STEM Innovation Academy
Integrated Mathematics 1 - Unit 6 Plan

Unit Title: One-Variable Statistics	Teacher: Chelsea M. Fonseca
Grade(s): 9th	Duration: 1-2 Weeks - May (~5/27) / June (~6/10)
Theme: What are one-variable statistics ?	

In this unit, students are introduced to one-variable statistics. Students encounter contexts with quantities that have varying means, medians, Interquartile Ranges (IQR), Mean Absolute Deviations (MAD), standard deviations, and outliers. These contexts are presented verbally and with box and whisker plots, dot plots and histograms. They construct spreadsheets and use them to obtain the information of varying situations and to solve problems.

Essential Questions

- How can we describe distributions?
- What does it take to calculate measures of center and measures of variability and know which are most appropriate for the data?
- How can we use technology to represent data?
- How do statistics change with the data?
- How can we investigate variability using data displays and summary statistics?
- What is standard deviation?
- How can we interpret standard deviation?
- What are outliers and how do we deal with them?

Enduring Understandings

- You can describe the shape of a distribution using the terms "symmetric, skewed, uniform, bimodal, and bell-shaped."
- You can use a graphical representation of data to suggest a situation that produced the data pictured.
- You can calculate mean absolute deviation, interquartile range, mean, and median for a set of data.
- You can create graphic representations of data and calculate statistics using technology.
- You can describe how an extreme value will affect the mean and median.
- You can use the shape of a distribution to compare the mean and median.
- You can arrange data sets in order of variability given graphic representations.
- You can describe standard deviation as a measure of variability and calculate standard deviation.
- You can create graphic representations of data and calculate statistics using technology.
- You can describe how an extreme value will affect the mean and median.
- You can use the shape of a distribution to compare the mean and median.

NJSLS

- 6.SP.B.5.c: Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
- HSS-ID.A.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).
- HSS-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.
- HSS-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).

Ongoing standards: The following standards should be present in all applicable lessons.
- N.Q.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N.Q.2: Define appropriate quantities for the purpose of descriptive modeling.
- N.Q.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- F.IF.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- F.IF.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*[*]

Focused Mathematical Practices

- MP 1: Make sense of problems and persevere in solving them
- MP 2: Reason abstractly and quantitatively
- MP 3: Construct viable arguments and critique the reasoning of others
- MP 4: Model with mathematics
- MP 5: Use appropriate tools strategically
- MP 6: Attend to precision
- MP 7: Look for and make sense of structure
- MP 8: Look for and express regularity in repeated reasoning

Objectives

- Describe (orally and in writing) the shape of a distribution using words such as "symmetric, skewed, uniform, bimodal, and bell-shaped."
- Interpret a graphical representation to suggest a possible context for the data.
- Calculate mean absolute deviation, interquartile range, mean, and median.
- Use technology tools to graphically represent data and calculate useful statistics.
- Recognize the relationship between mean and median based on the shape of the distribution.
- Understand the effects of extreme values on measures of center.
- Interpret (orally) a data set with greater MAD or IQR as having greater variability.
- Comprehend (in spoken and written language) standard deviation as a measure of variability.
- Use technology to compute standard deviation.
- Describe (orally and in writing) the meaning of standard deviation in context.
- Describe (orally and in writing) how outliers impact measure of center and measures of variability.
- Determine (in writing) when values are considered outliers, investigate their source, and determine if they should be excluded from the data.
- Compare and contrast (orally and in writing) situations using measures of center and measures of variability.

Assessment Evidence

Diagnostic Assessments	- Pre-Assessment - NWEA Diagnostic
Formative Assessments	- Daily Classwork and Exit Tickets - Quizzes
Summative Assessments	- Unit 6 Test - MP4 Benchmark Assessment
Authentic Assessments	- Desmos Art Project - ECR
Authentic Experiences	Where is Math Hidden in the Real World? Research Paper & Presentation

Learning Plan

Unit Overview

- **Section 6.1**: This section begins with lessons that ask you to describe distributions using the appropriate terminology. In order to learn more about different kinds of distributions, one thing students do is invent reasonable contexts for a given distribution. This section also reviews the five-number summary.

- **Section 6.2:** You will create data displays and calculate statistics using technology. Students encounter the term statistic which is a quantity that is calculated from sample data. In this lesson students will enter data into a spreadsheet, find statistics, and create box plots using technology. You will also recognize a relationship between the shape of a distribution and the mean and median, using dot plots to investigate this relationship, compare data sets with different measures of variability and to interpret data sets with greater MADs or IQRs, calculate standard deviation, recognize outliers, and compare measures of center and the standard deviation and the IQR for different data sets.

Vocabulary:

- Bell-Shaped Distribution
- Bimodal Distribution
- Five Number Summary
- Interquartile Range (IQR)
- Mean
- Mean Absolute Deviation (MAD)
- Median
- Outliers
- Skewed Distribution
- Standard Deviation
- Symmetric Distribution
- Uniform Distribution
- Variability

Modifications	
Special Education/504	**English Language Learners**
- Adhere to all modifications and health concerns stated in each IEP. - Give students a MENU option, allowing students to pick assignments from different levels based on difficulty. - Accommodate Instructional Strategies: reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), handouts, definition list with visuals, extended time - Allow students to demonstrate understanding of a problem by drawing the picture of the answer and then explaining the reasoning orally and/or writing , such as Read-Draw-Write - Provide breaks between tasks, use positive reinforcement, use proximity - Assure students have experiences that are on the Concrete-Pictorial- Abstract spectrum by using manipulatives - Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 17-18) - Strategies for Students with 504 Plans	- Use manipulatives to promote conceptual understanding and enhance vocabulary usage - Provide graphic representations, gestures, drawings, equations, realia, and pictures during all segments of instruction - During ALEKS lessons, click on "Español" to hear specific words in Spanish - Utilize graphic organizers which are concrete, pictorial ways of constructing knowledge and organizing information - Use sentence frames and questioning strategies so that students will explain their thinking/ process of how to solve word problems - Utilize program translations (if available) for L1/ L2 students - Reword questions in simpler language - Make use of the ELL Mathematical Language Routines (click here for additional information) - Scaffolding instruction for ELL Learners - Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 16-17)
Gifted and Talented	**Students at Risk for Failure**
- Elevated contextual complexity - Inquiry based or open ended assignments and projects - More time to study concepts with greater depth - Promote the synthesis of concepts and making real world connections - Provide students with enrichment practice that are imbedded in the curriculum such as: - Application / Conceptual Development - Are you ready for more? - Common Core Approach to Differentiate Instruction: Students with Disabilities (pg. 20) - Provide opportunities for math competitions - Alternative instruction pathways available	- Assure students have experiences that are on the Concrete-Pictorial- Abstract spectrum - Modify Instructional Strategies, reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), inclusion of more visuals and manipulatives, Field Trips, Google Expeditions, Peer Support, one on one instruction - Assure constant parental/ guardian contact throughout the year with successes/ challenges - Provide academic contracts to students and guardians - Create an interactive notebook with samples, key vocabulary words, student goals/ objectives. - Always plan to address students at risk in your learning tasks, instructions, and directions. Try to anticipate where the needs will be and then address them prior to lessons. - Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 19)

21st Century Life and Career Skills
Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study. https://www.state.nj.us/education/cccs/2014/career/9.pdf

● CRP1. Act as a responsible and contributing citizen and employee. ● CRP2. Apply appropriate academic and technical skills. ● CRP3. Attend to personal health and financial well-being. ● CRP4. Communicate clearly and effectively and with reason. ● CRP5. Consider the environmental, social and economic impacts of decisions. ● CRP6. Demonstrate creativity and innovation.	● CRP7. Employ valid and reliable research strategies. ● CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. ● CRP9. Model integrity, ethical leadership and effective management. ● CRP10. Plan education and career paths aligned to personal goals. ● CRP11. Use technology to enhance productivity. ● CRP12. Work productively in teams while using cultural global competence.

Students are given an opportunity to communicate with peers effectively, clearly, and with the use of technical language. They are encouraged to reason through experiences that promote critical thinking and emphasize the importance of perseverance. Students are exposed to various mediums of technology, such as digital learning, calculators, and educational websites.

Technology Standards
All students will be prepared to meet the challenge of a dynamic global society in which they participate, contribute, achieve, and flourish through universal access to people, information, and ideas. https://www.state.nj.us/education/cccs/2014/tech/

8.1 Educational Technology	8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming
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.	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
● Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations. ● Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. ● 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. ● Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. ● Research and Information Fluency: Students apply digital tools to gather, evaluate, and use of information. ● Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.	● The Nature of Technology: Creativity and Innovation- Technology systems impact every aspect of the world in which we live. ● Technology and Society: Knowledge and understanding of human, cultural, and societal values are fundamental when designing technological systems and products in the global society. ● Design: The design process is a systematic approach to solving problems. ● Abilities in a Technological World: The designed world is a product of a design process that provides the means to convert resources into products and systems. ● Computational Thinking: Programming- Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge

Interdisciplinary Connections	
English Language Arts	
ELA.Literacy.RI-9-10.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
ELA-LITERACY.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
ELA-LITERACY.W.9-10.2.A	Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aid comprehension.