Using Calculators as Effective Learning Tools

Summary: In elementary classrooms, calculators are most often used to check computations or for simple practice. In an article for *Teaching Children Mathematics*, a group of researchers and teachers discuss concrete ways that calculators can be used as pedagogical tools which advance students' math understanding.

Practical Applications

Research has shown that students benefit the most from calculator use when calculators "had a pedagogical role in the classroom and were not just available for drill and practice and checking work." The authors go on to detail three specific lessons/games that exemplify using calculators in this way.

- **"Wipe-Out"** (*objective: develop place-value concepts*). "The object of the Wipe-Out game to 'wipe out' a specific digit from a given number." Playing in pairs, one student types a multidigit number into a calculator, with each digit being unique, and tells his or her partner which digit to 'wipe out' (e.g. 4316, "wipe out the 3"). The partner then takes the calculator and performs a subtraction, attempting to turn the '3' into a zero (in this case, by subtracting 300). The partners then switch roles, and continue to play, recording their work as they go. This game gives students immediate feedback and provides rich opportunities to discuss place value. Extensions can include using decimal numbers or changing digits into non-zero digits (e.g. 3 into 1, or 3 into 8).
- **"Groups: How Many, What Size?"** (*objective: develop multiplication and division sense*). In this game, students use repeated addition or subtraction on their calculators to show that the value is the same as multiplying or dividing. Specific steps, listed for the students on a worksheet, are:
    - **What** does it mean to have four groups of seven [or another question]
    - **Use** physical counters to model the problem
    - **Compute** using your calculator, once with addition and once with multiplication; how many times do you have to add seven to get to 28?
    - **Write** the multiplication and addition equations on a worksheet
    - **How** many groups of seven can you get from 28?
    - **Model** how you can divide 28 counters into groups of seven
    - **If** you start with 28, how many times do you have to subtract seven on your calculator to get to zero?
    - **Note** the subtraction and division equations on a worksheet

  This game can be extended by using multiplying a whole number by fractions or decimals, and can lead to discussions about the different operations.
- **The Range Game** (*objective: develop estimation skills*). In this game, "the teacher state[s] a starting number, an operation and a target range." (e.g. "250, division, range of 40-45") In pairs, students share a calculator. One at a time, each student makes a mental estimate of what needs to happen to the starting number (e.g. "divide it by 8"), and then uses the calculator to check. If they are right, they gain a point; if not, they let the other student try. This can lead to good discussions about estimation, and the game can be extended by using decimals.

Conclusion and Citation

The calculator can be a much more powerful learning tool than it is usually given credit for, as these example games demonstrate.

Cady, J. & Lucas, K. "Pedagogical Instruction with Calculators." *Teaching Children Mathematics* (Feb. 2012), pp. 384-389. http://bit.ly/wwLNs1 (subscription only).