GUEST EDITORIAL

Technology and Mathematics: The Importance of Values

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An example is worth a thousand pictures. Recently, I had the opportunity to observe a Grade 8 mathematics class in a computer lab environment. There were about 30 microcomputers, with a student at each one. The students were engaged in a math drill program requiring rapid responses to a series of computational problems of increasing difficulty. The screen was filled with fancy, colorful graphics as the students worked through the various levels of the scenario. About a quarter of the students were not involved. While the computer was meticulously measuring their response time to a thousandth of a second, they were actively engaged in conversation with their neighbor or close friend. (Imagine a researcher, removed from the classroom, interpreting those lengthy delays!) Most of the other students were giving the task their attention. For many, the importance of obtaining another 10,000 points was all-important. By most criteria, the latter three-quarters of the class would be considered good students. They were enjoying—and in a few cases, really enjoying—the activity set for them. This was what I found most upsetting.

We all have dreams. We all have visions of an ideal educational system. My visions do not include the above scenario. My comments are not directed to the teacher but to the students, particularly the majority who were enjoying the exercise. They shouldn't have! And though my comments are directed at students, my concern lies with the educational enterprise. I am concerned about an educational system in which students enjoy such activities. I am not opposed to drill. Far from it. There is clearly a place for such practice, and this classroom may well have been such a place.

Nonetheless, I am using the example to suggest something about the appropriate use of technology in education. The simple fact that a computer *can* be used in a certain manner is no reason to suggest that it *should* be used in that manner. More fundamental issues, pedagogic and conceptual, need to be addressed first. One of my criteria for a desirable educational activity, with or without computers, is that students should be actively thinking. Another is that students should have the opportunity to exhibit self-control and independence. A third is that students should work within a sharing environment, where ideas and suggestions are freely communicated among the participants.

I would like to contrast the above scenario with one that occurred in the same room during the next period. This time it was a Grade 5 class. Students were each working on a task of their own choosing within a Logo environment. To me, the differences were dramatic. First, the level of excitement and enthusiasm was contagious; the students were proud of their work and had good reason to be. Second, the students were actively engaged in a myriad of problems and subproblems—their minds were in high gear as they reasoned their way through the various implications of their actions. Third, although the students may not have realized it, they were doing mathematics, in contrast to remembering mathematics. In the case of Logo, the glitter was in the students' minds (and eyes) rather than on the screen. We need to distinguish between the enjoyment that comes from using a new device and the enjoyment that comes from understanding, for example, the pattern behind the concept of a square, or the relationships among a square, a hexagon and a circle. A Logo screen display is relatively barren, but it can be deeply satisfying.

Among the goals of the senior high school mathematics program are these:

1. To develop in each student a positive attitude toward mathematics
2. To develop the ability to use mathematical concepts, skills and processes
3. To develop the powers of logical analysis and inquiry
4. To develop an ability to communicate mathematical ideas clearly and correctly to others

The goals of the elementary mathematics program are similar. The program is intended to "foster within the learner a sense of accomplishment and success, a positive attitude toward mathematics and a positive attitude toward learning." However, there is often a substantial gap between these goal statements and the skill objectives that are then formulated, avowedly to achieve these goals. Our concern for measurable skills and behaviors has the unfortunate tendency to pull us away from our goals—an embarrassing paradox.

I believe that these Grade 5 students were actively involved in a setting that is highly consistent with all of these goals. I am less confident about the activities of the Grade 8 class. The choice is ours. The critical issue is not technology but how the classroom teacher plans to use the technology. I would like to see the computer used more often in a way that is consistent with the goals just listed.