

## Action Research Changes the Teaching of Arithmetic in Central New York State

*This article tells the story of an 'economy-sized' piece of action research carried out by the supervisors of elementary education and the teachers in the elementary grades of the member schools of the Central New York School Study Council, working primarily with Professor V. J. Glennon and, to a lesser degree, with Professor C. W. Hunnicutt.*

"THE COPERNICAN SHIFT" is an expression originally used to refer to the intellectual reorientation and acceptance of the sun, rather than the earth, as the center of our universe. The expression is now generalized to refer to any great intellectual modification of shift in concepts and ideas.

The expression might well be applied to that shift of considerable magnitude and importance in the teaching of arithmetic—the shift from the *drill theory* to the *meaning theory*—that has been evolving in the last decade or two. The shift in theory has found ready acceptance throughout the country. There has not, however, been an equally ready acceptance of a shift in practice in the teaching of arithmetic. By and large, the teaching of arithmetic is still based largely on a drill theory.

### Reasons for the Gap Between Theory and Practice

There are a number of reasons for this discrepancy between accepted theory and prevalent practice. First, it is common practice to teach for the material that appears on standard tests; and since standard tests do not measure understandings and meanings, teachers do not teach for these outcomes. Another reason lies in the content of the arithmetic textbook. Changes in text material come slowly. Authors are limited in the degree to which they can make major modifications of content and method by the reluctance of teachers to accept anything too different.

A third reason is that the teachers do not understand arithmetic as a series of meanings and related ideas, hence cannot teach arithmetic as such. And fourth, courses, graduate and undergraduate, in the psychology and teaching of arithmetic, although successful in bringing about an understanding of and insight into research studies in the discipline, do not help teachers to understand arithmetic as a science of numbers.

### Locating the Needs

The problem of reducing the gap between accepted theory of the teaching of arithmetic and the widely prevalent practices in the teaching of arithmetic is not an easy one. Inroads into the problem are being made in various cells throughout the country. One such cell, or multiplicity of cells, is that which is made up of those schools in central New York State that are members of the Central New York School Study Council.

The ten all-day meetings of the current school year are being attended by forty to seventy representatives of the member schools, traveling in one or two cases more than two hundred miles round trip. They represent rural, central, village, and city school systems. The supervisors are the central core, usually bringing with them a teacher of the grade level most concerned with the problems of the particular meeting. By choice of the steering committee, the meetings of the current year are devoted to arithmetic.

Following the first meeting, a two-item questionnaire was sent to each supervisor for use by his staff in sampling needs of the group. The questions were:

- What do children in your class say puzzles them in the study of arithmetic?
- What do you, as their teacher, find puzzling in the teaching of arithmetic?

Hundreds of problems were received by the steering committee and submitted to the resource person. These problems formed the basis for the direction of subsequent meetings. The kind of problem most frequently mentioned concerned "teaching for meaning." Stated negatively, if arithmetic were being taught meaningfully most of the problems would not have been mentioned by the teachers.

Out of the meetings of the steering committee there developed a pattern into which most of the specific problems of the group seemed to fit. This pattern could be stated in three questions:

1. What are the meanings and understandings important to teaching arithmetic?
2. What are some good methods (techniques or learning experiences) for bringing about growth in these understandings?
3. What are some good test items for measuring learners' growth in these understandings?

The year has been devoted to action research in attacking these problems.

### Attacking the Problems

During a typical day the members all meet together during the morning and the first part of the afternoon. With lecture-discussion using a blackboard, with motion pictures, and with tests and other materials, the resource person and group identify and discuss several mathematical meanings or understandings important to a given grade level. Later, in discussion groups of four to eight persons, members develop more detailed lists of mathematical

understandings. These are reported back to the over-all group for open discussion, and from the many lists the resource person builds a master list for distribution to the member schools. This list of basic understandings is used by classroom teachers on the job to devise teaching techniques and test items.

A critical problem in an in-service development involving over one thousand elementary grade teachers is that of maintaining liaison between the ideas and materials being developed in the monthly meetings and the teachers in the field. The central person in this problem is the supervisor. In most cases the supervisor has attempted to solve this problem by having three weekly meetings between the regular meetings. During these weekly meetings with the rest of the teachers, the supervisor and guest teacher discuss the developments of the previous meeting, present material and understandings developed by the group at the monthly meeting, and discuss ways of bringing about changes in teaching.

As a result of these weekly discussions the teachers develop insights into the problems of teaching and testing for understanding and meaning in arithmetic. Each teacher then develops on her own (1) techniques and methods for teaching specific meanings and understandings, and (2) test items for measuring their progress. These ideas for teaching techniques and test items are forwarded through the supervisor to a publication committee.

### Next Steps

After the last meeting in May, 1950, it will be the responsibility of the publication committee to compile these ideas and get them into the hands of the teachers and supervisors. These materials should aid in the problem of reducing the gap between the accepted "meaning" theory and practice usually based on the drill theory. The responsibility of the publication committee is great. They have the opportunity of producing, with the com-

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School at the University of Chicago, *chairman*; George E. Beauchamp; Harold E. Benjamin; Mildred English; Mary G. Kelty; Allen Y. King; Robert Reid; Virgil Rogers; I. Keith Tyler; Ralph C. Wenrich; and Howard Wilson. The members of the Panel on Teacher Education, omitting overlapping membership, are: Karl W. Bigelow, Teachers College, Columbia University, *chairman*; W. Earl Armstrong; Mrs. Charles Fitzwater; Walter E. Hager; George W. Diemer; and Charles Thompson. The two major interests of these panels are the exchange of persons and of materials.

It is a truism that the best way to send ideals and ideas overseas is to wrap them up in a person. The exchange of human resources is the throbbing heart of the program, with arteries running in all directions. Dozens of teacher-educators from the United States have rendered service "beyond the call of duty" on foreign soil, and countless visitors from overseas are daily crossing the thresholds of our educational institutions.

With the increase in numbers of teachers and students coming to the United States, we must be cautioned against quantitative-itis or elephantism. Each project and the itinerary for each visitor must be tailor-made. A hotel in Wisconsin has on its registration desk this slogan, visible to all registrants: "You are a person—not a number." One of our main functions is to facilitate *personalized* exchanges, which leave some choice to the individual.

In addition to the more expensive procedure of exchanging personnel is the less

costly and more continuous program of exchanging packets, packages, papers, pamphlets, etc. Books as a mental diet are replacing CARE packages of food. The Panels have sent overseas orientation kits for visitors coming here. Many more packets are needed for those *not* coming. It has been suggested that each school in the United States assume the continuing responsibility of sending its school newspaper, its annual and catalog, to one or two specified kindred institutions overseas. What is needed is a perennial procession of precious packages!

New instrumentalities and new techniques are needed in international cooperation between schools. When the great German musician, Beethoven, composed his famous symphonies, he wrote music for instruments not invented at that time. Only when man devised new instruments could Beethoven's majestic music be heard in its fullest grandeur. New means and methods must be found for working together on world problems. No persons have a greater role in meeting this challenge for improved methods than have the teacher and the teacher of teachers. The need for international exchanges in education is *great*, the danger is *greater*, but the opportunity is the *greatest* in the history of our profession.

The occupied countries of Austria, Germany, and Japan are but three of the areas in the world that invite your help and cooperation.

Yours for ASCD, the COA,  
and the WORLD,  
Chris A. DeYoung

## Curriculum Research

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bined efforts of hundreds of teachers, a contribution that will aid in the development of desirable practices in the teaching and testing of arithmetic.

The most important aspect of this 'economy-sized' in-service development program is the two-fold growth of individual

teachers (1) in insight into arithmetic as a science of numbers, and (2) in insight into newer methods and devices for teaching and testing meaning in arithmetic.—*Vincent J. Glennon, assistant professor of education, Syracuse University, Syracuse, New York.*

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