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: Geometry	**Grade Level: Geometry**

G.G.GMD.B Cluster: Visualize relationships between two-dimensional and three-dimensional objects

The focus of this cluster is to reinforce the relationship between a three-dimensional object and the dimensions of its two-dimensional cross section. Focusing on the two-dimensional cross-sections helps learners visualize dimensions needed later for finding volume and surface area of solids. For example, the height of the triangle in the cross section of a cone.

****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.*

G.G.GMD.B.4 Identify two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

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

G.G.GMD.B.4 Identify two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand a cross section is a two-dimensional representation of a slice of a three-dimensional object. Realize that the cross section can be different depending on location and angle where the three-dimensional object is cut.	Given a three-dimensional object, identify possible cross sections. Given a two-dimensional object, identify the three-dimensional object created from its rotation. For example, the rotation of triangle represents a cone.	Represent real-life rotating objects as three-dimensional objects. For example, the space occupied by a revolving door can be described as a cylinder.

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

1. **Make sense of problems and persevere in solving them.**
   - Learners must be challenged to develop deep understanding through exploring a range of tasks that require problem solving.
   - Make sense of formulas and the relationships among them.
2. **Reason abstractly and quantitatively.**
   - Justifying formulas will move learners from concrete to abstract thinking.
3. **Construct viable arguments and critique the reasoning of others.**
   - A central focus is constructing viable arguments about formulas in order to avoid ambiguity.

4. **Model with mathematics.**
    - There are multiple opportunities for modeling with geometric shapes representing real-world applications.
    - Develop generalizations using modeling.
5. **Use appropriate tools strategically.**
    - Physical models and dynamic geometry software can be used to explore these concepts.
6. **Attend to precision.**
    - Attend to units of measure.
    - Use precise mathematical language to avoid ambiguity.
7. **Look for and make use of structure.**
    - Learners connect related formulas (i.e cylinder/cone and prism/pyramid) and deconstruct composite shapes.
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 6th grade, learners represent three-dimensional figures using nets made up of rectangles and triangles to calculate surface area. In 7th grade learners describe the two-dimensional figures that result from slicing three-dimensional figures, focusing on right rectangular prisms and pyramids.	Learners use cross section dimensions in volume calculations (i.e. the height of the triangle when calculating the volume of the cone)	In later courses, learners study conic sections which can be described as cross sections of a cone. Calculus concepts will build on volume of solids of rotation.

Vocabulary (key terms and definitions)

- three dimensional (3-D) shape
- two-dimensional (2-D)
- cross-section

Relevance, Explanations, and Examples:

These skills are helpful when interpreting plans and scale drawings (IKEA etc.)

Physical models would be helpful for students.

Activities like taping a two dimensional shape to a pencil and spinning it can help learners see the three dimensional shape created.

Achievement Level Descriptors

Cluster: **Visualize relationships between two-dimensional and three-dimensional objects**

Concepts and Procedures	***Level 1:***
	Level 2:
	Level 3:

	Level 4: