

## Summary

1. In the *achievement variable mathematics*, the different methods produced equivalent results in both experiments. In the standard tests for grade 8 there was in the spring term of '64 no significant difference between any of the experiment classes and the national population. On the other hand the students of the machine class with a maximum use of teaching machines were significantly better than those of the comparison class.

2. In *reading ability* no differences occurred between the classes compared if we consider the experiment period as a whole.

According to the standard tests and standardized reading tests the experiment groups are representative of upper level students in general.

Reading comprehension increases steadily for students with a maximum use of teaching machines, while reading speed fluctuates from occasion to occasion.

3. *Behavior*: More disturbances occurred in classes with conventional teaching than in classes with machine teaching combined with group teaching. At the end of each term the disturbing activities increased in classes with conventional teaching.

Behavioral differences between high, middle and low groups were only noted in experiment 1 and then in the variable "Disturbing interactions." The middle group here had higher scores than the others, especially towards the end of the experiment period in grade 8. Disturbances encroached on very little of the lesson time, however.

The great variation between the test occasions for all behavior variables depend on irregularities in the time-pattern, rather than on a distinct trend.

4. *Preference for mathematics*, measured by Form H, remained relatively constant for the comparison classes. In the class with maximum use of teaching machines the preference diminished, but there was still no significant difference between the machine and comparison classes. In the class with the modified experiment (group teaching+ machine teaching) the preference values for the whole experiment period lay somewhat above those for the comparison class, but no difference between the methods could be established.

5. *Attitude towards machine teaching* has been studied by means of essay analysis in Experiment 1. The reaction of the students in class 7 was fairly positive. This changed in grade 8. The students were significantly more negative in class 8 than in class 7. After three terms' teaching by machine 15 out of 16 students had a negative attitude towards P1. This result should not be over-interpreted. We have no information as to how negative the comparison class was towards its mathematics teaching in grade 8.

In Experiment 2 the attitudes towards machine teaching were evaluated by means of Attitude test H. When the scores on all the statements in the test were added and the difference in attitude between grade 7 and grade 8 was tested, a negative bias was noted in this modified experiment too. This difference stemmed mostly from the circumstance that the students considered programmed teaching more tiring than conventional teaching. After three months' work with machines, 73 % of the students found this form of work more tiring. 67 % of the students thought that they learned more mathematics or as much as they would have done with conventional teaching.

Thus in our two long-term experiments-the first with maximum use of teaching machines and programmed material and the other with programmed material presented via machines alternating with teacher-led small-group teaching, both compared to conventional teaching-no significant differences were found in mathematics achievement or in preferences for the subject. Behavior during mathematics lessons is rather similar for students using the three different methods. The attitudes towards the method with maximum use of teaching machines is negative. When we modify the method by alternating group-teaching and machine-teaching, the attitudes become more moderate. The students consider that programmed teaching is more tiring than conventional teaching, but in compensation they think they learn more. This opinion is to certain extent verified by the results obtained on the standard tests, which were given three weeks after the completion of Investigation of Effects 1.

In the standard tests in mathematics, spring term '64, the class with a maximal use of teaching machines was significantly better than the comparison class. This is an important result, since the standard tests consist of centrally produced test material. The good results achieved by the machine class in the standard tests show that the programmed material has given the students good training in various mathematical skills. The doubts expressed earlier that PI might make the students less able to solve problems were not confirmed. The students in the machine class achieved these good results in the standard tests despite the fact that they have had less time for mathematics training than those in the comparison class, who had homework once a week.