03 Data Science - The data of our community

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

This course combines the study of Statistics and Probability with Data Science. The goal is to have students think critically about data in today's data-driven world and understand its role in the 21st Century economy. Furthermore, students will become familiar with the concepts, topics, and techniques used by data scientists and statisticians in their day-to-day work.

Throughout this course, students will engage in project-based observational studies and experiments to develop their understanding of data analysis, sampling, correlation/causation, bias and uncertainty, probability, modeling with data, as well as making and evaluating data-based arguments. Students will also learn about the roles of data scientists, the power of data in society, machine learning, and how data scientists extract knowledge and insights from real-world data.

In this unit students will explore different ways of modeling data, starting with the basic models of measures of center and spread, as well as considering sampling. Students will likely already be familiar with the calculations needed to find measures of center and spread for small data sets, but this unit takes a deeper dive into understanding the concepts, deeper meanings, limitations, and the impact of outliers in the context of data modeling. Students will explore distributions and the role of probability in understanding them. Additionally, students will collect their own data and compare it to a larger data set. During the project, students will consider their sampling choices and those of the larger data set to see how such decisions impact the comparisons drawn between the two data sets.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Essential Questions

- How can the measures of center and spread be used to model data?
- What role does the normal distribution play in our world?
- How can data representations help us understand the meaning behind the data?
- Why is it important to consider sampling and variability when analyzing data?

Enduring Understanding:

- Center and spread plays a vital role in data science story telling
- The normal distribution displays data taken from our world and can be used to efficiently manage our lifestyles and production
- Samples may vary vastly within a data set

CONTENT AREA STANDARDS

MA.S-ID.A.4	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
MA.S-ID.B.6a	Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.11-12.SL.11-12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.

TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Measures of center and spread can be used to model data
- Data may follow a normal distribution, be skewed left or right, be bimodal or unimodal
- Samples from data may not accurately represent the story being told by the data

Procedural Knowledge

Students will be able to:

- Compare how the collection of data is being displayed and choose which method is more effective
- Consider questions that may be potentially problematic due to intrusive or personal information
- Determine when outliers are significant and how they impact the centers of the distributions
- Recognize the characteristics of a normal distribution and use the empirical rule to answer questions relating to normal phenomena
- Compare samples from a data set.

EVIDENCE OF LEARNING

Formative Assessments

Observations

Task completion

Student journals and notebooks

Cooperative team work

Summative Assessments

Project completion

Task completion on unit assessments

RESOURCES (Instructional, Supplemental, Intervention Materials)

https://hsdatascience.youcubed.org/curriculum/

Unit 1

INTERDISCIPLINARY CONNECTIONS

Educational tech applications

Current Events

Experimentation

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.