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AUTHOR	Werdelin, I.
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ABSTRACT

Three samples of 58 subjects each, selected from the students of seven eighth grade classes and matched with respect to scholastic achievement, program of study, and sex, were taught a foreign alphabet (Arabic) differently. Sample A was told the principles of the alphabet and applied it to examples; Sample B was given most examples first, then told the principles, and given additional examples; and Sample C was given the examples only. There were very small differences between the samples, but there was a clear tendency that Sample A learned the principles best, but Sample C was comparatively better on tests which measured retention and transfer. (Author)

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THE VALUE OF EXTERNAL DIRECTION AND INDIVIDUAL DISCOVERY IN LEARNING SITUATIONS: THE LEARNING OF A FOREIGN ALPHABET

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Communications should be addressed to

Department of Educational and Psychological Research
School of Education
Munkhättegatan 3
Malmö, Sweden

Director: Åke Bjerstedt

THE VALUE OF EXTERNAL DIRECTION AND INDIVIDUAL DISCOVERY IN LEARNING SITUATIONS: THE LEARNING OF A FOREIGN ALPHABET

Abstract. - Three samples of 58 Ss each, selected from the students of seven eighth grade classes and matched with respect to scholastic achievement, line of study, and sex, were taught a foreign alphabet differently. Sample A was told the principles of the alphabet and applied it on examples; Sample B was given most examples first, then told the principles, and given additional examples; and Sample C was given the examples only. There were very small differences between the samples, but there was a clear tendency that Sample A learned the principles best, but Sample C was comparatively better on tests which measured retention and transfer.

This is a report from the School Mathematics Project at the School of Education, Malmö, Sweden. The study has been supported by grants from the Swedish Council for Social Science Research.

PROBLEMS

By means of this study we wanted to compare the so-called discovery method of teaching the application of a principle, where the students are allowed to discover it individually from given examples, with the method where they are told how to use it. Previous investigations have not given final answers to the question which of these methods is the best one in different school situations. Some authors have found that the direction given by the teachers is essential to learning (cf. e.g. Craig, 1953, 1956; Kittell, 1957), while others stress the importance of the discovery method to transfer (see Hendrix, 1950; Haslerud & Meyers, 1958).

In a previous study (Werdelin, 1966), the author compared three methods of learning a mathematical principle, one where the Ss were told this and applied it on a set of examples, one where they were first given some of the examples, then the principle, and finally the rest of the examples, and one where they were given the examples only. It was found that the Ss who were instructed according to the first method learned the principle best and were always superior to the other groups, but the Ss who were given their instruction according to the third method showed comparatively better ability of transferring their knowledge and better retention.

In this study we want to compare the same methods of instruction on a new material. We have every reason to believe that we will get different results for different materials and different samples.

EXPERIMENT

The 223 students of 7 eighth grade classes were first randomly distributed in three experimental groups. After the experiment, which is described below, we selected the final samples by matching students from the experimental groups with respect to sex, line of study, and marks (total for all subjects studied). In this way we got three samples of 58 Ss each, called Samples A, B and C.

In the experiment we wanted to teach the use of the Arabic alphabet, which seemed suitable for our purpose because it is based on certain principles different from those of ours. The three principles treated in the experiment were:

I) The letters are written from right to left.
II) Different forms of the letters are used in different parts of the words.
III) Short vowels are not represented by letters.

The subjects of sample A were given a booklet to read. The principles were given one at a time, followed by a number of solved examples and a number of exercises to be solved by the Ss. On the final pages there were a number of "mixed" examples. The instruction concerned how to pronounce the words which were written in the foreign alphabet. Sample B was given a booklet which first contained the examples and exercises to the principles; then the principles were given, and the Ss could apply them on the "mixed" examples. Sample C was given a booklet with the examples and exercises only. The instruction was entirely written. In addition the Ss were given a sheet of paper with the Arabic characters used, and another with the correct solutions to the exercises.

The abilities of the Ss to read the alphabet was measured by means of a test of 12 items, where they were told to write the pronunciation of certain words. When scoring we noticed whether the Ss had applied principles I and III correctly; we also found the number of words that were transcribed correctly. This gave us three scores for each S: To measure transfer to a somewhat similar situation, the Ss were also given a test where they were asked to transcribe words with the Arabic alphabet. Here we noticed whether the three principles were used correctly, and we also found the number of words where the correct characters were used and at least principles I and III correctly applied. After two weeks we repeated the testing with two parallel tests, scored in the same way.

RESULTS

The results of our study are presented in table 1. For each test we report the proportions of cases where each principle has been correctly applied and the medians of the numbers of correctly solved items. As can be seen the three samples were rather close to one another. Only one significant difference can be found: On principle I in test 1 sample A was significantly superior to the other samples combined ($0,10 \geq p > 0,05$; two-tailed test). On the whole, there is a strong tendency for sample A to be superior in test 1, which measures the immediate application of what has been learned.

When we study transfer and retention, the picture is different, however. In the case of principle I we find that the ability of sample A decreases the more the tests differ from test 1 as to time and stimulus similarity, while the proportions of correct application of the principle by sample C is higher in tests 3 and 4 than in tests 1 and 2; this difference between the groups is clearly significant, as can be seen from table 2. With respect to principle III we find the same tendency, but the difference we find are not significant. For principle II we find so low proportions of correct application that we cannot draw any conclusions.

DISCUSSION

Data are not in favor of any particular method of instruction. There is a tendency that students who are told the principles are somewhat superior to the other groups, but on the other hand it is evident that students who discover the principles from examples are comparatively more able in situations which involve transfer and retention over two weeks. The aim of educational research must be to look for a general law or rule, but we are still far from it. From what we can find from this experiment, there is not much difference between the methods applied to this material. However, it is evident that there are differences between different materials. In this respect we can compare with the results of the author's previous study of the problem (Werdelin, 1966).

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Table 1. Proportions of correctly used principles, and medians

Test and Aspect	Sample		
	A	B	C
Test 1			
Medians	9.00	5.50	8.00
Proportions			
Principle I	0.90	0.81	0.77
Principle III	0.67	0.60	0.62
Test 2			
Medians	6.50	5.24	5.30
Proportions			
Principle I	0.79	0.66	0.66
Principle II	0.12	0.16	0.05
Principle III	0.59	0.57	0.66
Test 3			
Medians	5.25	4.93	5.00
Proportions			
Principle I	0.79	0.78	0.86
Principle III	0.59	0.43	0.52
Test 4			
Medians	6.50	6.50	8.00
Proportions			
Principle I	0.71	0.74	0.83
Principle II	0.10	0.10	0.03
Principle III	0.57	0.48	0.57

Table 2 Directions of and probabilities of differences between proportions of positive scores in the tests

Tests and Principles Compared	Sample		
	A	B	C
1:I and 2: I	decrease $0.10 > p > 0.05$	decrease $0.05 > p > 0.01$	decrease $0.10 > p > 0.05$
1:I and 3:I	decrease $0.10 > p > 0.05$	decrease $p > 0.10$	decrease $p > 0.10$
1:I and 4:I	decrease $0.005 > p > 0.001$	decrease $p > 0.10$	increase $p > 0.10$
1:III and 2:III	decrease $p > 0.10$	decrease $0.01 > p > 0.005$	increase $p > 0.10$
1:III and 3:III	decrease $p > 0.10$	decrease $p > 0.10$	increase $p > 0.10$
1:III and 4:III	decrease $p > 0.10$	decrease $p > 0.10$	decrease $p > 0.10$
2:I and 4:I	decrease $p > 0.10$	decrease $p > 0.10$	increase $0.05 > p > 0.01$
2:III and 4:III	$p = 1$	decrease $0.05 > p > 0.01$	decrease $p > 0.10$

The word decrease means that the first-mentioned test and principle shows significantly larger proportions of positive scores than the last-mentioned ones.