What Kind of Math?

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"No, we're not playing poker!" That was my answer to the students' questions as they came into my classroom. "I don't even know how to play poker, but we ***are*** going to play with poker chips today!" was my rejoinder to these eager grades four and five students. So what are poker chips doing in an Adventist classroom? My students use them to navigate the base-ten system of math, especially the larger numbers that seem to elude some students' understanding.

As a learning assistance teacher, I see students who are missing a solid understanding of how our number system works. Students should understand the underlying concept of our "base-ten" number system by grade two, maybe grade three at the latest, but I've seen students in middle school who continue to struggle with the concept. And if they struggle with this concept, they also struggle with all the concepts that build on it…addition and subtraction, multiplication and division, and higher level math concepts.

Most elementary teachers teach number system concepts using base-ten blocks. Most students in regular classes easily grasp these concepts, almost effortlessly making the leap to larger numbers. But a few students need more time and experience with manipulative materials to understand the concepts. Some students understand numeration concepts up to one thousand, but without manipulatives to explain larger numbers, they struggle. To help these students, I trolled teacher sites on the Web to find. I found a helpful website (http://www.garlikov.com/PlaceValue.html) and "poker-chip" math was born.

As I hand out white and red chips to my students, we discuss the need for rules in games. I hand each a card with two rules printed. I explain that, for now, these will be the rules of our game. I ask my students to take poker chips and "make five" from the chips. After some strange looks, and a couple of questions, "Should I use white or red?" or "What do you mean, 'make five'?" the students count out five white chips into a rectangle I've give them to use as their playing surface.

Game rules:

10 white = 1 red
10 red = 1 blue

I then ask them to "add seven." Each dutifully adds seven white chips to his or her group of five chips, and I ask how many are in the rectangle. They reply, "Twelve," and I acknowledge their correct answer. I then ask if they can find a way to use fewer chips to show me the twelve. Again, I get strange looks, but as I point to the card with the game rules, I start to see looks of understanding. Over the next class period or so, we continue playing with white and red poker chips as they explore the trades they need to make when they add, and later, subtract numbers up to ninety-nine. I start to tie the game they have been playing into our number system that contains ten randomly chosen symbols that we call 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. I share that when they count to twelve, there is no symbol for "twelve", but that they use the digits 1 and 2 in the same way they have used the red chip and two white chips to symbolize "twelve". By the time we are ready for the next rule in the game, they are excited about trading into blue chips!

We then explore addition and subtraction with numbers up to 999. By this time, we record their solutions using numerals. They see the link between the chips and the numbers they use every day to add and subtract. But the excitement continues to build as we turn their rule cards over, and they see the rules for larger numbers. An interesting comment usually comes when they trade ten yellow chips for one black. I ask them what they call that number, and many students will call out, "million!" I ask the students to re-count their yellow chips, and they discover that they need to call the black chip "ten thousand" instead! The discussions that ensue about the names of the "houses" where they find ones, tens, and hundreds become less of an abstraction and more of a reality as they explore these ideas with the chips.

Game rules:

10 white = 1 red
10 red = 1 blue
10 blue = 1 yellow
10 yellow = 1 black
10 black = 1 green
10 green = 1 orange

By continuing to play this game, my students learn to easily grasp the exponential growth of place value within the base-ten number system. It becomes very simple to show them that the thousands place, for instance, can be shown as 10 x 10 x 10, because they can follow the logic backward by using the different colored chips that they have become so adept at manipulating. By playing with poker chips, they have come to understand the foundation of our math system. (Hint: high school math teachers can use the same tools to teach other base values, such as base-2 or base-5. The tools are the same, but the rules governing the tools would change.)