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Geometric Models in Many Classrooms. Preliminary report.

We present class-tested projects in which students make and use models to increase mathematical understanding.

Geometry students collaborate to build several models of non-Euclidean geometries, which we continue to work with throughout the unit. Building the model changes attitudes toward hyperbolic geometry from an absurd notion to one that is new but interesting and understandable. The models help students make conjectures or demonstrate results in an unfamiliar system. In liberal arts courses, the models help students discover that there are aspects of mathematics they have not seen. Finding a world where the angles of a triangle are too small or the circumference of a circle is too big changes a boring, “we already know this” subject into one that has surprising properties to explore.

Students draw star polygons and tie knots with strips of ribbon. In geometry, they will have discussed construction by ruler and compass and by origami. The knots provide another means of constructing regular polygons. These figures also show links between star polygons, modular arithmetic, and subgroups of finite cyclic groups. Liberal arts students use the models to make conjectures about the number of sides to a figure, the star pattern used to construct it, and common factors. (Received September 22, 2011)