Unpacked South Dakota State Mathematics Standards

Purpose: *In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.*

Domain: Interpreting Categorical and Quantitative Data	**Grade Level: Algebra 1**

A1.S.ID.A Cluster: Summarize, represent and interpret data on a single count or measurement variable.

Represent sets of data using various data displays (dot plots, histograms, and box plots) to make conclusions about the data.
Identify when the shape of data indicates the use of mean/median for center and standard deviation/interquartile range for spread is appropriate.
Explain the impact outliers have on the shape, center, and spread of a set of data.

****This is a MAJOR cluster.** *Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.*

A1.S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

A1.S.ID.A.2 Use statistics appropriate to the shape and context of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

A1.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).

Aspects of Rigor: (Conceptual, Procedural, and/or Application)

A1.S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand how to construct a dot plot. Understand how to construct a histogram. Understand how to construct a box plot. Understand the dot plot is the best model to see the shape of the data. Understand data given as intervals would best be represented by histograms. Understand the box plot is the best	Plot data using a dot plot. Plot data using a histogram. Plot data using a box plot.	Use a dot plot, histogram, or box plot to represent contextual data. Based on contextual data, determine which plot best represents the data given in a situation. Choose the appropriate plot, given a set of data, based on what one wants to take away from the data (ex: see shape, group in intervals, see the quartiles, etc…) Given a display of data based on a contextual situation, explain what the display is telling the viewer.

way to represent non-symmetric data and see the impact of that data (a stem-and-leaf plot or dot plot can be used to help see data is non-symmetric). Understand a modified box plot (box plot showing the outliers) is an option to show the spread of the set of data without the influence of outliers.		

A1.S.ID.A.2 Use statistics appropriate to the shape and context of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand the distribution of data can be symmetric or non-symmetric. Understand median and mean are calculations that represent the center. Understand interquartile range and standard deviation are calculations that represent spread. Understand how to find standard deviation and what it represents in the data. Understand symmetric data is best described by mean and standard deviation. Understand non-symmetric data is best described by the median and interquartile range. **Note:** Less time should be focused on box plots in Algebra 1 and more time should be spent on the mean and standard deviation in Algebra 1.	Classify a data set as a symmetric distribution. Calculate mean and standard deviation (use technology). Classify a data set as a non-symmetric distribution. Calculate median and interquartile range (use technology).	Interpret the mean and standard deviation to the context of a situation. Interpret the median and interquartile range to the context of a situation. Compare center and spread of the distributions of two or more different sets of data.

A1.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).

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand how to find an outlier and what it represents in a set of data. Understand the mean is pulled in the direction of an outlier.	Find the outlier(s) of a set of data. Identify and compare the differences of the shape, center, and spread of data with and withOUT the outliers.	Interpret the shape, center, and spread to the context of a situation. Interpret and explain the impact of an outlier(s) on the measures of center, shape, and spread for a set of data.

Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

1. **Make sense of problems and persevere in solving them.**
    - Decide and find the measures of center and spread when given a set of data.
2. **Reason abstractly and quantitatively.**
    - Explain in writing the comparisons of data with and without the impact of outliers.

3. **Construct viable arguments and critique the reasoning of others.**
    - Use and create a data display and be able to defend their reasoning for their chosen display.
4. **Model with mathematics.**
    - Identify and create a dot plot, histogram, or box plot of a set of data.
5. **Use appropriate tools strategically.**
    - Use technology to create data displays and calculate measures of center and spread for large sets of data.
6. **Attend to precision.**
    - Vocalize effective and appropriate uses of vocabulary.
7. **Look for and make use of structure.**
    - Identify when a set of data displays a symmetric or a non-symmetric shape.
8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

Previous Learning Connections	***Current Learning Connections***	***Future Learning Connections***
In middle grades, learners: 1. plot points on a coordinate grid, 2. plot data on dot plots and box plots, 3. describe center and spread in a data distribution.		In future courses, learners: 1. use a standard deviation to make conclusions about a set of data 2. investigate normal distributions within a context 3. calculate confidence intervals based on a normal curve, mean and standard deviation.

Vocabulary *(Key Terms Used by Teachers and Students in this Cluster):*

- Dot plot
- Histogram
- Relative frequency
- Cumulative relative frequency
- Box plot
- Modified box plot
- Minimum
- Quartile 1 (lower quartile)
- Median
- Quartile 2 (upper quartile)
- Maximum
- Outliers
- Interquartile Range
- Shape
- Symmetric Distribution
- Non-symmetric Distribution
- Mean
- Standard Deviation
- Center
- Spread

Relevance, Explanations, and Examples:

Bar Graph vs Histogram: Bar Graph should be used for categorical (qualitative) data and histogram should be used for numerical (quantitative) data.

Teacher Notes for approaching any set of data:
---------Step 1) order the data on dot plot or stem and leaf plot to determine symmetric or non-symmetric
---------Step 2) then determine based on symmetry whether you find median/IQR or mean/St. Dev

Example: Given a set of test scores: 99, 96, 94, 93, 90, 88, 86, 77, 70, 68, determine the shape, center, and spread of the data. What information does this give the teacher?

Achievement Level Descriptors

Cluster: Summarize, represent and interpret data on a single count of measurement variable.

Concepts and Procedures	***Level 1:*** Students should be able to describe a data set in terms of center and spread and represent data graphically.
	Level 2: Students should be able to describe and use appropriate statistics to

	interpret and explain differences in shape, center, and spread of two or more different data sets, including box plots, histograms, or dot plots, representing familiar contexts. They should be able to identify the mean and the median and select the appropriate one for representing the center of the data for data sets.
	Level 3: Students should be able to use appropriate statistics to interpret, explain, and summarize differences in shape, center, and spread of two or more different data sets of varying complexity and levels of familiarity, including the effect of outliers. They should be able to select the appropriate choice of spread as interquartile range or standard deviation based on the selection of center.
	Level 4: Students should be able to interpret data to explain why a data value is an outlier.