

Essential Tools for Math Teachers

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When we teach our students about all of the things available to them, we are truly differentiating instruction, enabling our students not only to choose how they solve a problem, but how they present the final answer. Essential tools for math teachers these days are all about differentiating instruction for their students. In order to solve the multi-step, vocabulary rich, and real life math problems of today, our teachers must provide as many tools to which they have access to their students. Besides the algorithm method, and using pencil and paper, students must be versed in how to use manipulatives, as well as computer programs and virtual manipulatives in order to solve these problems.

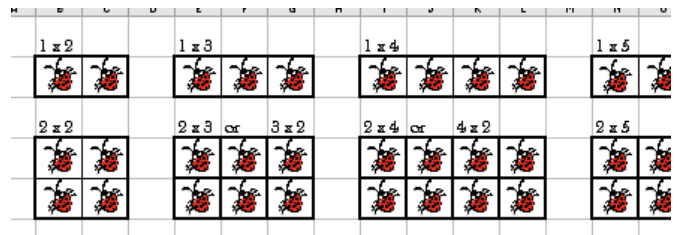
When using the computer for math problem solving, many of the virtual manipulatives give students from K-12 an entirely different view of a problem and/or a solution. Virtual manipulatives can give insight that is nearly impossible to see using hands-on manipulatives and certainly not using pencil and paper. What a wonderful set of tools for teachers to have in their tool belt!

Virtual Geometric Shapes

This web site: <http://illuminations.nctm.org/LessonDetail.aspx?ID=L406> uses polygons to help students understand geometry.

This web site, and others like it, can show students from kinder all the way through 12th grade a totally different view of a geometric figure. When students maneuver the figure, they can see it from angles that even the handheld solid figures never present. They can turn the object in transparent mode, which gives them an entirely new view. They can count the edges, vertices, and faces with ease, by holding down the shift key on the computer and clicking on each of the parts he wants to count.

This series of lessons can be adapted to all ages. I have even used it with parents on parent nights, and watch even their eyes light up in amazement. One reason I use it with parents is so that they begin to understand why their child may not come home with the traditional worksheets and problems that they once came home with. Something I like to do is to place toothpicks and clay (the non-stick kind) in a baggie near each computer. When the students have finished a task, worksheet, or some project they have been assigned to do, their charge is to make one of the figures. They count the edges to find the number of toothpicks



Above: Arrays with Excel

needed, and they count the number of vertices to see how many balls of clay they need to make. Their delight at making even the most complicated figure is very rewarding. Imagine the retention of what a face or a vertex is when you talk about geometric figures!

Virtual Geometric Dot Paper

Have you had students in your classroom that just cannot draw something you have asked them to when you are studying geometry? I certainly have, even using the dot paper, or isometric dot paper that we give them to help guide them. This web site with virtual isometric drawing tools is the motivator for those students, as well as many other types of learners in your classroom. <http://illuminations.nctm.org/ActivityDetail.aspx?ID=125>.

When studying volume, area, or perimeter this site is invaluable. Although it should not replace the pencil paper method, it most certainly should be taught as an alternative way to solve a problem or find a solution. This site gives a student many choices on how they want to draw a figure, either line by line, or by using square units to draw their figure. This is an Illuminations site,

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7	61	62	63	64	65	66	67	68	69	70			61	62	63	64	65	66	67	68	69	70
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Above: Comparing skip counting or factors

Left: Missing numbers fill in

which always has great lesson plans, teacher ideas and examples.

Virtual Perimeter and Area

Another site that belongs in our tool belt helps with the learning of perimeter and area is this one: <http://www.shodor.org/interactivate/activities/perimeter/index.html>

This applet allows students to test their skill at calculating the area and perimeter of a given figure. I have used it with students that need reteaching, but after learning about this site and using it, the light came on! You don't have control over the shapes you have to calculate, but you have many varied shapes with which to practice. It is self-checking and gives students practice that might take days to complete by drawing or making the shapes using cubes in the classroom. You can also choose only to have rectangular shapes or non-rectangular shapes, according to the difficulty you wish to present. The site also keeps your score if you want to, so that the teacher can come and look to see if the student is getting the concept. What a GREAT center activity for math practice!

Hundreds Charts and Arrays

Another resource that I have used frequently in all grade levels for math, is the Excel program. Obviously, using a program such as Excel to graph data and to record your findings can be a good way to give students

choices as to how to find and present their information, but there are many more uses for students. One way to use Excel is to make a hundreds chart with it. I have made some in which the hundreds chart covers the whole sheet, and I have some in which I have four small charts on one sheet so that I can compare different ideas on the same sheet. Once one of these hundreds charts is made, younger students can use it elec-

tronically as they would a paper hundreds chart. They can compare number patterns and skip count. They are also learning how to use the Excel program by using the paint bucket by coloring in the skip count numbers, or when they are to color in the multiples of a certain number. They can type in text when asked to complete a set of numbers on a hundreds chart some are left out, or when asked to make their own hundreds chart, as you might ask older children to do.

Another great way to use Excel with elementary children is to have them use it to make arrays. They can use just about any clip art picture or paint bucket color to make their arrays (they like the clip art pictures the best!) They love doing this, and it does not take them long to learn how to do it. Students can then write their problems or their arrays underneath the actually array that they created to show they understand what they made. Again, as with the geometric figures, the retention after making their own arrays using Excel is significant!

Differentiation in math means that students are not only given the math problems at their level, but that they are given a choice as to which method to use to solve the problem as well as, or in addition to, given a choice as to how they are to show their work and the answer. Exposing students to the available online tools and software empowers them to make choices for their own learning.

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