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ABSTRACT

Third grade pupils from a suburban school district were subjects of a study which examined the effects of two social studies teaching strategies, demonstration deductive and directed discovery inductive, and two intelligence levels as they affected mastery, immediate retention, immediate transfer, delayed retention, and delayed transfer. Three elementary teachers conducted the teaching and testing of a series of instructional lessons and mastery tests. It had been hypothesized that the demonstration strategy would be more efficient and aid subjects to mastery in fewer trials. It was found that the directed discovery group took fewer trails but the difference was not significant. It was also found that intelligence and the interaction between intelligence and strategy were nonsignificant factors related to trials to mastery. Recommendations based on the results are offered and it is concluded that if, as the study suggests, the demonstration approach is as effective as the directed discovery approach, then the use of the demonstration mode as a well organized strategy deserves greater attention in teaching. (Author/KSM)

A COMPARISON OF DIRECTED DISCOVERY AND DEMONSTRATION STRATEGIES FOR TEACHING GEOGRAPHIC CONCEPTS AND GENERALIZATIONS

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A current emphasis in the teaching of social studies concepts and generalizations is the use of learning experiences that proceed from the more specific to the more abstract. Writers such as Bruner (1961), Taba (1967), Hills (1970), Beyer (1971), and others have argued that the most effective strategy for presenting materials is one that starts with the specific and less abstract ideas and works toward the larger and more subsuming ones. This emphasis is related to some of the recent developments in social studies. First, it is related to the trend toward curricula based upon the structure of the disciplines and the allied concern for the inductive method that characterizes the scientific approach. Second, it is a reaction to the rote type of learning which has characterized the traditional teaching of social studies.

Other writers have disagreed with this emphasis on proceeding from the specific to the abstract. Tanck (1969) hypothesized that teaching social studies concepts and generalizations may be best accomplished by a demonstration strategy that starts at a higher and more abstract level (e.g. one that states and explains a generalization) and then provides instances of the generalization and concepts at related lower levels. In such an approach, the teacher seeks evidence to support and test the generalization and the concepts therein.

Many writers (e.g. Ausubel, 1961; Carroll, 1964; Cronbach, 1966; Gagen, 1966; Martorella, 1971; Wittrock, 1966; and others) have argued that research energy on the general question of the relative merits of inductive versus deductive teaching procedures has resulted in very limited claims for the superiority of either approach.

The social studies is part of this dilemma. For the social studies, the inductive-deductive question has two major problems: (1) the fact th very few studies deal explicitly with the social studies and (2) experim ters have failed to delineate operationally the nature of their inductive and deductive treatments. Accordingly, the purpose of this study was to investigate the effects of two parallel but reverse social studies teachi strategies on learning by third grade pupils. One strategy was a demonst tion - deductive strategy based on a model by Tanck (1969). The other strategy was a directed discovery - inductive approach based on a model by Hills (70). The effects of the two social studies teaching strategies and two intelli nce levels were examined as they affected mastery, immediate retention, immed te transfer, delayed retention, and delayed transfer.

The third grade pupils used in this study were from one school in a suburban Seattle school district. To detect possible intelligence differences pupils were blocked (top 30 percent and bottom 30 percent) according to intelligence. From a pool of 106 pupils, two intelligence blocks were established using Lorge-Thorndike verbal scores available fro the school district. It was determined that the top 30 percent of the sample had a range of verbal intelligence scores from 69 to 91 and includ 32 pupils. The bottom 30 percent, also 32 pupils, ranged from 33 to 59. Within each block, 16 matched pairs were formed. Seven pairs of pupils were randomly selected for each block. One pupil from each pair was then assigned randomly to one of the two treatment groups. Thus in each strate (treatment) group there were 14 subjects, seven high intelligence and seve low intelligence. Due to absence, one pair was dropped from each treatmer group making a final N of 24.

Three experienced elementary teachers conducted all of the teaching and testing. The researcher trained the experimenters in both of the teaching strategies and all teaching was conducted using script, slides, and audio tape.

Subjects were randomly assigned to the experimenters. Each experimenter had an equal number of subjects for each strategy. And within each strategy each experimenter had an equal number of high and low intelligence subjects. Each subject worked with only one experimenter for all of the instruction and testing.

Each subject participated in five instructional lessons on a one-to-one basis. Each lesson lasted 15 minutes and the lessons took place on five consecutive days. The lessons were taught using the demonstration strategy and the directed discovery strategy and each strategy consisted of five steps, albeit five lessons. On the sixth school day after the start of the treatment, the subjects were administered the immediate posttest consisting of 20 items (10 retention and 10 transfer items randomly mixed). No subject reached mastery on the immediate posttest. Each subject was then given the opportunity of three additional trials to reach mastery. Each trial was 10 minutes in length and was followed by a 10 item mastery test (5 retention and 5 transfer items randomly mixed). If a subject achieved a 90 percent correct score on a mastery test then all instruction stopped for that subject. If a subject failed to achieve mastery on the third and final mastery lesson one additional mastery trial was arbitrarily assigned to that subject for computational purposes. Therefore, if a subject reached mastery on the first trial his score was one while a socre of four meant the subject failed to reach mastery.

Two weeks after the last mastery trial for each subject the delayed posttest (10 retention and 10 transfer itmes randomly mixed) was administered on an individual basis.

Materials for the instructional lessons were developed by the researcher. The generalization selected was: "The sites of cities are often places where goods are transferred from one means of transportation to another." The component concepts are: (1) means of transportation, (2) transfer of goods, and (3) site of city. Materials were revised as a result of two pilot studies. The completed materials contained the five 15-minute lessons and three 10-minute mastery trial lessons.

The criterion instruments were developed by the researcher based on the materials of the lessons. Items classified as retention were knowledge level questions based on the concepts and generalization. The transfer items were questions at the application level (Bloom 1956) or above that required students to transfer learning from the treatment situation to materials that were new but related to the initial tasks.

To determine the internal consistency of the measurements, the Kuder-Richardson coefficient Formula 20 was computed on the immediate posttest of 20 items, i.e. 10 retention and 10 transfer items randomly mixed. The reliability was .63. Using the Spearman-Brown formula the test reliability was expanded to the total pool of 70 items that were used for testing purposes. The reliability of the total 70 item criterion was .85.

Based on the research, the major hypotheses identified for this study were:

1. Pupils who are taught using a demonstration strategy will achieve higher scores in a measure of immediate retention than pupils taught using a directed discovery strategy.

2. Pupils who are taught using a directed discovery strategy will achieve higher scores on measures of delayed retention, immediate transfer, and delayed transfer than pupils taught using a demonstration strategy.

3. Pupils who are taught using a demonstration strategy will achieve mastery in fewer trials than pupils taught using a directed discovery strategy.

4. Pupils with high intelligence will score higher on tests of retention and transfer and take fewer trials to mastery than pupils with low intelligence.

To explore these four major hypotheses, a 2 x 2 factorial design was used. The two levels of treatment (directed discovery strategy, demonstrat strategy), and two levels of intelligence (high, low) were examined as they related to five dependent measures: immediate retention, delayed retention, immediate transfer, delayed transfer, and trials to mastery. Scores from the retention tests and and the transfer tests were examined by analysis of variance. Trials to mastery were also examined by analysis of variance.

The findings of this study related to immediate retention indicated that the subjects in the demonstration strategy did significantly better than subjects in the directed discovery strategy ($p < .01$). The mean for the pupils in the demonstration group was 9.08 while the mean for the pupils in the directed discovery group was 7.58. The higher scores for the pupils in the demonstration treatment are indicative of the effectiveness of a deduct strategy for imparting information. It is important to note that even with time held constant, as it was through the first five lessons, the instructional process for the directed discovery treatment seemed to proceed more slowly This observation was made by all three experimenters. In addition, the subjects in some cases appeared uncertain in the earlier stages of the directed discovery strategy. This combination of factors may account, at least in part, for the significant difference between the two treatments on the immediate retention measure.

The difference between the intelligence mean for the high intelligence block ($\bar{X}$ = 77.55) and the intelligence mean for the low intelligence block ($\bar{X}$ = 53.50) was 24.05. Consequently, the lack of differences between the intelligence groups on the immediate retention measure (high 30 percent vs. low 30 percent) is difficult to explain. In fact, the mean score for the low intelligence group ($\bar{X}$ = 8.41) was slightly higher than for the high intelligence group ($\bar{X}$ = 8.25. In post-experiment discussion, the experimenters generally agreed that subjects subjects in the low intelligence group showed greater interest and enthusiasm in the lessons than the high intelligence group. The laboratory setting and individual attention may account for some of the interest displayed by the subjects in the low intelligence group. Conversely, the subjects in the high intelligence group appeared more relaxed and less anxious in the treatment sessions. It should be noted here that the nonsignificant differences between intelligence groups reappears throughout the findings.

The delayed retention measure was administered two weeks after the last mastery lesson for each subject. This retention measure was parallel in form to the original retention measure and consisted of the same number (10) of retention items. Whereas on the immediate retention measure there was a significant difference between treatment groups favoring the demonstration strategy the delayed retention measure revealed none. Obviously, the advantage of the demonstration strategy did not hold up over time. One possible explanation may be the differential effect of the mastery trials between the immediate retention test and the delayed retention test. Another important factor may be the number of subjects that reached mastery within each strategy group. For the demonstration strategy 7 out of 12 reached mastery while for the directed discovery strategy 11 of the 12 subjects reached mastery. The delayed retention scores probably reflect this

difference. Also, the small size (24) and type II errors could account for the difference.

The nonsignificant difference between the treatment groups on immedia transfer scores should be considered along with the relatively low scores by subjects in both treatment groups. This suggested that at the end of the first five lessons the subjects' understanding of the concepts and generalization was insufficient to effectively transfer the knowledge to sequentially related material. In addition, the nonsignificant difference between the intelligence groups indicated that both the high and low intelligence groups had a comparable amount of difficulty with the transfe items. The lack of a difference between the intelligence groups on immedi te transfer, however, is consistent with the findings on other intelligence components of this study.

The nonsignificant interaction between treatment and intelligence revealed that the two levels of intelligence were not affected differentiall by the two strategies as they related to immediate transfer.

There was no significant difference between treatments on the delayed transfer criterion measure. There were only small differences between the means and standard deviations of both of these groups. The increase in the mean for the total N from $\bar{X} = 4.88$ on the immediate transfer measure to $\bar{X} = 6.21$ on the delayed transfer measure undoubtedly reflected the additional instruction in the mastery trials. Whereas the immediate transfer test was administered when none of the subjects had reached the mastery level, the delayed measure was administered two weeks after 18 of the 24 subjects had reached mastery. There appeared to be an interrelation between mastery and the transferability of concepts and the generalization. This issue will be discussed further in the next section on mastery.

A nonsignificant finding on the intelligence factor in relation to delayed transfer was consistent with the previous findings of this study and further elaboration at this point would be redundant. However, the interaction between intelligence and treatment must not go unnoticed. Although the finding was not significant at the .05 level the decided trend toward interaction warrents a look at the cell means. For the demonstration strategy the high intelligence group had a mean of 5.67 while the low intelligence group had a mean of 6.67. For the direct discovery strategy the high intelligence group had a mean of 7.00 and the low intelligence group had a mean of 5.50. These data suggest that on delayed transfer, students in the low intelligence group tended to do better on the demonstration strategy, while students in the high intelligence group tended to do better on the directed discovery strategy.

The nonsignificant F ratio (4.10) for treatment in relation to mastery indicated that neither strategy was significantly better than the other in aiding students to reach mastery. It was hypothesized that the demonstration strategy would be more efficient than the directed discovery which is generally considered slow and time consuming. The directed discovery treatment had a mean of 2.00 trials to mastery while the demonstration treatment had a mean of 2.92 trials. (On trials to mastery a lower score is desirable in that it indicates fewer trials.) Furthermore, 11 of 12 subjects in the directed discovery strategy reached mastery while only 7 out of 12 of the subjects in the demonstration strategy reached mastery at the end of the experimental period. Thus, more students in the directed discovery strategy reached mastery in fewer trials than did students in the demonstration strategy. The magnitude of these differences, however,

was not sufficient to be considered significant, probably because of the small sample size.

The students' motivation may also have been a factor in the number of trials needed to achieve mastery. All of the experimenters were of the opinion that the interest level of the subjects in the demonstration treatment started to wane sooner than subjects in the directed discovery group

In summary, it had been hypothesized that the demonstration strategy would be more efficient and therefore aid subjects to mastery in fewer trials. It was found that the directed discovery group took fewer trials but the difference was not significant. This finding does not support Ausubel's (1968) contention that the time used in the discovery process is greater. Nor does it support Guthrie's (1967) finding that the deductive approach takes fewer trials to criterion.

It was also found that intelligence and the interaction between intelligence and strategy were nonsignificant factors related to trials to mastery.

In retrospect the findings of the present study may be attributed to the fact that the researcher made a concerted effort to equalize the contact between the strategies and, in so doing, the unique nature of each of the two strategies was somewhat modified. Therefore, some of the potential differences were never detected. Secondly, the laboratory teaching sessions brought out a concerted effort on the part of many low intelligence students that exceeded initial expectations. Thirdly, the difficulty with transfer tasks and the high criterion level for mastery (90 percent) may have discouraged some students and consequently affected their performance.

The findings of this study together with past theoretical and empirical positions point to the following recommendations:

1. There is a need to develop the two teaching strategies for use in a classroom setting. This effort should be directed primarily toward student mastery and preferably with both large group and individual procedures.

2. Pretest pupils to determine their impulsive or reflective nature and then assess their learning within an inductive or deductive mode (Kagan, 196 . The pupils that have become rather bored with the instruction may exemplify different learning characteristics and this may have a much closer relationship to learning outcome than the intelligence factor that this study investigated.

3. The lack of differences between the intelligence groups suggests that at least for the social studies, students ability many times plays a much smaller role than teachers are willing to concede.

4. The evidence on the learning of concepts and generalizations using inductive and deductive teaching modes is mounting. Indications point to the need to explore new directions. Because much of the research thus far has been directed toward concepts, rules, or the like, the social studies would benefit from research that uses the two strategies to investigate learning in other social studies areas, e.g., critical issues, problem solving or value

The results of this study substantiate many of the findings from previous research on inductive and deductive teaching modes. If, as the study suggests the demonstration approach is as effective as the directed discovery approach then the use of the demonstration mode as a well organized strategy deserves greater attention in teaching. Perhaps the curriculum developers and textbook writers in social studies who have given almost exclusive attention to the inductive or inquiry approach should now reexamine their position in light of the accumulating evidence that students appear to do equally well with either strategy, regardless of intelligence level.

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