Understanding Math via Arts ❖ Creating Arts via Math

Preface to Bridges for Teachers, Teachers for Bridges

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Abstract

This preface attempts to give a brief overview of Bridges for Teachers, Teachers for Bridges (BTTB) workshop papers while reflecting on their place in a broader setting of teaching and learning mathematics as a creative activity. BTTB 2007 papers provide an eclectic collection of inspiring ideas of mathematics and art interplay. This collection can be clustered in many different ways. The way selected here is considering mathematics as: creative transitioning between dimensions, a study of artful patterns, inquiry, and connections within and outside of mathematics.

Understanding and Learning Mathematics

Research suggests that learning and thinking is more efficient if learners are provided with multiple entry points and perspectives (Adams & Hamm, 1997). This provides an insight into learners' understanding how learning mathematics can be approached from multiple directions, while facilitating understanding and making meaningful connections both within and outside of mathematics (National Council of Teachers of Mathematics (NCTM), 2000). Furthermore, this requires providing curriculum alternatives that will appeal to learners with different learning styles and different backgrounds (Adams & Hamm). Integrating arts and mathematics instruction supports the idea of multiple ways of thinking. It an exemplary alternative that not only provides different ways of representing mathematics knowledge and understanding of arts but also an arena for developing critical and creative thinking.

People often think about mathematics as a computation, while all mathematicians see computation as only one aspect of mathematics, almost just a tool for accomplishing many other mathematical tasks, within and outside of mathematics (National Research Council, 2000). The phrase *Mathematics is an art of avoi*ding numbers is used to emphasize that there are other facets of mathematics.

The following is a brief clustering of mathematics and art integration concepts that will be presented at Bridges for Teachers, Teachers for Bridges strand of Bridges 2007 conference.

Mathematics as creative transitioning between dimensions. Developing a deep understanding of inter-dimensional relationships by constructing variety of structures is a challenging facet of mathematical thinking. Zometool is an excellent resource for exploring such aspects of geometry, especially in three and even four dimensions. A considerable body of pedagogical expertise, both guided inquiry and discovery, has been built up using it with classes of children, both in and out of school, which will be of immense value to anyone considering its use (Hildebrand).

Visualizing three dimensional objects may be notoriously difficult, so a collection of large models suitable for demonstrating transitions between dimensions to a large group of people, in a class for example, is invaluable. Mc Dermott presents a cheap, quick and easy way to do that.

When you think that all ideas are exhausted, there is always one more fascinating transition from 2D stripes to 3D artifacts: Exploring Cubes woven on the Skew. Plaited or woven polyhedra have been explored for over one hundred years, and produced as useful artifacts for much longer, but there are still uninvestigated aspects of something as simple, apparently, as woven cubes (Wood).

Mathematics as a study of artful patterns. This cluster comprises an eclectic collection of patterns, from imaginative quilted geometric assemblages to integrating Islamic art patterns to mathematics teaching. This is a rich collection of mathematics and arts ideas for any classroom.

Geometry has an immediate appeal for many pupils, most obviously the visual thinkers. Pattern making activities will usually engage all pupils at some level, and they can provide useful ways to develop and consolidate mathematical insights (Ellison).

Paper-folding is a popular activity that enhances both visual and kinesthetic learning, so that in Japan origami is an essential aspect of the school curriculum. In a further development it can provide the raw materials for artistic and/or mathematical investigations, and much geometry appears along the way (Bier).

Mathematics as an Inquiry. Any mathematics teacher needs a bank of stimulating classroom activities. Dobson and Gage prepared a rich, imaginative and inspiring collection of ideas for a mathematics classroom: digit-sum spirals, Islamic art, fractals, labyrinths, Celtic knots… They go even further to include related questions, mathematics objectives and additional resources (Dobson & Gage).

Mathematics as Connections. Traditional trouser designs seem to have little in common with the conventional view of patterns and mathematics, but here is another example of mathematical thinking by people who would seem, probably even in their own estimation, to be incapable of mathematics (Woolfitt).

Activities based on modular arithmetic provide excellent number practice. Producing colored patchwork designs can provide motivation for number work, and the patterns provide the basis for explorations of some less-obvious number properties. Yet another connection: Using translation and rotation to draw an anamorphic image develops an interesting insight into both various aspects of geometry and source of puzzlement that anamorphic art provokes (Hanson).

References

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