# BOOTSTRAP

K-12 Data Science

Bootstrap:Data Science is a suite of FREE curricular materials for students in grades 4-12, which teach students to answer real-world questions using data

Data Science is a Must-Have Skill

In a world awash in big data, being able to *make sense* of that data is a critical skill for everything from public policy to molecular biology, and from software development to shipping logistics. Writing code to crunch huge datasets is great, but pure <u>coding must go hand in hand with being able to think, talk and write about the analysis</u>. With job openings far outstripping supply, it is crucial that students are exposed to data science in middle and high school.
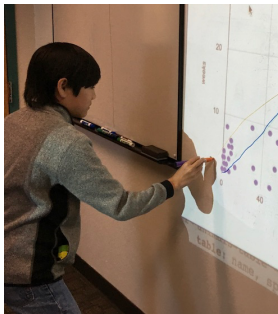
Students are Natural Data Scientists

Even children who "hate math" avidly gather and analyze data about their favorite sports teams, musicians or TV game shows. Students care deeply about whether a certain policy is biased. Furthermore, a foundation in data analysis is important both for numerous later subjects of study (beyond computer science, from business to biostatistics to archeology to sociology) and for creating an educated citizenry. Our plan is to channel students' inherent passions to motivate learning.

Growing Data Science at Your School

For schools that can offer it, Bootstrap:Data Science makes an incredible full-year course. But our materials are also **designed for integration** into Science, Math, and Social Studies! Whether it's exploring experimental data in Science, population data in Social Studies or History, or using logarithms to fit exponential relationships using linear functions in Algebra 2, Bootstrap offers a smooth on-ramp for teachers to *build on the curriculum they already have*, integrating authentic data science without having to find room in the budget for a new teacher, or room in the schedule for a new class.

To access our free, evidence-based materials, published research, and evaluation results, or find an upcoming PD workshop, or learn more, visit **www.bootstrapworld.org** or e-mail us at **contact@bootstrapworld.org**.
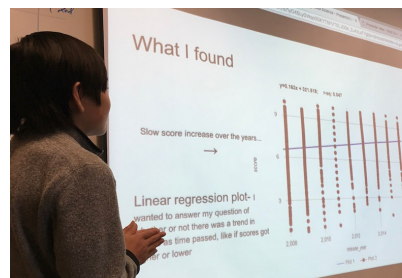
Data Science in Elementary School

Thanks to support from the Robin Hood Foundation, Bootstrap has partnered with the KIPP Charter School network to support Data Science as part of elementary-grade history and social studies courses. Students confront historical data about everything from precolonial America to Mayan Civilization, and learn to make inferences about what this data can tell us about life at that time. This creates curiosity for younger students, who want to know "what the book says." They also understand the limitations of imperfect data, and what challenges that presents for the study of history.

Data Science in Middle School

Our hands-on, project-based lessons cover the majority of middle-school statistics standards and a host of computer science standards. Students explore all of these concepts when working with data that *matters to them*, using our curated library of datasets or by bringing their own data. Learning these concepts is a lot more engaging when using data about pokémon, sports, food, healthcare, the environment, or rollercoasters! Teachers can use these materials piecemeal in a variety of classes, or combine them into a programming or data science elective.

These standards include (but are not limited to!):

Math and Statistics	Computer Science
• Mean, Median and Mode	• Loops and Iteration
• Pie and Bar Charts	• Problem decomposition
• Histograms	• Building on existing code
• Box and Whisker Plots	• Testing and debugging
• Scatter Plots	• Using data to highlight cause-and effect
• Line of Best Fit	• Creating variables, procedures, and algorithms
• Domain and Range	• Creating and refining computational models
• Function Composition	• Using data and data analysis tools

Data Science in High School

A lot of Data Science efforts in High School frame Data Science as a one-size-fits-all approach: the alternative to Algebra 2. But Algebra 2 includes standards that are critical to STEM fields, like quadratic, logarithmic, inverse and exponential relationships! For schools that are able to offer both courses, Bootstrap:Data Science is one of the largest dedicated course offerings nationwide! But it gets even more interesting…

Our materials can also be used to modernize existing Algebra 2 classes, providing a gentle onramp for teachers that doesn't require throwing out one set of STEM standards and replacing them with another. Just as linear relationships in scatter plots can be used to motivate linear functions in Algebra, more interesting datasets are fertile ground for the kinds of functions that are the foundation of Algebra 2.
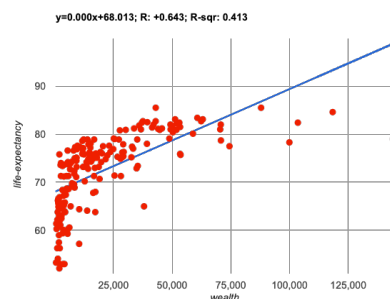
To find out more about how Bootstrap can serve your teachers, meet existing standards, or assist in developing standards for Data Science in your state, e-mail us at contact@bootstrapworld.org