



A Mathematics Laboratory in GRADES VII AND VIII

James H. Vance

Mr. Vance, assistant professor in the Faculty of Education at the University of Victoria, is a doctoral candidate in the Department of Secondary Education at the University of Alberta.

In the June issue of this *Newsletter* Bernice Andersen suggested developing a mathematics laboratory program for the academic option. Despite recent enthusiastic reports concerning laboratory methods in mathematics, Alberta teachers may wonder how they could set up labs in their schools and what the results of such a venture would be. A recent study conducted in an Edmonton junior high school not only confirmed that students like studying mathematics in a laboratory situation, but indicated that they are able to effectively learn new concepts and acquire desirable attitudes toward learning mathematics through experiences in this kind of instructional setting.

A mathematics laboratory program consisting of 10 activity lessons and designed to function as an adjunct to the regular courses for Grades VII and VIII was developed for the study. Each activity was designed to lead to the discovery of a new concept or relationship through the manipulation of some type of concrete material. The physical materials accompanying each lesson were to stimulate interest, to provide a real setting for the problem to be investigated, to provide a means of gathering data leading to the solution of the

problem, and to provide a way for students to check hypotheses and answers independently of the teacher or textbook. The problems and ideas encountered in the lessons were new to the students but had been chosen to support and supplement topics studied in the regular program as well as to enrich the curriculum. Topics investigated in the laboratory program included probability, numeration, the circumference and area of a circle, the number of subsets of a set containing elements, a finite mathematical group, and Euler's formula for polyhedra. Other activities were centered about a balance arm, a set of logic blocks, and a geoboard. The main idea was to create learning situations in which the students could be active and free to investigate mathematical ideas in their own way and at their own rate.

These laboratory activities were held on a once-a-week basis in place of regular mathematics classes. In the lab the students worked in pairs with the various physical materials, taking directions from prepared sets of written instructions. The teacher's role was that of a guide or advisor, giving assistance to groups of students who needed and requested help but allowing the learners to discover mathematical ideas through their own experiences.

Several measures were used to compare the lab students with students who had taken the experimental lessons in a teacher-directed class setting and also with students who had not been exposed to the experimental materials but who had continued to study the regular program (*Seeing Through Mathematics*), the full time allotted for instruction in mathematics. It was found that the use of 25 percent of class time in mathematics for informal exploration of new mathematical ideas did not adversely affect achievement in the regular program over a three-month period. In addition, tests of learning, retention, transfer, and divergent thinking indicated that students in both experimental groups had benefitted mathematically from participating in the program. Although test scores were slightly higher for the students who had studied the lessons under a teacher in a class situation, the reaction of the lab group to their instructional setting was more favorable. The lab students also rated higher than students in the other two groups (a) in feeling that learning mathematics is fun and enjoyable, and (b) in the view that mathematics is a subject which can be investigated and developed experimentally by using real objects rather than restricted to a textbook subject in which symbols are manipulated.

The most popular feature of the laboratory method as identified by the students was the opportunity which it provided for working independently of the teacher. The following are comments made by students in the laboratory group:

I liked the privilege of working at your own speed and without a teacher always telling you what to do. It was fun and helped me a great deal. I think it is better than teaching from the book and is a lot more interesting.

I liked where you could find out and prove things yourself so you would know for a fact that something is true.