

Optimum Teacher-Pupil Interaction for Pupil Growth^{1,2}

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Introduction

BOTH hypotheses and conclusions relating teacher-pupil behavior to pupil growth tend to be stated in simple, declarative sentences, as: "Increased teacher indirectness is associated with increased pupil growth in subject matter and more favorable attitudes"; or, "Decreased teacher criticism is associated with more favorable pupil attitudes and increased subject-matter growth." Yet probably the researcher would question whether these relationships could be extended indefinitely, and many classroom teachers would be skeptical as soon as the hypothesis was stated.

Probably both could agree on such a statement as "Up to some point, increasing indirectness leads to greater subject-matter growth and more favorable attitudes, but beyond that point, further increases in teacher indirectness lead to decreased subject-matter growth and less favorable attitudes." That is, there is an optimal level of teacher indirectness which is less than the maximum possible and an optimal level of teacher criticism which is greater than the minimum possible.

Once the idea of an optimal level has

been suggested, rather than an open-ended relationship, a question which follows readily is, "Do all learning tasks have the same optimal levels of teacher behavior?" An affirmative answer would seem unreasonable on the face of it, and there is some evidence supporting the existence of differences in optimal levels.

Research Background

Laboratory studies of learning (Castaneda, Palermo, and McCandless, 1956; Runkel, 1959) have shown an interaction between complexity of task and anxiety level of subjects such that high anxious subjects learned simple tasks more rapidly, but low

¹ This investigation was supported in part by Public Health Service Grants, No. 5-R11 MH 01096 and 7-R11 MH 02045 from the National Institute of Mental Health, and in part by the Institute for the Development of Human Resources, University of Florida.

² Modified from a paper of the same title read at the meeting of the American Educational Research Association, Chicago, Illinois, February 1968.

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anxious subjects learned complex tasks more rapidly—that is, the optimal level of anxiety for most rapid learning shifts with task complexity.

Work by Soar (1966) showed that both indirect control and a warm emotional climate contributed to pupil growth in vocabulary, but that for reading the most growth was associated with either indirect control and a non-supportive climate, or direct control and a supportive climate. These findings were interpreted as paralleling the laboratory studies relating anxiety to learning. That is, that both direct control and a non-supportive climate induce stress on the pupil; that a minimum of stress is associated with most growth in vocabulary, but that for reading an intermediate level of stress was optimal.

By this line of reasoning, indirect control and a supportive climate were interpreted as inducing too little stress; and direct control and a non-supportive climate, as inducing too much stress for optimum growth in reading. These findings are based on the assumption that vocabulary was a more complex or abstract function than reading, as it was measured in the project. Examination of the relevant subtests of the *Iowa Tests of Basic Skills* appeared to support this interpretation.

Presumably important to this interpretation of the results were the data indicating that on most measures this group of teachers, on the average, was more indirect than either of Flanders' (1965) groups of indirect teachers, and expressed much less criticism. Presumably, for a less supportive, more direct group of teachers, the results would have been different.

The measure of indirect control employed in the analyses of variance just cited was a single measure—the revised I/D ratio for Rows 8 and 9 of the Flanders Interaction Analysis matrix. This measure is a ratio of the teacher behaviors of accepting feeling, praising, or accepting ideas to those of directing or criticizing. It considers only those teacher behaviors which immediately follow pupil talk.

However, different results were found when indirectness was identified by a more

complex measure, a factor score made up of the sum of the 3-3 cell, the 4-4 cell (accepting ideas and asking questions, each lasting more than three seconds), the cells of rows and columns 1 through 3 (any sequence of accepting feelings or ideas or praise which lasts more than three seconds), and the sum of column 3 (the total amount of teacher acceptance of pupil ideas); less the sum of column 10 (the total of silence and confusion)—all in Z scores. This score failed to correlate significantly with growth in either reading or vocabulary, but did relate to pupil growth in creativity. It seemed reasonable, then, to assume that this composite was a more comprehensive measure of indirect teacher behavior—that a classroom extreme on this measure is a more completely indirect classroom than a classroom identified as indirect on only one measure.

When this composite measure was related to pupil growth, it was assumed that levels of indirectness had been identified which were higher than optimal (too indirect at the higher levels) for vocabulary as well as for reading. Linear correlations then would no longer be significant because the relationships had become nonlinear. On the other hand, creativity, as a still more abstract or complex growth measure, would have a still higher optimal level of teacher indirectness than vocabulary or reading, and consequently, it would show significant relations with this more comprehensive measure of directness.

These interpretations were supported somewhat by the additional findings of clearly nonlinear relationships between several measures of teacher behavior and pupil growth when teacher behavior at three levels was studied in relation to pupil growth over a two-year time period.

Although teacher criticism, another of the factor scores, correlated significantly with achievement growth, it also showed nonlinear relations over two years; and it seemed reasonable that these optimal levels might also vary with the measure of growth employed.

A moderate correlation had been found between teacher indirectness and pupil crea-

tivity growth. But when pupils were divided at the median for pre-test anxiety, this relationship was resolved into a higher one for low anxious pupils and an insignificant one for high anxious pupils. This finding suggested the possibility of differing optimal levels of teacher behavior for different levels of pupil anxiety.

Hypotheses

1. Different levels of teacher indirectness will be found to be optimal for pupil growth in reading, vocabulary, and creativity. Increasing levels of indirectness will be optimal for the growth measures in the order stated.

2. Decreasing levels of teacher criticism will be optimal for pupil growth in reading, vocabulary, and creativity, in the order stated.

3. The optimal level of indirectness for pupil growth in creativity will be higher for low anxious pupils than for high anxious pupils.

Procedure

In the previous research, pupil measures were taken in the fall and spring of the year, consisting of the *Iowa Tests of Basic Skills* (Lindquist and Hieronymus, 1956), the *Minnesota Tests of Creative Thinking* (Torrance, 1962), and the *Children's Manifest Anxiety Scale* (Castaneda, McCandless, and Palermo, 1956). Although other measures also were administered in the original research, they are not relevant to these analyses. Complete data were available for 54 classrooms, grades three through six. From the Iowa Tests, only the Vocabulary and Reading subtests were employed; from the creativity battery, only the Toy Dog Unusual Uses measure was employed. Growth measures were obtained by estimating true gain (Lord, 1963) and adjusting out the remaining relations with initial standing by a procedure suggested by Webster (1958, 1959).

During the year, observation was car-

ried out in the classrooms using two standardized procedures: Flanders Interaction Analysis (Amidon and Flanders, 1963); and an especially built instrument emphasizing affective behavior, both verbal and non-verbal, physical movement, groupings, and pupil activity. It was assembled from the Medley and Mitzel (1958) Observation Schedule and Record, and their next later version (D. M. Medley, personal communication), Fowler's Hostility-Affection Schedule (1962), and a number of original items. These observational data were processed through two successive factor analyses, one to reduce redundancy and a second to derive factor scores.

In order to examine the questions posed by the earlier research, the factor scores for indirectness of teacher control and teacher criticism were used, along with pupil residual true gain scores for reading, vocabulary, and creativity. Mean pupil gain was calculated for each classroom for each measure (separately for high and low anxious pupils for creativity, in addition). Analysis of the data was carried out using the BMD 05R Polynomial Regression program (Dixon, 1965), specifying the fitting of a two-degree polynomial as the most complex curve which our theory appeared to accommodate.

In order to test for differences in optimal levels for different growth measures, classrooms were divided at the optimum for the three growth measures in the following manner: Part of the output from the analysis consisted of a prediction of the degree of pupil growth to be expected for each classroom behavior score (these predictions, when plotted, make up the curve which has been fitted to the data to express the relation between classroom behavior and pupil growth [Figure 1]). The classroom behavior score associated with the highest prediction of pupil growth was identified as the optimum, and all others as above or below the optimum. Then the classrooms at or above the optimal level of indirectness for reading were compared with those for vocabulary, and classrooms identified whose indirectness scores had been at or above the optimum for reading, but were below for vocabulary.

The proportion of classrooms showing this shift was tested for significance by the McNemar Test for Significant Change (Siegel, 1956).³ The same procedure was carried out to compare vocabulary with creativity, and the sequence was repeated for teacher criticism.

Results and Discussion

Since the curve fitting was carried out primarily as a method of estimating optima, significant differences in variation accounted for by curve fitting will not be reported.

The optimal levels of indirectness for each of the measures of pupil growth fall in the order predicted (see Figure 1) with reading having the most direct optimal level, vocabulary a somewhat more indirect optimal level ($P < .002$), and creativity growth continuing to increase in apparently linear fashion with increasing teacher indirectness to the limits of the data ($P < .001$). The results for teacher criticism (see Figure 2) do not show optimal levels in the predicted order. The optimal level for vocabulary apparently falls below the lowest level of teacher criticism observed. The optimal level for reading fell slightly above the optimal level for creativity, with both well above any possible value for vocabulary. So the order for vocabulary and reading was as predicted ($P < .001$); but creativity failed to require an even less critical optimal level, as was predicted.

As might be expected from the observed relationship between teacher indirectness and creativity growth for the total group, an optimal level was not indicated for either group when pupils were divided into high and low anxious subgroups (see Figure 3). Rather, both groups continued to increase

³ Since the different growth measures were originally on scales having different means and variances, they were rescaled to make them approximately comparable, so the curves could be compared more readily. It should be noted, however, that the scale on which the optimal level of teacher behavior is identified (the base line, in each case) is the same scale for all curves, and that the rescaling of the curves did not shift the peak of the curve with respect to the base line. That is, the rescaling was done in such a way as to leave the optimal level unchanged.

in creative growth with increased teacher indirectness, but with a steeper rate of increase for low anxious than for high anxious pupils. Although both groups grew more under indirect teachers, high anxious pupils showed a smaller increase of growth under relatively direct teachers, and low anxious pupils appeared to grow slightly more under more indirect teachers.

When these results are considered overall, perhaps the most important point to be made is that these are tests of *post-hoc* hypotheses carried out on the same data which suggested the hypotheses, so that all that has been done has been to identify (or fail to identify) previously suspected relationships. That is, these findings should not be taken as more than hypotheses for further research. Within these limits, however, the support for differing optimal levels of indirectness which parallel differences in the abstractness or complexity or divergence of the growth measure is striking.

The failure of a similar but inverse order of optimal levels of teacher criticism to emerge clearly suggests that this hypothesis is faulty. Perhaps what these two sets of findings together indicate is that teacher behavior should shift materially in indirectness from concrete to abstract subject matters, but that all teaching should proceed under a relatively supportive emotional climate. It is clear that although there is some tendency for all pupils to grow more in creativity with increased teacher indirectness, high and low

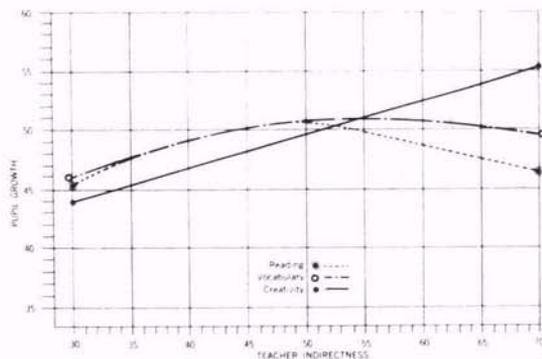


Figure 1. Teacher Indirectness Related to Pupil Growth

anxious pupils differ materially in their response to differing levels of indirectness. Low anxious pupils appear to "use" indirect teaching more effectively.

It is clear that these conclusions are limited not only by their *post-hoc* nature, as was indicated earlier, but also by the clearly atypical group of classrooms from which they were derived. Probably they reflect only a segment of the total curve. A clearer picture of the relationships should be obtained from a broader range of teacher behavior and should include a study of the effects at higher grade levels, as well as more concrete kinds of learning.

The possibility suggested by these findings is that families of curves such as these may be identified which would specify the degree of directness which will produce most pupil growth for a given subject matter (or, more likely, for a set of immediate objectives). What appears to be clear is that when the objective is the learning of concrete material such as spelling, the multiplication table, or foreign language vocabulary, the teacher should be quite direct and highly structured in his presentation; but when the objective is an abstract one, such as the concept of conservation in young children, or new math, or creative writing in older pupils, the teacher should be highly indirect. The effective teacher must be able to shift style as he shifts objectives.

Early in the process of planning a unit with pupils, the teacher may wish to be

highly indirect, so as to encourage the production of a variety of divergent ideas; but in carrying out the unit, the teacher may be more direct in suggesting procedures for implementation and serving as a subject matter resource.

If, as Taba and others (1964) suggest, thinking skills of pupils are developed by gathering extensive, relevant, concrete information from which abstractions and generalizations are drawn, the teacher may be relatively direct in the information gathering stage but indirect in the higher level stages. The principle is that the more concrete or convergent the learning objective, the more direct the teacher behavior; the more divergent the objective, the more indirect the teacher behavior.

The results also suggest that the teacher should be warm and supportive in teaching all objectives. Further, the results suggest that pupils differing in anxiety level will differ in the teaching style which is most useful for them. Grouping by ability level has not seemed to be effective; perhaps grouping by personality might be.

Another conclusion suggested by these findings and others like them is that progress in identifying teaching effectiveness will depend on intensive and refined statistical analysis. For example, the term "permissiveness" has seemed to involve aspects of both emotional climate (warmth) and teacher control (directness). These results (and others, Soar, 1966) indicate that the

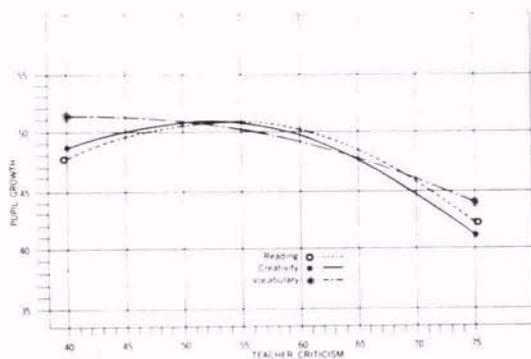


Figure 2. Teacher Criticism Related to Pupil Growth

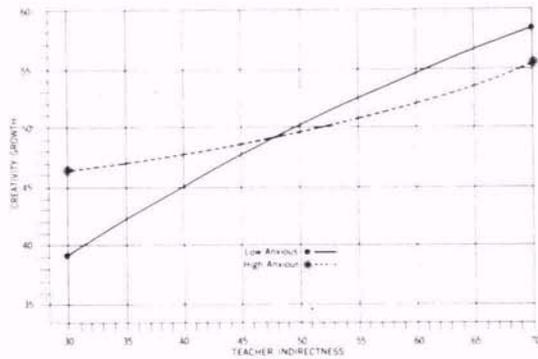


Figure 3. Teacher Indirectness and Growth in Creativity for High and Low Anxious Pupils

two aspects of permissiveness are independent, and differ in their effect on pupils. Perhaps a failure of progressive education was the failure to recognize the need to reach concrete objectives by direct teaching. The assumption that a child needed warmth to grow was correct, but the concept of permissiveness was too broad and excluded the sometimes necessary element of teacher direction.

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