NEEDED: TEACHER-LEADERS FOR ELEMENTARY MATHEMATICS

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Mathematics teacher-leaders can be the key to successful implementation of the NCTM Standards in the elementary schools. The need for a teacher-leader in each elementary building is recognized by recommendations of professional groups, individuals and the recently completed Kramer Project. (NCTM; Romberg, 1986; Everybody Counts; Friesen, 1990; Wesson, 1990)

After observing the active and effective role teacher-leaders played in the Kramer Project, a successful implementation of a primary mathematics program which went far toward meeting the demands of the Standards, the writers decided to try to characterize the contributions and activities of these leaders. Demographic methods adapted to this problem resulted in both structured and open-ended interviews with the teachers and teacher-leaders involved in the project. All interviews were conducted after the study was completed and the program was moving forward on its own.

Compilation of teachers' answers to interview questions and their comments during the open-ended portion of the interviews led to the following generalized set of characteristics leading to success for a elementary teacher-leader.

- The first and most nearly unanimous response was that an effective elementary mathematics teacher-leader must be secure in dealing with content mathematics and be knowledgeable about materials and instructional processes for the elementary grades.
- Interviewees felt strongly that the teacher-leader must be a full-time, effective classroom teacher at the grade levels concerned. They also felt that the leader should be assigned to the same building.
- Participating teachers saw the effective teacher-leader as an active collector of materials and activities, a person willing to share these ideas with colleagues. A frequent parallel comment was that the teacher-leader should be willing to accept and use ideas for activities developed by other teachers.

IMPLEMENTING CALCULATORS: ISSUES AND IMPLICATIONS

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The Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989) recommends the integration of the calculator into the school mathematics program at all grade levels in class work, homework, and evaluation. In other words, hand-held calculators should be made readily available to all children, K through 12. Large amounts of time spent on computation could be freed up and used to develop an understanding of mathematics through reasoning and problem solving. Problem solving, the principal reason for studying mathematics, is the process of applying previously acquired knowledge to unfamiliar situations. It is also a method of inquiry and application, interwoven throughout the Standards to provide a consistent context for learning and applying mathematics (NCTM, 1989). The calculator is a tool that reduces calculation difficulty in problem solving.

At one time price was a barrier to using calculators in the classroom, but no longer. Discount stores have calculators for less than $5.00. Data from the Second Mathematics Assessment of the National Assessment of Educational Progress (reported in Reys, 1980) support the fact that many children have access to calculators outside the classroom: 75% of 9 yr. olds, 80% of 13 yr. olds, and 85% of 17 yr. olds either own their own calculators or have one available to use. As George Immerzeel, a mathematics educator, noted: "Almost any teacher who asks children to bring calculators find that they do."

Another consideration reported by Suydam (1978) is that the tendency to use calculators may be associated with the teacher's level of mathematical background: the greater the teacher's knowledge and confidence about mathematics, the more comfortable or secure he or she may feel with a tool that can process numbers so quickly.

Schools are "burying their heads in the sand" if hand-held calculators are not recognized and used as the calculational tool that they are (Shumway, 1976). Of course elementary students still will be required to learn their facts; the human mind is much quicker than keying in the basic facts on a calculator. Estimating and judging reasonableness of answers will be even more important. The intangible
posed by the students. "When am I ever gonna use this stuff?" I don't believe most teachers can, or even should, answer for anyone but themselves. Thus, every teacher of mathematics should ask him/herself, "When do I use this stuff?"

To be ignorant of many things is expected.
To know you are ignorant of many things is the beginning of wisdom.
To know a category of things of which you are ignorant is the beginning of learning.
To know the details of that category of things of which you were ignorant is to no longer be ignorant.

Phenella in The Unwritten Comedy
[Duncan, p. 220]

Bibliography
Halmos, Paul R. I Want to be a Mathematician. New York: Springer Verlag, 1985.

NOTE: I wish to thank the referees for their valuable assistance in suggesting certain modifications of this article.

Teachers in the Anchorage, Alaska, area created these addition cryptarithms. One answer for each is given on page 29. You are welcome to submit other answers for these or to create new cryptarithms of your own. Ask your students to help.

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Peggy Frost  Ed Sievert  Kathie Maloney  Rick Volk  (Joe K.)

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- An important characteristic of such a leader is the ability to listen, to listen to a teacher's ideas and especially to listen to a problem that is difficult to verbalize.
- An effective teacher-leader must be knowledgeable about outside professional resources. These resources include such things as consultants, professional meetings, publications, materials, and catalogues. Thus, the teacher-leader brings the outside professional world into the building.
- Equal in importance to the preceding characteristic is the ability to encourage active teacher participation in professional activities, local, regional, and national.
- The teacher-leader must be skilled in conducting inservice activities for peers and for other adult groups. Closely related is the need for this leader to take responsibility for communication with administrations, parents, and other community groups.
- As a further characteristic, it should be recognized that the teacher-leader may be most effective in informal unscheduled one-to-one contacts.

Although these characteristics may not be exhaustive, they are ambitious and may seem intimidating to the prospective holder of the teacher-leader position, but all are seen as important by a significant portion of the teachers participating in the interviews. Teachers with an interest in elementary mathematics should recognize the importance of the teacher-leader and seek the role. Lack of any one of the characteristics listed above can be overcome by a commitment to work toward acquisition of that characteristic while other significant contributions continue.

Building level and district administrators must recognize the benefits that can accrue from the presence of a teacher-leader as improvements in the elementary mathematics program are sought. Interviews with teacher-leaders as well as teachers produced a number of simple ways in which administrators can enhance the effectiveness of the person willing to accept the leadership role. A clear designation of who is to fill the role needs to be made. This designation should include a job description which makes it clear to all concerned that the leader is in a supporting role. This designation should be further strengthened, perhaps gradually, by
tangible support such as small amounts of released time, control of materials budget, discretionary travel funds, and responsibility for scheduling professional activities related to mathematics. Further enhancements can include extra travel allocations for the teacher-leaders, support for further training through conferences, courses and workshops, and support for establishing and maintaining a professional library. Even if these benefits are necessarily small, their existence conveys a sincere administrative commitment to improving the elementary mathematics program.

Not all schools or all districts can immediately have teacher-leaders or resources as described here, but all schools and all districts must begin and work toward filling this role, toward meeting this need. Existence of active elementary mathematics teacher-leaders is essential to the successful and timely implementation of programs such as those envisioned by the Standards.

Bibliography


I have a philosophy that if students do not see a teacher practice what s/he preaches, then what reason do they have to listen to a teacher preach? Thus, for example, music teachers should play music; art teachers should exhibit in public art shows; literature teachers should be publishing or be seen reading. In other words, a teacher should participate in the field in which s/he teaches! Our principal recently sent out a memo with the sage advice, "If you don't do it, you don't believe it." How true. If we are to develop mathematical power in our students, as the NCTM Curriculum and Evaluation Standards (Standards) is proposing, then it had better start with us.

Teachers at all levels of mathematics must be comfortable with mathematics in order to develop their own power to pass this attribute on the students. It is disheartening to hear (as I have) an elementary teacher say, "I hate math!". It appears that before we try to sell mathematics to our students, we must be sold on it ourselves!

I've read an article showing that a group of education majors did not have a grasp of the concept of "zero". Another stated that junior high teachers could get by with a minor or less in mathematics. I know of a teacher who got very frustrated in the classroom one day and told the students, "Don't ask me any question I can't answer!". Given this set of circumstances, are high school teachers unwilling to put their mathematical knowledge on the line and in the open, even in front of the students? Is this the reason some teachers are locked into the textbook, and thus reluctant to do mathematics?

The Standards are portraying a new attitude about teaching and learning—a classroom where the teacher becomes a FACILITATOR while the students become the DOERS! Paul Halmos stated that

A teacher who is not always thinking about solving problems—ones he does not know the answer to—is psychologically not prepared to teach problem solving to his students. [Halmos, p. 322].

Teachers of all levels must be familiar enough with mathematics and the applications of mathematics in order to convey its beauty, interest, and utility to students.

I would like to leave you with two questions which I think teachers of mathematics must answer before they can be serious about their teaching. "What does mathematics mean to me?" The second question deals with a question often