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: Statistics and Probability	**Grade Level: Algebra 2**
A2.S.IC.B Cluster: Make inferences and justify conclusions from sample surveys, experiments and observational studies. *Learners make inferences about populations through surveys, experiments, and observational studies. These studies directly relate to what learners can infer about a population and possible cause and effect.*	
****This is a SUPPORTING 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.* **A2.S.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.** **A2.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.** **A2.S.IC.B.5 Use data from a randomized experiment to compare two treatment groups; use simulations to decide if differences between parameters are significant.** **A2.S.IC.B.6 Evaluate reports based on data.**	
Aspects of Rigor for Students: (Conceptual, Procedural, and/or Application)	
A2.S.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	
Conceptual Understanding	***Procedural Fluency*** / ***Application***
Learners understand the differences between a sample survey, experiment, and observational study and the advantages to their uses. Learners can explain how to use random sampling techniques and the importance of random sampling.	
A2.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.	
Conceptual Understanding	***Procedural Fluency*** / ***Application***
	Learners estimate population mean / Learners use real world data to

	and calculate a margin of error.	determine the population mean and margin of error.
A2.S.IC.B.5 Use data from a randomized experiment to compare two treatment groups; use simulations to decide if differences between parameters are significant.		
Conceptual Understanding	***Procedural Fluency***	***Application***
Learners compare two treatment groups in an experiment and decide if the difference in parameters is significant.		
A2.S.IC.B.6 Evaluate reports based on data.		
Conceptual Understanding	***Procedural Fluency***	***Application***
Learners understand and can explain the parameters of data and their significance.		Learners evaluate a report based on real world data.

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

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
   - Students make inferences paying particular attention to the inclusion and understanding of variability from multiple contexts.
3. **Construct viable arguments and critique the reasoning of others.**
   - Students are able to use simulation and the collection of data to make inferences.
4. **Model with mathematics.**
   - Students model with different phenomena using both simulation and data-generating processes.
5. **Use appropriate tools strategically.**
   - Students decide which kind of sampling technique to use in different situations (experiment, survey, observational study)
6. **Attend to precision.**
7. **Look for and make use of structure.**
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 previous math courses: *Students have learned to determine mean, median, mode, range, IQR, minimum, maximum.* *Students have learned how to graph data distributions (ie - histograms, box plots, etc).*	*Students are able to understand and evaluate the randomness of a sample and use this to determine if a specified model is consistent with the results.*	*Students will build on this knowledge in subsequent statistics course (AP or college level).*

Vocabulary (key terms and definitions)

- Blind experiment
- Control group
- Double-blind experiment
- Experimental group
- Margin of error
- Observational study
- Placebo
- Sample survey
- Simulation
- Statistically significant
- Survey

Relevance, Explanations, and Examples:	
- This would be a great time for teachers to also start talking about correlation vs. causation when reading data.	
Achievement Level Descriptors	
Cluster: Make interferences and justify conclusions from sample surveys, experiments and observational studies.	
Concepts and Procedures	***Level 1:*** Students should be able to apply mathematics to solve familiar problems arising in everyday life, society, and the workplace by identifying important quantities and by beginning to develop a model.
	Level 2: Students should be able to apply mathematics to propose solutions by identifying important quantities, locating missing information from relevant external resources, beginning to construct chains of reasoning to connect with a model, producing partial justification and interpretations, and beginning to state logical assumptions.
	Level 3: Students should be able to apply mathematics to solve unfamiliar problems arising in everyday life, society, and the workplace by identifying important quantities and mapping, displaying, explaining, or applying their relationship and by locating missing information from relevant external resources. They should be able to construct chains of reasoning to justify a model used, produce justification of interpretations, state logical assumptions, and compare and contrast multiple plausible solutions
	Level 4: Students should be able to apply mathematics to solve unfamiliar problems by constructing chains of reasoning to analyze a model, producing and analyzing justification of interpretations, stating logical assumptions, and constructing and comparing/contrasting multiple plausible solutions and approaches.