- Google advanced search including a specific search of: Education Scotland, Scottish Government, Education Endowment Foundation (EEF), The National Foundation for Educational Research (NFER), Scottish Educational Research Association (SERA), British Educational Research Association (BERA), Department for Education (DFE) and Education Wales;
- The National Library of Scotland; and
- The General Teaching Council of Scotland (GTCS) research database.

Articles and recommended texts from The Children and Young Peoples Improvement Collaborative (CYPIC) and the Education Scotland *Self Evaluation for Continuous Improvement* (SECI) programme were also referenced.

Key findings were analysed and have been summarised into 6 main themes:

- I. Establishing the purpose and use of data
- II. Defining and classifying data
- III. Creating effective processes and systems
- IV. Interpreting and analysing data
- V. Developing a data informed culture
- VI. Using data for improvement

The main conclusions from each theme are outlined below. This is followed by a glossary of key terminology.

I. Establishing the purpose and use of data

Key findings

- Data and evidence should be used for a range of purposes by educators at all levels in the system.
- Data is everyone's responsibility; it should be used continuously and embedded throughout each stage of the school improvement cycle.
- Data can be used to:
 - plan, implement, track, monitor, review and evaluate the impact of improvement activity;
 - identify individual or group needs and inform universal, targeted and intensive support;
 - encourage practitioner reflection and influence pedagogy/practice;
 - report, ensure accountability, and inform key stakeholders who may support and influence improvement.
- Educators should be clear about the link between whole school or local authority data and classroom practice, including targeted interventions.
- 'Small data' such as Assessment for Learning (AfL), jotters, observations and reading records 'moves' or directly influences 'big data' such as Achievement of a Curriculum Level (ACEL) or stretch aims data.
- It is important that classroom practitioners understand the connection between the 'big' whole school data and the 'small' classroom data.
- Data can be utilised to identify key metrics that may help to predict and mitigate against whole school or subject underperformance. Metrics will include attainment and achievement but may also include others such as staffing, resources and leadership capacity.
- Educators should be aware of the strengths, limitations and potential bias of data. For example, '95% of parents said X but only 50% completed the survey'.

II. Defining and classifying data

Key findings

- It is important to develop a shared language. This should be embedded and modelled at all levels of the system. Acronyms vary and should be explained.
- There should be clarity around what is meant by the terms 'data', 'evidence' and 'research' and how these interact with each other for school improvement.
- Key terms should be shared and defined such as: attainment, achievement, progress, value added, statistical significance, triangulation, summative, formative, quantitative, qualitative, triangulation, intersecting data, demographic data, perception data, input data, output data, trends, patterns, range and variation.
- Time should be taken to ensure that all educators, learners, partners and key stakeholders understand key terminology as appropriate and necessary to each role.
- Data for improvement can be classified as demographic, input, output, and perception.
 - Demographic data refers to data organised by key learner characteristics such as male, female, or the Scottish Index of Multiple Deprivation (SIMD).
 - Input data refers to data or evidence that captures the provision or pedagogical approaches received by learners.
 - Output data refers to data or evidence that demonstrates the impact or outcomes for learners. This may be 'big' data such as Achievement of a Curriculum for Excellence Level (ACEL) or 'small' data such as work in jotters or ongoing reading assessments.
 - Perception data represents the perceptions or views of key stakeholders including learners, families, partners and educators.
- More effective schools or settings ensured that they looked at data by key demographic groups and characteristics including: boys, girls, English as an Additional Language, Black

Minority Ethnic, Free School Meals, Care Experienced, Additional Support Needs and those learners 'at risk' of underperformance or poor outcomes.

III. Creating effective processes and systems

Key findings

- It is important to be clear about which data to gather, how this is collected and by whom. Consideration should be given to streamlining wherever possible. Collection should not outweigh use.
- Data must be accurate and procedures should be built in to allow data to be regularly checked and updated.
- Digital solutions and data specialists should be utilised to provide support and expertise in efficiently gathering and organising data for analysis.
- It is important that data and educational specialists work in partnership to ensure a shared understanding of roles, expectations and intended outcomes. The most effective schools and local authorities placed value on ensuring time was set aside for these colleagues to work together.
- Consideration must be given to how data collection or the 'data cycle' fits into the improvement cycle.
- Tracking systems should be intuitive and minimise workload, but sophisticated enough to allow educators to explore patterns and trends and understand needs. For example, users should be able to filter attainment by demographic groups, subjects, cohorts and attendance information.

IV. Interpreting and analysing data

Key findings

- Educators often report a lack of confidence in the statistical and analytical interpretation of data and should be supported to develop relevant skills and knowledge.
- Educators often report a lack of knowledge or skills in specific areas including: IT skills, interpretative skills and content knowledge.

Identifying key measures

- Educators should be familiar with a range of key measures.
- Measures can be classified as 'outcome', 'process' or 'balance'.
- Measures should be embedded into improvement plans and baselines established.
- Qualitative measures may be limited to surveys and questionnaires. Additional methods should be utilised as appropriate such as pupil profiling, focus groups or content analysis.
- Formative assessment or frequent but 'lower stakes' diagnostic assessment can have a more direct impact than less frequent, 'higher stakes' summative assessment.
- Schools and settings sometimes report difficulty in tracking the progress of learners with complex needs. Metrics and measures don't always 'fit' and consideration should be given to ensuring appropriate measures and tracking are in place for this group.

Observational or statistical interpretation of data

- Local authorities can support schools and settings with summative analysis through the provision of data profiles or data packages. Consideration should be given to ease of interpretation, relevance and the best timeframes for material to impact on improvement.
- Local authorities can also support schools with tracking systems, statistical analysis, professional learning, policy, guidance, frameworks and advisory visits that support interpretation.

- Educators can be supported through the use of language or an analysis framework. This should help them to draw out observational statements such as: 'X has increased by X% since X' or 'there is a gap of X% between X and X' or 'I notice an upwards trend in X.
- Looking at 'live' or current data was found to be most beneficial for improvement. The most effective schools did not wait for local or national aggregation.
- Educators should gather and analyse improvement data frequently and look for patterns, trends and variation. This can then be immediately reflected on and responded to.
- It is important to understand variation in data, when it is to be expected and when it may indicate that a change has occurred.
- Statistical significance is important. For example, 1 child in a class of 10 is more statistically significant than 1 in a class of 35.

Analytical interpretation of data

- It is important that leaders and practitioners are able to interrogate data in order to be able to make comparisons and identify trends and patterns across cohorts, over time and for specific demographic groups including learners with key characteristics.
- The most effective schools also look at data in terms of those learners who may be 'at risk' or 'borderline' for their age and stage. This was found to be effective for targeting and closing gaps.
- It is important to intersect data and evidence to understand why a pattern, trend or gap exists. For example, if writing is identified as an area of low attainment in a primary school educators may look at a variety of data and evidence to understand 'who' and 'why?'
- Classroom practitioners should be supported to make the connection between high level data, whole school or departmental data and classroom level data, pedagogy and provision.
- The role of Assessment for Learning (AfL) is key to improvement in the classroom. AfL strategies can be utilised to engage learners in understanding their progress.

Using comparator data

- Schools and settings should utilise local and national comparator data to: share practice, reflect on their own progress, consider alternative and more effective approaches, create a culture of curiosity around data and encourage dialogue and reflection.
- Research from the London City Challenge found that some schools were not utilising data within their family or cluster groups effectively. Providing a clear rationale for data sharing activities alongside modelled application opportunities increases the chance of success.
- Research shows that between-class variation in learner outcomes is typically much greater than the variation between schools. It is also important to consider how data is looked at and compared internally as well as externally.

V. Developing a data informed culture

Key findings

Roles and expectations

- It is important that data for improvement is understood and utilised at all levels. This includes classroom practitioners and support staff. Improvement happens closest to children and young people. Leaders should avoid 'data gatekeeping.'
- Clear policies, frameworks and governance can help to clarify roles and expectations
- Local authorities can support schools and settings in a range of ways including: policies, frameworks, guidance, tracking systems, professional development and data profiles/packages. It is important to consider data literacy levels when implementing.

- Establishing data co-ordinators, leaders or champions can help to drive data literacy and the effective use of data for improvement.
- Building the capacity of middle leaders to lead on data for improvement has been found to be effective particularly in secondary settings and larger primary settings.
- Leaders have a key role in facilitating the effective use of data for improvement including:
 - auditing needs
 - ensuring there are clear systems and processes
 - co-ordinating appropriate training and development
 - utilising extended leadership including middle leaders
 - developing accountability and governance structures
 - fostering a positive data culture
 - ensuring data is shared and time is provided for interpretation and analysis

Creating a positive culture

- Utilising different types of data to share data stories can 'win over' people to an improvement approach. Qualitative data provides depth and 'wins hearts' whilst quantitative data provides statistical data that can 'win minds'.
- Psychological factors can impact data literacy including an over reliance on "felt" knowledge and perceived ownership or control.
- It is vital to provide time for collaboration and discussions around data. These should be formal and informal. Discussions can be supported by the use of a frame such as introducing a 'data driven dialogue' approach.
- Foster a 'high challenge, low threat' approach to data. Rigour and pace should be present but this should be balanced by collaboration, empowerment, transparency and safe spaces to reflect and address identified issues.
- Encouraging practitioner enquiry can provide an opportunity for practitioners to positively engage with data for improvement.

VI. Using data for improvement

Key findings

- Data and evidence should be used to inform improvement planning. Effective schools develop clear improvement and data cycles. They also support the universal ownership and involvement in data by all staff and key stakeholders at an appropriate level.
- Data does not make improvement decisions but once organised, interpreted and analysed it should inform action. Educators should ask, "what are the next steps?" or "how can this inform improvement?"
- Data should be used to challenge perceptions and assumptions. Effective schools are not over reliant on 'felt knowledge'. Decisions are data informed and evidenced based.
- Data driven dialogue approaches can support all staff to engage in data and also provides an effective framework for analysis and action planning.
- It is important that learners are involved and engaged with data. Schools had increased success in improving outcomes where learners were more involved in target setting, progress, feedback and review.
- Using data to inform target setting at all levels is important. However, time must be taken to ensure that links are clear. For example, schools should consider how a whole school reading target links to an individual learner or group reading target.
- Time should be allocated to ensure that teacher professional judgements are secure. Moderation opportunities should be formal and informal and take place between internal and external colleagues.

Appendix I: Glossary of Terms

Achievement refers to the totality of skills and attributes embedded within the four capacities of Curriculum for Excellence and developed across the curriculum in school and through learning in other contexts [How good is our school? \(4th edition\) \(education.gov.scot\)](#)

Attainment refers to the measurable progress which children and young people make as they progress through and beyond school. This progress is measured in relation to curriculum areas and in the development of skills for learning, life and work. [How good is our school? \(4th edition\) \(education.gov.scot\)](#)

Big data can refer to large scale assessment and achievement data that are collected and collated, often at a national or international level. Examples include: international student assessments, national education statistics, various large scale surveys etc. Large data sets can be analysed to reveal patterns, trends and associations or correlations.

Data analysis involves examining information and breaking it down for understanding and meaning.

Data collection refers to the gathering of information from a variety of sources.

Data culture is the collective behaviours and beliefs of people who value, practice and encourage the use of data to improve decision-making. [Data culture | Using technology & culture to drive business decisions | Tableau](#) and [Data Culture: What It Is And How To Make It Work \(forbes.com\)](#)

Data driven dialogue is a structured process for reviewing data and managing data discussions. It consists of 5 phases: *Prediction, viewing the data, observation, inferences* and *next steps*. The data driven dialogue process builds awareness and understanding of viewpoints, beliefs, and assumptions about data while suspending judgments. The phases of data-driven dialogue assist individuals/groups in developing a shared understanding of data through achieving a clarity of focus. [data driven dialogue.pdf \(schoolreforminitiative.org\)](#)

Data literacy refers to the ability to explore, understand and communicate with data in a meaningful way. [Data literacy explained: Definition, examples & more | Tableau](#)

Data science refers to visualising data, summarising it in various ways or using it to predict events or outcomes. It usually consists of gathering large sets of data, using computer algorithms to find patterns in the data. Those patterns are then used to understand processes or make predictions in order to plan for and respond to events. [Using Data Science in Policy | The Behavioural Insights Team \(bi.team\)](#)

Data synthesis involves examining multiple sources of information in order to create a coherent picture through the identification of patterns, connections and relationships.

Demographic data – descriptive information about the school community, such as SIMD, FME, attendance, exclusions, EAL, ASN etc. [Multiple Measures \(ed.gov\)](#)

Evidence can be considered to be information used to demonstrate impact and to support decision making. Evidence can be data, in many forms, and also the knowledge base about what works. [Developing and implementing an explicit school improvement agenda \(acer.edu.au\)](#)

Formative refers to processes by which teachers and learners use information about student achievement to make adjustments to the students learning to improve their achievement. [Dylan Wiliam: Formative assessment | Resources | National Improvement Hub \(education.gov.scot\)](#)

Input data (school process and provision) – defines what the school are doing to get the results they are getting, such as programmes, pedagogy, interventions. [Multiple Measures \(ed.gov\)](#)

Intersecting data based on the work on Victoria Bernhardt, considers four categories of data (**demographics, school processes, pupil learning, perceptions (views)**) to provide a wider picture of learner achievement. Each measure in itself can provide useful information but by intersecting data categories it can enhance the level of analyses and allows for different questions to be explored.

[Multiple Measures \(ed.gov\)](#) for further information.

Output data (Pupil learning data) – data related to pupil attainment and achievement, such as CfE, SNSA, SCQF etc. [Multiple Measures \(ed.gov\)](#)

Perception data (views) – helps to understand what stakeholders think and can be gathered through surveys, questionnaires, feedback etc. [Multiple Measures \(ed.gov\)](#)

Qualitative data is non - numerical data which deals with descriptions of what can be observed and recorded such as questionnaires, feedback etc. [Robson \(real world research\)](#)

Quantitative data is data in the form of numbers which can be measured, such as attendance levels, attainment, leaver destinations etc. [Robson \(real world research\)](#)

Small data is described (Sahlberg, P) as tiny clues found in school that can uncover important relationships about teaching and learning. Big data can reveal correlations but small data can reveal causation. Small data may come from teachers' and learners' purposeful observations, formative assessments, and reflections of what is happening during teaching and learning processes in schools to reach collective human judgement to understand what is happening. [Small Data for Big Change: What does it mean for teachers? | Pasi Sahlberg](#)
[Pasi Sahlberg - Big Data or small data: What's the key to unlocking learning opportunities? - YouTube](#)

Statistical significance refers to the probability that a particular result of a statistical test could be due to chance factors alone and can describe the statistical uncertainty of a result. [Robson \(real world research\)](#)

Summative refers to periodic summaries of progress and achievement for reporting and monitoring. [BtC5 Framework \(education.gov.scot\)](#)

Triangulation is the process used to ensure evaluative statements about strengths and aspects for development are grounded in a robust evidence base. Triangulation involves bringing together evidence-based information from quantitative data, people's views and direct observations of practice. Triangulation should involve all school staff, learners, partners and other stakeholders. [How good is our school? \(4th edition\) \(education.gov.scot\)](#)