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Where do you find time? The national standards for both science (National Research Council, 1996) and mathematics (National Council of Teachers of Mathematics, 1989) emphasize hands-on learning, inquiry-oriented laboratory experiences, and performance-based assessment of student achievement. Many state curriculum frameworks also call for remediation and enrichment programs. Can all of this be effectively accomplished within the traditional schedule of six to nine class periods in a school day? Perhaps it is time to consider a different way of structuring time in schools.

The national standards for science and mathematics education call for sufficient instructional time for inquiry-oriented activities, accompanying discussion, and explanations of concepts involved. The science standards prescribe a minimum of 300 minutes per week for science instruction in secondary schools, with at least 40% of that time devoted to inquiry or hands-on experiences. The mathematics standards contain similar guidelines and stipulate one hour of mathematics each day at all grade levels as being a "reasonable expectation."

TEACHING STANDARDS

Several of the standards will require increased time to achieve ambitious instructional goals. For instance, according to Science Teaching Standard D (NRC, 1996), teachers are to design and manage learning environments that provide students with the time, space, and resources needed for learning science. In doing this, teachers must:
*Structure the time available so that students are able to engage in extended investigations.

*Create a setting for student work that is flexible and supportive of science inquiry.

*Make the available science tools, materials, media, and technological resources accessible to students.

*Identify and use resources outside the school.

Many schools are turning to "block scheduling" as a way of meeting these goals. The term, "block," does not refer to a specific period of time, but it implies a schedule that is flexible enough to allow extended sessions for courses that would benefit from longer periods. Typical models of block scheduling have blocks of time ranging from 80 to 120 minutes in duration, but there is no minimum or maximum. It is also possible to have blocks split into smaller modules for those courses that are better accommodated by shorter time segments.

There is also the possibility of "alternate day" schedules where students take different courses on alternate days for the entire year, instead of different courses each semester. The Copernican model (Carroll, 1994) has a 2.5 hour class for two subjects within a ten-week semester.

There is no one model that is right for every school or type of school. Each school must design the schedule that is right for local circumstances. When designing the schedule, the primary goal is to structure time to maximize student learning within each course. Implicit in this goal is the need to structure the schedule to provide teachers the time they need to plan and evaluate instruction, and to collaborate with each other in developing new and effective methods and materials.

Experienced teachers know the importance of engaging student interests, allowing them time to explore, encouraging them to ask questions, and helping them construct meaningful concepts. Schools must structure time to enable such practices, as well as make tools available, identify resources, and assess student performance. It is also generally accepted that "lecturing" is not an appropriate substitute for more effective instructional methods, but the lack of skills, facilities, support, and sufficient class time often inhibits the use of other approaches.

While the mathematics curriculum standards (NCTM, 1989) do not specifically refer to block scheduling, they do suggest that some reorganizing of schools will be necessary. For example, the standards state that, "Calculators and computers with appropriate software transform the mathematics classroom into a laboratory much like the environment in many science classes, where students use technology to investigate, conjecture, and verify their findings." As with the science standards, the mathematics standards emphasize the importance of meeting the needs of students along the full continuum of abilities and challenges to learning. This, too, implies a need for longer periods of instructional time during class sessions than is available in traditional schedules.

STAFF DEVELOPMENT STANDARDS

Every class includes learners with a variety of learning styles; each student sees the world from a unique perspective. Most classes have some degree of cultural diversity, as well as students for whom learning is a challenge. Classroom culture continues to become more complex, requiring more technical skills and more time to respond to the wide range of individual differences. Therefore, increased time for professional development will become increasingly crucial to achieving the objectives of the national standards.
Here are some of the guidelines provided by the Professional Development Standards (NRC, 1996) for science teachers :

*Provide regular, frequent opportunities for individual and collegial examination and reflection on classroom and institutional practice.

*Provide opportunities for teachers to receive feedback about their teaching and to understand, analyze, and apply the feedback to improve practice.

*Provide inservice programs characterized by collaboration among the people involved in programs, including teachers, teacher educators, professional associations, scientists, administrators, policy makers, members of professional and scientific organizations, parents, and business people.

*Provide opportunities for teachers to learn and use various tools and techniques for self-reflection and collegial reflection, such as peer coaching, portfolios, and journals.

These and other standards for professional development will also require additional time in larger blocks. It will become increasingly important that school schedules provide sufficient time for instructional preparation and professional development.

ASSESSMENT STANDARDS

The standards recommend that all assessments be authentic, fair, varied, valid, and reliable. The impetus is to move away from heavy reliance on multiple-choice testing to assessments which are performance-based. This will require using many different forms of student assessment. Traditional tests cannot adequately assess the outcomes of standards-based science and mathematics education. Alternative forms of assessment might include use of portfolios, concept mapping, open-ended questioning, Paideia Seminars (Holden & Bunte, 1995), and other performance tasks that involve student manipulation of materials to produce a product that illustrates conceptual understanding. A return to the idea of a "laboratory practicum" is implied by the science standards, but this practicum will be assessed much differently than previously. The "Benchmarks for Scientific Literacy" (AAAS, 1993) assert that "If students themselves participate in scientific investigations that progressively approximate good science, then the picture they come away with will likely be reasonably accurate. But that will require recasting typical school laboratory work. The usual high-school science "experiment" is unlike the real thing. The question to be investigated is decided by the teacher, not the investigators; what apparatus to use, what data to collect, and how to organize the data are also decided by the teacher (or the lab manual); time is not made available for repetitions or when things are not working out for revising the experiment; the results are not presented to other investigators for criticism; and to top it off, the correct answer is known ahead of time."
Assessment is addressed in the mathematics standards as well, and the focus is on alternate assessments such as project work , group and individual writing assignments, discussion between teachers and students-and among students, and the maximum appropriate use of educational technology.

CONCLUSION

If the visionary goals of the science and mathematics standards are to be achieved, educators must take a hard look at just about everything they do. Certainly the structuring of school time will be one important dimension to examine. Perhaps scheduling for administrative simplicity or efficiency must give way to scheduling for maximal student learning and teacher planning.

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