FRACTION EXPLORATION WITH THE MATH EXPLORER

Most adults today find the calculator an indispensable tool, yet there is still controversy about using the calculator in a mathematics instructional program with young children. This is in spite of the fact that numerous research studies have indicated no detrimental effect on students’ skills (Rudnick and Krulik, 1976; Fuys and Tischler, 1979; Suydam, 1982). One implication of the increased use of calculators is greater importance being attached to mental math and estimation (Hope and Sherrill, 1987; Dick, 1988). A second implication is that technology reduces needed time for paper-and-pencil drill and practice so that more time can be spent on realistic problem solving and conceptual development (Demana and Waits, 1990).

According to the National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards for School Mathematics (1989), a shift in focus from an emphasis on computation to a much broader curriculum is essential, particularly in the middle school grades. This broader curriculum must include relevant real-life situations—and skills. "Basic skills today and in the future mean far more than computational proficiency. Moreover, the calculator renders obsolete much of the complex paper-and-pencil proficiency traditionally emphasized in mathematics courses." (NCTM, 1989, p. 66)

PURPOSE

We were interested in doing a preliminary study to determine if the use of a calculator, Texas Instruments (TI) Math Explorer, would prove effective in the teaching of operations with fractional numbers. Prior to the development of the Explorer, the calculator has rarely been used in fractional lessons except for converting fractional numbers to their decimal equivalents by division. One of the features of the Explorer is its ability to display numbers in fractional form (i.e., numerator and denominator) and to perform calculations that include simplifying and changing to mixed numeral format. A grant from the Dean’s Fund for Research and Creativity at The Teachers College at ESU provided support for this project. This grant enabled the researchers to purchase a classroom set of
the Math Explorer calculators and provide support materials for the teachers participating in the project.

THE STUDY

Fifth grade teachers at six schools were invited to participate in the project. One fifth grade class at each of three schools became involved with the calculator. The schools are located in rural Kansas with the largest school having a student population of about 550 in grades K-5, and the smallest having a student population of about 150 in grades K-6. Preliminary interviews with each of the participating teachers indicated that they were optimistic about the use of the calculator and its ability to enhance student understanding of concepts related to the meaning of, and the computation with, fractional numbers.

A total of 62 students were involved in the project from beginning to end. We used both a pre- and a post-test to evaluate the students. The pretest consisted of 51 items that covered such topics as meaning, equivalence, ordering, computation, and reasoning. All of these items were paper-and-pencil response. The post-test was more extensive, including not only the paper-and-pencil items similar to the 51 items in the pretest but an additional set of three problems requiring the demonstrated use of manipulatives, and a set of 20 problems to be solved using the calculator.

There was only one set of classroom calculators available for the project; thus one class began the year with the study of fractions. The second class began a unit on fractions in November, and the third class did its unit beginning in March. Each of the classroom teachers was provided with a set of activities and transparencies to use in teaching the functions of the special keys found on the Explorer. The teachers also were given a set of activities and materials for using manipulatives in the development of concepts.

Because of the different starting times with use of the calculators, and because of the additional use of manipulatives in the study, we chose at this point to only do an informal summary of the results we obtained. We felt that this preliminary study could provide necessary information for a larger, more in-depth study at a later date.
The results were very encouraging although at this point it is difficult to say what part of the differences detected resulted from the use of manipulatives and what part resulted from the use of the calculator. There appeared to be no gender differences in the results.

CONCLUSIONS

Although positive results were found, we feel a more formal study with the use of control and experimental groups now needs to be pursued. Research questions to be answered include: "What are the most effective ways to integrate calculators into the mathematics curriculum?" and "How do calculators improve mathematics performance--it is just computational efficiency and accuracy, or are there more subtle problem-solving and affective factors also involved?"

Reforms that call for the use of technology in mathematics education will be slow if parents and educators persist in the fear that calculator use is detrimental to student performance in arithmetic. Instead, educators need to be aware of the research findings that indicate students who are taught the appropriate use of calculators emerge from their schooling with "better problem-solving skills and much better attitudes about mathematics." (National Research Council, 1989, p. 48).

REFERENCES


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