Unit 01: Exploring Data (8 Weeks)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

Capacities of the Literate Individual
Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

They build strong content knowledge.

They respond to the varying demands of audience, task, purpose, and discipline.

They comprehend as well as critique.

They value evidence.

They use technology and digital media strategically and capably.

LA.K-12.NJSLSA.R	Reading
MA.S-ID	Interpreting Categorical and Quantitative Data
MA.S-ID.A	Summarize, represent, and interpret data on a single count or measurement variable
MA.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
MA.S-ID.A.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
LA.K-12.NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
MA.S-ID.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
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	Summarize, represent, and interpret data on two categorical and quantitative variables
MA.S-ID.B.5	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
MA.S-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
	Integration of Knowledge and Ideas
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.
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
MA.S-ID.B.6b	Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
MA.S-ID.B.6c	Fit a linear function for a scatter plot that suggests a linear association.
MA.S-ID.C	Interpret linear models
MA.S-ID.C.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
MA.S-ID.C.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.
MA.S-IC	Making Inferences and Justifying Conclusions
MA.S-IC.A	Understand and evaluate random processes underlying statistical experiments
LA.K-12.NJSLSA.W	Writing
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
	Text Types and Purposes
MA.S-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
MA.S-IC.A.2	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
MA.S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies
MA.S-IC.B.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
MA.S-IC.B.4	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
MA.S-IC.B.5	Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
MA.S-IC.B.6	Evaluate reports based on data.
LA.WHST.11-12.1	Write arguments focused on discipline-specific content.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
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.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
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	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

LA.K-12.NJSLSA.R	Reading
MATH.K-12.1	Make sense of problems and persevere in solving them
	Key Ideas and Details
MATH.K-12.2	Reason abstractly and quantitatively
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
LA.RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP11	Use technology to enhance productivity.

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

The purpose of the unit is to gain a basis for how data can be represented. Data is the building block for everything we do in statistics and a language is necessary for describing it. In this unit, we will explore ways to illustrate data and ways to describe the nature of raw data as well. We will gain a basic vocabulary for things like outliers and weirdly "shaped" data. Being able to represent, illustrate, and analyze data will be a tool that we use in units to follow. These skills are also tools we use in life after AP Statistics since, in our culture, we are constantly bombarded with things like infomercials, sales pitches, and grades in college courses where data is thrown at us in many different ways. Thus, an understanding of these ideas will help us make better choices.

Meaning

Essential Questions

Essential Questions

- **How can standard deviation and mean allow us to "compare apples to oranges" and determine how "outstanding" two data values are from separate samples?**
- **What should we be looking for when information about studies is being presented to us in order to ensure we aren't being mislead?**
- **How can a strong correlation within a data set allow us to make predictions?**

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

- **Data can easily be misrepresented in such a way to strengthen any argument.**
- **Standard deviation describes how far data is spread out and can allow us to determine how outstanding a particular data value is.**
- **Just because two entities seem to be correlated does not necessarily mean that one is the cause of the other.**

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

- **proper format for different graphic representations of data**
- **types of data: continuous, discrete, categorical, quantitative**

- **4 levels of data: nominal, ordinal, interval, ratio**
- **the pros and cons for different measures of center and spread**
- **which characteristics make certain data values considered 'unusual'**
- **the criteria for data to be classified as having a strong correlation**
- **the effect of changing units on descriptive measures**
- **different types of useful data representation diagrams**
- **what the relative standing of a data value is using it's z-score**

Skills

Skills

Student will be skilled at …

- **organize and illustrate raw data**
- **classify different types of data**
- **determine if bivariate data is correlated**
- **predict results by extrapolating known correlations with lines of best fit**
- **describe data sets using measures of center and variation**
- **create box-plots, histograms, frequency tables, and other methods to convey data**
- **calculate and graph lines of best fit**
- **compare two different data values from different populations**

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

- **The Practice of Statistics (5th Edition) - School-Issued Textbook**
- **College Board Website (http://www.collegeboard.org/)**
- **Barron's AP Statistics Practice Workbook - School-Issued Workbook**
- **Practice AP Resources: http://www.appracticeexams.com/ap-statistics**

- **TI-83 Calculator**
- **Online Statistical Calculators (http://www.stattrek.com)**
- **Notes/Practice Problems from Amsco AP Statistics Workbook**
- **Notes/Practice Problems from The Princeton Review Workbook**
- **Notes/Practice Problems from 5 Steps to a 5 Workbook**
- **Notes/Practice Problems from Kaplan AP Statistics Workbook**
- **Practice problems from Barron's AP Statistics Practice Flashcards**
- **Practice problems from 5 Steps to a 5: 500 Questions**
- **TV Commercial - Prudential "Stickers" (For distribution shapes/ bell curves)**
- **Geogebra - Mathematical Calculator (Chrome App)**
- **Z-Score Tables**
- **Correlation Coefficient Tables**
- **Random Number Generator (http://random.org)**

Formative Assessment Strategies

Formative Assessment Strategies

- **Geogebra: Normal distribution practice**
- **Collaborative AP practice problems (open ended)**
- **5 question quizzes (daily)**
- **Prudential Stickers discussion**
- **Order of Operations Check-up**
- **Summer Packet**

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- **Watch Prudential "Stickers" commerical**
- **Design our own studies to compare correlation between two data sets**

- **Review mean, median, mode, range, standard deviation and other basic descriptors**
- **Discuss guidelines for format of AP open ended questions**
- **Create Box-Plots to be displayed around the room**
- **Take practice AP tests regarding only Unit 1**
- **Drill with 5 APquestion multiple choice quizzes.**
- **Tutorial on "using the ti-83 for High School Statistics"**

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to

ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.