

Principles of Data-Rich Instruction

▶ We found it useful to spell out the beliefs and principles that ensure all students have the opportunity to pursue data fluency. **The following principles guide our work:**

1. Data-rich learning is accessible to all learners.

Data-rich classrooms utilize the principles of universal design and culturally sustaining pedagogies to support all learners in growing and developing their data fluency. It can extend beyond statistical interpretations and include data storytelling, infographics, or even spoken word.

2. Data-rich learning is learner-driven.

Data-rich instruction promotes the use of data for purposes that matter to learners by empowering them to become “data detectives,” to question and explore data stories for themselves, and to develop productive habits of mind such as perseverance and curiosity.

3. Data-rich learning uses complex data sets.

Rich data sets foster learner imagination and curiosity to find and explore questions that are meaningful to them and engage them in data science practices such as cleaning and transforming messy data for authentic purposes.

4. Data-rich learning encourages a healthy skepticism.

Data-rich classrooms utilize scaffolds or routines for evaluating data sources, interpretations, and representations to prepare students to be critical consumers and ethical producers of data.

5. Data-rich learning strengthens content knowledge.

Data-rich classrooms provide opportunities for learners to engage with data that are interesting, relevant, and potentially surprising in order to stimulate interest and support the content goals of the learning.

6. Data-rich learning utilizes the power of digital tools.

Software applications provide opportunities to find and access a wide range of datasets, generate displays, manipulate values and communicate insights about data that aren't possible with paper and pencil. Data-rich instruction explicitly fosters data moves that support content learning through data exploration.

7. Data-rich learning draws on learners' personal, historical, and cultural contexts.

Interacting with and using data that are contextualized, personal, historical, or culturally meaningful to learners, offers opportunities to explore socio-cultural impacts. This allows learners to bring their whole selves and community to the learning for purposes that may extend beyond the content.

Data-Rich Instruction Principles with Examples

Principles of Data-Rich Instruction	Examples
<p>1. Data-rich learning is accessible to learners at all levels.</p> <p>Data-rich classrooms utilize the principles of universal design and culturally sustaining pedagogies to support all learners in growing and developing their data fluency.</p>	<p>Accessible data-rich classrooms can look like this:</p> <ul style="list-style-type: none">● Students have opportunities to communicate their understanding in a variety of ways (e.g., written or spoken explanations, creating representations, graphs, tables, models, etc.).● Students are actively engaged in learning and sharing about themselves and/or their communities via their data activities. Students are actively engaged in learning that connects to their cultural and linguistic assets via their data activities.
<p>2. Data-rich learning is learner-driven.</p> <p>Data-rich instruction promotes the use of data for purposes that matter to learners by empowering them to become ‘data detectives,’ to question and explore data stories for themselves, and to develop productive habits of mind such as perseverance and curiosity.</p>	<p>Learner-driven data-rich classrooms can look like this:</p> <ul style="list-style-type: none">● Students learn about and develop their own questions that can be answered with data.● Students explore data that are relevant to their cultures, community and lives.● Students engage in exploratory data analysis and informal inference to pursue questions of interest to them.● Students independently determine which variables to investigate and how to transform them to support their analysis.● Students decide what actions to take in their communities, on the basis of their data investigations.● Students engage in an interchange of ideas around data discoveries and understandings as they make meaningful connections to their lives

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<p>3. Data-rich learning uses complex data sets.</p> <p>Rich data sets foster learner imagination and curiosity. Learners find and explore questions that are meaningful to them and engage in data science practices such as cleaning and transforming messy data for authentic purposes.</p>	<p>Using rich data sets in a classroom can look like this:</p> <ul style="list-style-type: none"> ● Students use multivariate data sets that are clean enough for learners to use and explore in their learning environment. ● Students use data sets that include different types of data, such as qualitative and quantitative, discrete and continuous, cardinal, ordinal, counts, and proportions. ● Students use non-numeric data types such as maps, images, sounds, or videos. ● Students use probing questions to interrogate simulations, models, and summary visualizations to pose and/or answer questions of interest.
<p>4. Data-rich learning encourages a healthy skepticism.</p> <p>Data-rich classrooms use scaffolds or routines for evaluating data sources, interpretations, and representations to prepare students to be critical consumers and ethical producers of data.</p>	<p>Classrooms that support a critical stance towards data can look like this:</p> <ul style="list-style-type: none"> ● Students consider where data come from to better understand and evaluate its quality and utility for their purpose. ● Classroom norms support critical evaluation of data and interpretations, including respectful questioning of data interpretations and data-based claims.
<p>5. Data-rich learning strengthens content knowledge.</p> <p>Data-rich classrooms provide opportunities for learners to engage with data that are interesting, relevant, and potentially surprising in order to stimulate interest and support the content goals of the learning.</p>	<p>Data-rich classrooms can look like this:</p> <ul style="list-style-type: none"> ● Students learn content because data is infused into their classroom experiences. ● Students use existing data sets or collect their own data to answer questions related to the content goals of the class. ● Students use alternative modes to represent data-content connection including new graph types, infographics, social media.

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<p>6. Data-rich learning utilizes the power of digital tools.</p> <p>Software applications provide opportunities to find and access a wide range of datasets, generate displays, manipulate values, and communicate insights about data that aren't possible with paper and pencil. Data-rich instruction explicitly fosters data moves that support content learning through data exploration.</p>	<p>Data-rich classrooms using technology can look like this:</p> <ul style="list-style-type: none"> ● Students find, download, and import relevant datasets into CODAP. ● Students use simulations to collect data. ● Students use CODAP to rescale graphs to better understand the relationships between variables. ● Students filter, transform, and regroup their data to support sense-making about patterns within the data. ● Students subset their data to consider only the data that directly relate to the questions they posed. ● Students create models of relationships between variables using digital tools.
<p>7. Data-rich learning draws on learners' personal, historical, and cultural contexts.</p> <p>Interacting with and using data that are contextualized, personal, historical, or culturally meaningful to learners, offers opportunities to explore socio-cultural impacts. This allows learners to bring their whole selves and community to the learning for purposes that may extend beyond the content.</p>	<p>Data-rich classrooms that attend to learners' contexts can look like this:</p> <ul style="list-style-type: none"> ● Students interview community members or elders to provide historical context when interpreting data. ● Students identify and use data from their community ● Students communicate findings in formats that are relevant to them (e.g., storytelling, language, poetry, animation) ● Students can represent data through different mediums such as objects, sculpture, or acting out the data.