When I started this school year, I was excited to have five student computers and a teacher's presentation station available to me in my classroom. However, I was not yet sure how I would use the computers to enhance instruction for my high school math classes. As the year progressed, I learned much about using computers for instruction. The first lesson I learned is that using computers for instruction does not come easily, nor did it seem to flow naturally as I had envisioned that it would. My situation this year has been rather unique since I teach math in the morning and coordinate my school district's technology staff development program in the afternoon. This experience of being both a classroom teacher trying to implement technology and an administrator involved in helping others to use technology has been enlightening.

The purpose of this article is to share how those of us who are in leadership roles regarding technology in the classroom are finding our way in how to use computers in a meaningful way to enhance instruction. We are still learning as we go. In the following paragraphs, I will identify some of the most important lessons we have learned in the North Syracuse Central School District.

Establish an In-House Cadre of Technology Trainers.

Long before North Syracuse implemented its ongoing technology plan to put five computers in every classroom, a cadre of teachers who were comfortable with using computers was formed. This cadre offered a variety of training workshops for teachers, focused on the use of various computer applications. Members of the cadre developed and piloted a six-hour course on how to use computers in secondary instruction. The course has been offered three times by invitation to teachers who are comfortable with the use of technology and have expressed interest to cadre members about learning more. This workshop is continually being revised for future offerings.

The importance of establishing a cadre, however, is not that a series of workshops on how to use computers will enable teachers to use computers as an instructional tool. Rather, it is the relationships that are formed during these workshops that establish the cadre members as a resource for their colleagues. While many teachers have learned computer skills from attending the workshops, they also can lose these skills if they are not practiced. Because the cadre consists of teachers from each of the schools in the district, members are available on an ongoing and informal basis to the rest of the staff. When teachers want to learn—or relearn—how to do something, they can approach a cadre member from their building to help them. Both Garavaglia (1996) and Maddin (1997) identify such ongoing support as an essential component of effective staff development programs. The informal in-service that has occurred one-on-one between teachers has perhaps been as important as the formal workshops presented by the cadre.

Help Teachers Provide Necessary On-Site Support.

Another benefit of the cadre is that as the computers have been placed in classrooms over the years, there have been cadre members who have taken on the role of helping teachers in the integration of technology. One cadre teacher from the junior high school, and one from the high school, are granted half-time sabbatical leave to help teachers integrate technology into instruction. These teachers are assigned half their regular workload, and devote the remainder of their time to providing on-site support to teachers who want to use computers for instruction. Having such a resource in-house has helped many teachers to take their first step. I would urge any school district to include funding—in their staff development budget or in any other available part of the budget—for helping teachers.

How Much Time Is Appropriate?

When plans are made to use computers for instruction, it is difficult to quantify the amount of time that is appropriate for using computers for instruction.
However, if one considers that 15–20% of class time is not an unreasonable amount of time for students to spend on assessment—based on one quiz for every five classes—and that at least half of class time is spent by the teacher presenting material in one way or another, then only 30% of class time remains. Assume that half of the 30% of time remaining would be appropriate for the use of computers for instruction, and the other half of that time would be best geared toward other learning activities. That leaves about 15% of instructional time for computer-based activities. Although this estimate is plagued with assumptions, it is intended to provide a high approximation of how often computers might be used. Computer-using teachers with whom I have discussed this point generally confirm this estimate and often offer a slightly lower figure of 10%.

My point in quantifying the percentage of instructional time that would be appropriate is not to establish a goal that all teachers use computers 10–15% of the time. Rather, my point is that even if teachers do incorporate the use of computers into instruction, the perception from the outside is still likely to be that the computers are not being used enough. Even in a school where all teachers are using the computers 10% of the time, a visitor walking around the school may observe computers being used in only one out of ten classrooms on a given day if the computers are placed in clusters in each classroom.

This time distribution must be thoughtfully considered in deciding how computers should be deployed.

The two most common models for the physical placement of computers are establishing classroom labs of computers or clusters of several computers in each classroom. Before getting to the "lab versus cluster" question, however, it is appropriate here to address the issue of constructivism.

**Constructivism**

In earlier paragraphs, I made assumptions based upon a teacher-directed model of instruction. In the literature, it is argued that we should be looking at more of a constructivist approach for integrating technology into instruction (David, 1991; Dwyer, Rigstaff, & Sandholtz, 1997). In brief, constructivism is based on the idea that meaningful learning occurs when students can build their own knowledge. In this regard, constructivism is in opposition to teaching techniques that are based upon the teacher disseminating knowledge to students. While I believe that the constructivist approach has its merits, I question the adoption of this model on two points.

First, I argue that constructivism works well in situations in which students can be motivated to learn in a self-directed manner, they attend school regularly, they have a foundation of knowledge to build upon, and the curriculum is such that less content can be covered so that learning can be more in-depth and meaningful. In my pre-calculus class, I believe that these conditions are met. In fact, the pre-calculus teachers from my school will be piloting a program as part of a study by Dr. Helen Doerr, of Syracuse University, that is based on constructivist principles.

I have less faith, however, that a constructivist approach would work with other classes I have taught where there is not a solid foundation of knowledge to build upon. These are also classes in which students must pass a state exam in order to graduate and the curriculum is such that it does not allow for the time necessary for students to build their own knowledge.

The second point about the feasibility of constructivist approaches is that it requires a major paradigm shift. Practically, I cannot foresee constructivism becoming the primary mode of instruction in public schools any time soon. Fullan (1996) makes the case that system exists—at least for now. For instances in which constructivism is the dominant mode of instruction, this difference should be accounted for.

**Labs vs. Classroom Clusters: One Size Does Not Fit All.**

At the secondary level, teachers of different content have different instructional needs. Many school districts do not take these differences into account (Deacon, 1999). The assumption that the computer needs of a math classroom would be the same as those of English, social studies, art, music, or science ignores fundamental differences between these disciplines. The North Syracuse District is learning this lesson now and is looking at other ways, or combinations of ways, to distribute computers based on different instructional needs among academic departments.

As a math teacher, I have used computers about 10% of the time. In my first year with a cluster of computers in my classroom I have found it difficult to use the classroom cluster effectively. I have preferred to take my classes to the library computer lab because my instructional objectives were better served within the lab environment. There was only one occasion when I preferred the cluster of computers: 20