Similarity, Right Triangles, and Trigonometry

http://www.corestandards.org/Math/Content/HSG/SRT/

For the standard I choose, the standards appear to be specific in many cases. “Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar;” doesn’t leave much room for interpretation. There are other standards that include a more description style, such as “Explain and use the relationship between the sine and cosine of complementary angles.” Lastly, there is one minor one that requires rote memorization, where the student is required to memorize the formulas for the volumes of “cones, cylinders and spheres.” I think this format does allow some flexibility on how it is taught, while still adhering to a common set of standards as to what the students will learn.

Where this standard lies in relation to prior knowledge does make some sense for me. Congruence is listed prior to similarity in the same class. I believe this makes sense as similarity is likely harder to define or understand without understanding congruence. Proving some of the theorems as in standard G.CO.10 for triangles would help greatly in proving similarity as in SRT.B.4. They would both use the same line of thinking in order to arrive at a conclusion.

In the previous year learning mathematics, traditionally thought of as algebra I, there are definitely some prior knowledge standards that make sense as prior knowledge for this topic. HSA.SSE.B.3 lists writing expressions in equivalent forms, which is partially a precursor to proofs, where frequently one simply manipulates expressions using equivalents to form a proof. Creating equations as in CED.A.3 includes inequalities, which further expands on the equation manipulation and helps make the concept of equivalence more generic. This abstraction continues into geometry, where proof form is the most abstract version of equivalence manipulation.

The high school standards are laid out in a slightly different form then the K-8 standards. The K-8 is organized by grade level and specify roughly what each grade should be learning. The high school standards are organized by topic, almost by class (algebra to algebra, geometry to geometry, etc). For me, this makes sense, as K-8 the students will be learning roughly the same material, but in high school the classes will probably be taken in traditional order, but it doesn't have to be so. And other students will need remedial help with some of the topics they learned in elementary school.

The way these are organized allows districts and schools to modify some of the classes if, for example, they want to move some Algebra I topics to Algebra II or vice versa. In other cases, the curricula might be the same, but a teacher reviewing algebra might adjust the focus, when talking about polynomials, to relate it to quadratics and parabolas, knowing that's what the student will be required to know in Algebra II. For these reasons of flexibility and review, I think the standards are laid out in a very meticulous fashion.

Another observation about the geometry standards is that it gets more abstract and theoretical as the grade levels increase. For example, grade 6 geometry requires finding volumes and areas of various figures that one can see, such as cubes and prisms. This practicality helps younger learners to relate the math to the real world. In the high school geometry curricula the topics be come more abstract and less able to relate it to the real world, for example a discussion of sine and cosine. While one could review, for example, an alternating current electrical application, there is really nothing to see or touch. In this way the standards appear to build increasing layers of abstraction through high school geometry, where the student is creating proofs from previously known information.

This abstraction will help the students begin to think logically about the world around them in a more abstract and logical way. A implies B, or A is disproven by B are constructs not limited to mathematics, and support the goals of a basic education, specifically the “basic knowledge and skills needed to compete in today’s economy and meaningfully participate in this state’s democracy” (McCleary v. Washington State 2012).

There are some practical lesson plans that can be developed with similarity and triangles. For those short on time, this might include drawing similar triangles and reviewing their relationships. Other lessons might include word problems about tiling a kitchen floor, then the next word problem changes the dimension of the floor and seeing if knowledge about similar triangles can get a fast way to rework the triangle floor. For a class with a lot of time and resource, this might include actually mapping out triangles of difference sizes on a floor and seeing how they relate to each other. With even more resource, a computer aided design program might make drawing similar and congruent triangles, and measuring dimensions and angles easier or more interesting.

Reference:
McCleary v. Washington State, No. 84362-7 (2012)
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