

THE REMEDIAL ARITHMETIC PROGRAM AT THE SAN FRANCISCO JUNIOR COLLEGE AND ITS IMPLICATIONS IN THE TEACHING OF SCIENCE

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The purpose of this paper is to discuss briefly the mechanics of the arithmetic program at the San Francisco Junior College with an emphasis on the implications of the program.

It is obvious to anyone who teaches science that the present generation of college students is weak in arithmetic skills and the fundamentals of algebra and geometry. The problem existed before the war, received a good deal of attention during the war because of the Army and Navy testing program, and has become acute today with the return of the veterans to our colleges and universities. We not only have the people who have been out of school for years, but those whose high school training was definitely not college preparatory. These people find themselves badly handicapped in fields requiring any mathematical skill.

The problem today is what to do with these poorly equipped veterans, but the underlying problem is the question of where the responsibility rests for preventing or removing these deficiencies. The problem can be ignored or talked about or worked on. The San Francisco Junior College attempted to do something about it.

The program was set up in 1942 with the author of this paper as coordinator. Dr. J. Paul Mohr, registrar of the San Francisco Junior College and a former mathematics teacher, made a study of the deficiencies of junior college students in arithmetic. He compared the work of college freshmen and high school freshmen in arithmetic as measured by the Metropolitan Test and

Book Company), is a drill book with timed tests of four minutes each. Retests are given every four or five weeks to students who have completed the drill book units. If they pass these retests they are excused from the course and receive their unit credit. If they fail, they go back to class and work through the drill book again. If at the end of the semester, they have not passed a retest, they re-enroll in Mathematics 51 for the next semester.

It is not enough to give the arithmetic program and stop there. Some system of checking results must be set up. In San Francisco, an attempt to do this was made by giving a retest each May to the students who had successfully passed Mathematics 51 the preceding semester. The results were good but not statistically convincing as it was never possible to get any sizeable test group together. They showed that a few students continued to improve after they finished the arithmetic course, probably because of further drill in mathematics classes, but most students lost slightly from their best retest score though they showed an appreciable gain over their original entrance scores.

There should also be devised some means of measuring the effect upon courses in physical sciences of the improvement in arithmetic skills. Nothing was done in this direction at San Francisco up to 1945.

What has all this to do with the teaching of science? Any teacher of science can answer that. Some of the difficulties in teaching science courses would be removed if students could add and subtract or convert decimals into common fractions, or if they understood ratio and proportion. Science teachers are in a position to offer constructive advice to mathematicians who are working on remedial courses and, in addition, later cooperation when studies are made to check the results in science courses.

In December 1945, approximately one-third of the student body of 2,000 were enrolled in Mathematics 51, in spite of the fact that the students who were not enrolled in a physical science course were not required to pass the test. This is a shocking situation and leads to the question of responsibility. Seventy to eighty per cent of the students who took the entrance test failed each semester, with the failure percentage increasing with the return of the veterans. Part of this increase was due to the introduction of a new test which was prepared by Dr. O. E. Anderson and this author to eliminate guessing as far as possible.

It seems obvious that if students enter college so poorly prepared in arithmetic, it is the responsibility of the college or even of the university, to attempt to remove this deficiency. Most college mathematics departments are unwilling to start a remedial program because it is such a thankless task and the hardest kind of teaching when they are already overworked. However it must be done and statistics compiled that can be printed to arouse high schools and grade schools to do something comparable on their levels. Most administrators feel this is a touchy matter and bet-

concluded that students gain in reasoning and problem-solving ability during their high school years but lose skill in fundamental operations. He felt that the problem at San Francisco Junior College was to restore, if possible, this lost skill. Accordingly all students enrolled in mathematics courses were tested in March 1942, the Progressive Mathematics test being used. All students who fell below the 50th percentile were required to enroll in a remedial arithmetic course, Mathematics 51. Because the program was begun in the middle of the semester, a rigorous enforcement was not possible. But in the fall of 1942 the arithmetic test was added to the battery of entrance tests required of all students. The 75th percentile was made passing. All students falling below this percentile or failing to take the test who enroll in any physical science course must now take Mathematics 51 and pass it, before their grades and credits in the physical science courses are released by the registrar's office. Each semester the official study lists are checked and Mathematics 51 students fail to comply with the requirement.

Mathematics 51 carries one unit of credit but meets two hours per week. The instructor conducts the course as a supervised drill hour, his chief duty being to motivate the students and correct faulty procedure. The textbook, *Learning to Compute*, Book Two (Schorling, Clark, Potter, and Deady: World

¹Mohr, J. Paul. *Arithmetic Disabilities of Junior College Students*. Dissertation for Ph.D. in Education, University of California, 1942.