Understanding and Using Data Science

What is Data Science?

Data science is an interdisciplinary application of mathematics, information science, and computer science. The data science inquiry process includes understanding principles of data collection, maintenance, analysis, visualizations and representations of data, inference, and interpretation and communication of results from a data set.

Why Data Science Standards?

Society is increasingly data-driven. Streaming services, news outlets, social media platforms, and other industries routinely collect and analyze data to better understand and reach more users. Across industries, being able to understand and analyze data is becoming a basic skill needed for the workforce. This shift is not isolated to careers in computer science, but includes marketing, the healthcare industry, and commercial manufacturing to name a few. Additionally, as consumers of information from a wide variety of forms and services, people are constantly shown data that indicates a story or conclusion. Students in Washington need to build data science skills so they are ready for college, careers, and making sense of everyday information.

Understanding Data Science

The Washington State K–12 Learning Standards for Mathematics (WA Math 2026) in data science centralize the data science inquiry cycle. There are two beliefs that guide this design: 1. every student—no matter the age—can ask questions, collect and consider data, and come to a conclusion from that data, and 2. every student—no matter the age—can engage in both the creative and curious process of a data science inquiry, and can grow and build data literacy skills.

Data literacy is focused on reasoning with and about data, making informed decisions using data, asking questions about data, critically analyzing data visualizations, and applying statistical reasoning. Data science goes beyond data literacy by engaging students in the full data science inquiry cycle. In the inquiry cycle, students design data investigations, collect and analyze data, create visuals, and communicate conclusions. Data literacy is like reading and interpreting information, while data science is about creating and sharing a story with data.

Data literacy requires a questioning mindset when evaluating data. Students should question whether the conclusion from a data set or data visualization in fact tells the whole story. Both data literacy and data science are key skills. The data science standards address data literacy through components of critically examining data sets, data visualizations, and conclusions as appropriate across grades.

The standards were developed from the Pre–K–12 Guidelines for Assessment and Instruction in Statistics Education II (GAISE II) standards. The GAISE II framework for data science education was authored by leaders in data science from across the nation. The GAISE II framework has been a resource for states in the national movement to increase access to data science in PreK–12 education. The GAISE II framework focuses on data science learning opportunities through levels A, B, and C without identifying a connection to a specific grade. The standards connect the GAISE II levels along with grade-level math learning, especially ideas about measurement and data, statistics, and probability. The GAISE II framework identifies four parts to the data science inquiry cycle: formulate statistical investigative questions, collect/consider data, analyze the data, interpret the results.

Formulate Statistical Investigative Questions

When students begin to think about questions that lead to a data science inquiry, students are focusing on questions where outcomes may vary, requiring data collection and analysis. In the youngest grades, students may use the data science cycle to ask a statistical investigative question about weather and seasons. In kindergarten, using the Next Generation Science Standards, students might collect weather data throughout the year including observations of weather conditions that describe patterns over time. Students can collect weather data connected to counting and cardinality standards in mathematics and observe both patterns of weather and rainfall data. This inquiry would build toward analyzing the data to understand the seasons. For kindergarten, a question about data could be: How does the weather change as the temperatures outside change?

Collect Data/Consider Data

Students both collect data and consider data. Students will create a plan for what data to collect and what the best ways are to collect the needed data. Data may come from themselves (for example, kindergarteners recording the weather and rainfall outside their classroom) or from other sources, including publicly available government data. In either case, students carefully plan how to collect data, so it matches the question they are trying to answer. Older students may examine how the data was collected. They may consider whether important data was missing or whether the data collected is appropriate for answering the investigative question.

Analyze the Data

When students analyze a data set, they interpret the results based on the real-world question being explored. For example, the kindergarten students' data may show there are more days with rain recordings in late October compared to early September. Students record outside temperatures, whether it was sunny, overcast, or raining as a picture icon on a calendar for all students to see. Students can compare the temperature and weather data with the rainfall data. In this example, the data analysis comes from the data visualization on the calendar where students can see long term patterns of sunny days to rainy days. Students count and make

comparisons across the calendar while their educator provides guidance on how this is a relationship to the outside temperature and seasons.

Data can be analyzed and visualized using a wide range of options including artistic representations (drawings, graphic design, weaving patterns), line graphs, box plots, histograms, scatter plots, and visualizations through platforms including Common Online Data Analysis Platform (CODAP) and Tableau. Both of which offer free access for educational use (a school district email may be necessary). To prepare students for college, careers, and civic engagement, educators should guide students as they engage with technology tools used to organize, visualize, and analyze data. Many openly available data visualization tools have embedded support and various entry points to support new users with a wide range of technical knowledge.

Interpret Results

Students use data analysis to make an interpretation or conclusion from the data to address the statistical investigative question. With guidance from their teacher, the kindergarten students may determine that in their area the weather becomes rainier as outside temperatures go down. Kindergarten students in a different region with the same data collection approach may see different results if they live in a more arid region. These kindergarten students may observe as the temperature goes down, their number of sunny days goes down. These students may observe as their number of overcast days goes up rain does not have a clear pattern yet for their observation period.

The Iterative Nature of the Data Science Inquiry Cycle

The data science inquiry cycle is not linear. At any point, based on students' observations, data collection, and analysis, students may feel the need to go back to any previous part of the cycle and reconsider their findings. For students in an arid region observing weather and temperatures, they may find recording rainfall for three months has not shown a pattern. They may ask whether rainfall should remain included in their data collection. They may choose to lengthen their data collection over a longer period to see if a rainfall pattern develops with more time. These questions could occur while students are collecting data and/or when they are analyzing data. In any data science inquiry, students may determine the results do not clearly provide an answer or pattern related to the investigative question. In this case students may reconsider their question, or whether their data collection process gave them the information they needed. This refining and reworking is encouraged in data science inquiry.

Emphasis on Relationships and Conceptual Understanding

The flexibility and iterative nature of the data science inquiry cycle, and data science standards, create learning opportunities to connect the real-world and questions students are curious about to standards within mathematics and other content areas. As the math standards are reframed through broad understandings of Data Analysis, Relationships, Spatial Reasoning, and

Quantities, the interconnection of the mathematics standards readily supports a data science inquiry. Mathematics is applied in meaningful contexts that build conceptual understanding of the standards, as well as flexible problem-solving skills students need across grades and in future careers.

Data Science is for Everyone

At each grade level the WA Math 2026 data science standards are written to allow educators to make their lessons and activities accessible to all students. The data science inquiry process is only limited by a student or group of students' curiosity, with educators guiding students toward content connections. The standards support content integration and mathematics in authentic contexts for students of all ages. Data science is not a gatekeeper to algebra, calculus, or advanced mathematics pathways. On the other hand, data science creates chances for rich meaningful math learning that connects to real life, including science, civics, sports, arts, and other subjects. In this way students use math to understand their world.

Embedded Standards for Mathematical Practice

The data science inquiry cycle focuses on understanding context, recognizing variability, examining, and justifying data collection, analyzing results, and drawing conclusions. Throughout this process, students use the Standards for Mathematical Practice as they solve problems. They persist, look for patterns and relationships, reflect on their thinking, and use tools to model data. They also pay attention to precision in how they collect and present data, notice patterns in repeated reasoning, and explain their thinking. When students work together to develop a statistical question, they apply these practices in much the same way teams approach problems in real-world settings.

The standards provide a meaningful, authentic, and real-world opportunity to learn and examine math content standards through a data science inquiry based on student curiosity. This shift in instruction moves math teaching and learning away from isolated concepts toward content that is connected to the world through asking questions, collecting, and analyzing data, and interpreting the results. These understandings support students to be data scientists, data consumers, and questioners of data to prepare them to critically examine data they may observe in daily life, and for college, careers, and civic engagement as members of the community.