Pupil Subject Matter Growth During Summer Vacation

Robert S. Soar, Ruth M. Soar

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It is often assumed that pupils grow in subject matter only while they are in school under the direction of the teacher. During the summer, the expectation is that the pupil will lose ground — "the summer slump." Since school testing programs commonly test either each fall or each spring, the relative growth or loss of the pupil over the summer in comparison to the school year is not often examined. While "conventional wisdom" assumes a lack of growth on the part of the pupil during the summer, there are data which argue against this assumption.

Schrepel and Laslett (1936) found growth over the summer in 14 out of 22 subtests, and commented as well that brighter pupils tended to show greater amounts of gain. Both they and Word and Davis (1938) commented on the greater likelihood of growth over the summer in material involving concepts, understanding, or application of principles, in contrast to factual learning, which was more likely to show a decline. A recent study in the Baltimore County schools by Gabriel (1966) showed summer losses in most of the classes studied, but found summer growth had occurred in pupils from a small number of classrooms. He commented, "In certain schools, the teacher influenced the students' retention of knowledge and

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* Institute for Development of Human Resources, University of Florida, Gainesville
skills over the summer. The reasons for this are not clear, and few conclusions can be drawn from this part of the study" (p. 23).

Parsley and Powell (1962) compared sexes and grade levels for school year gain and for summer gain using pupils of middle ability. But since grade-level norms were the data reported, their comparisons are relative to whatever gain or loss was made by pupils used in the norming of the test. Beggs and Hieronymus (1968) studied the specific question of rate of growth over the summer months for the complete Iowa Tests of Basic Skills battery. They hypothesized that nine grade equivalent months of growth would occur during the school year, and a tenth during the summer. Their data were variable enough from sub-test to sub-test, and from the samples studied for school year growth to the samples studied for summer growth, that they were reluctant to identify a common pattern. They did conclude, however, that the language and arithmetic sub-tests showed consistent losses during the summer.

An opportunity to examine this question further occurred in the context of a two-year longitudinal study of pupil growth in relation to teacher-pupil classroom behavior (Soar, 1966). Data collection from pupils had originally been planned for fall and spring of the first academic year, and spring of the second academic year, on the assumption that there would be little change in pupil standing during the intervening summer. But the system from which three of the four schools were recruited routinely administered the same achievement tests to sixth graders shortly after school opened, so that for pupils making the transition from the fifth to the sixth grade, the results of four testings were available. Growth during the intervening summer could then be separated from growth the preceding and following academic years.

Three general questions were studied:

1. How does summer growth compare with school year growth?
2. What is the relation between teacher-pupil behavior in the classroom and the subject matter growth of those pupils the following summer?
3. Are there stable individual pupil differences in tendency to show growth during the school year in contrast to growth during the summer?

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Table 1. Longitudinal Results* for Two Years of Growth for 189 Pupils

* In grade-level months.
Method

Procedure: Data were collected from all of the fifth grade classrooms in three elementary schools in a metropolitan area in central South Carolina. Although these classrooms were not necessarily representative, the schools spanned a broad range of socioeconomic levels. All teachers and pupils were Caucasian; the proportion of disadvantaged pupils was probably small. In all, complete data for the fifth and sixth grade years were obtained from 189 pupils.

Measures: The pupil measures used in this study consisted of the vocabulary, reading, and arithmetic sub-tests of the *Iowa Tests of Basic Skills* (Lindquist and Hieronymus, 1956). Administration of the tests the fall and spring of the fifth grade, and the spring of the sixth grade, was carried out by project field staff; the fall sixth grade tests were administered by the classroom teachers. During the first year, teacher-pupil behavior in the classrooms was observed using two observation schedules—Flanders' *Interaction Analysis* (Amidon and Flanders, 1963) and another schedule made up of items from several revisions of the *Observation Schedule and Record* (Medley and Mitzel, 1958), the *Hostility-Affection Schedule* (Fowler, 1962), and a number of original items. The new instrument was developed especially to supplement the data collected by *Interaction Analysis*. It stressed nonverbal behavior, the physical movement of pupils in the classroom, and the sorts of groupings observed in the classroom.

Analysis: The pupil measures were reduced by estimating true gain by a procedure suggested by Lord (1963). The remaining relation between initial standing and true gain was then eliminated by predicting true gain from initial standing, subtracting predicted true gain from observed true gain, and using the difference score as the measure for further analysis. This process was carried out so as to permit separate identification of growth for three time periods: the first school year, the intervening summer, and the second school year.

Forty-nine measures were obtained from the classroom observation data which were reduced by factor analysis using principal components extraction followed by varimax rotation. A series of rotations were carried out with different numbers of factors from the extraction matrix, and the nine factor rotation was chosen as that which apparently produced the clearest picture of classroom process.

Two factors were selected from this analysis to use as classifications for analysis of variance, on the basis of earlier work. Fleishman (1953) identified two dimensions of leader behavior from a number of settings which he called "Initiating Structure" and "Consideration." Descriptions of "permissive" teacher behavior in a number of studies of teacher effectiveness seemed to be pooling the same two dimensions identified by Fleishman—one, a measure of the extent to which control in the group setting is vested in the leader; the other, a measure of emotional climate. Accordingly, analogs of these two factors were sought in these data. Since it was not entirely clear that these were the same dimensions identified by Fleishman or

<table>
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Table 2. Residual True Gain* for Three Periods of Growth for 189 Pupils

* In grade-level months.

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by the teacher effectiveness studies, they were titled respectively “Control” and “Climate” in this study.

The dimension of control behavior was measured by the revised I/D ratio for rows 8 and 9 of the Interaction Analysis. This is a ratio made up of teacher behaviors which occur immediately after a pupil stops talking. If the teacher praises or encourages, accepts feelings, or accepts or uses a student idea, these are identified as indirect—that is, they have the effect of expanding pupil freedom; but if the teacher criticizes, justifies his authority, or gives directions, this is classified as direct teacher behavior, and tends to limit pupil freedom. The measure used is a ratio of indirect to direct teacher behavior, so that a high score reflects more pupil freedom, a low score more teacher control.

The clearest dimension of emotional climate which emerged from the analysis was made up of expressions of hostility, criticism, or negative feelings. These were counts of verbal and nonverbal pupil expressions of hostility, such as teasing, threatening, blaming, hitting, or taking another’s property, and counts of hostile verbal teacher behavior, such as humiliating, threatening, making disapproving comments, and blaming a child. The higher the score, the higher the incidence of critical or hostile comments or behaviors in the classroom.

In the phase of the study concerned with the relation between teacher behavior and pupil growth during the summer, classrooms were sought which represented the extreme conditions of these two dimensions—that is, direct control, high hostile; direct control, low hostile; indirect control, high hostile; indirect control, low hostile. The residual true gain measures from the pupils from each of these classrooms, then, made up the data which were analyzed in the resulting 2 x 2 weighted means analyses of variance. A separate analysis was carried out for each of the four achievement measures.

The tendency for pupils to grow more during the school year than during the summer, or vice versa, was tested by intercorrelating achievement measures within and across the three time periods. It was predicted that measures should correlate positively within each time period, and positively from the first school year to the second school year.

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<td>48</td>
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<th>First Item</th>
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</tr>
<tr>
<td>6</td>
<td>40</td>
<td>11</td>
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Table 3. Selected Performances Required by the Iowa Tests of Basic Skills for a 60 Grade Equivalent
but that both years should correlate negatively with measures of summer gain. Since, as Thorndike (1966) suggested, the correlation of initial status with gain is probably on the order of +.10, it did not seem reasonable to expect two measures of gain to correlate very highly, especially when gains in different subject matters were involved. Accordingly, the predictions were made only for the signs of the correlation coefficients. This process was carried out separately for the two verbal measures and the two arithmetic measures, and with the four measures pooled. It is interesting to note that when this prediction of signs is made for two measures, one more negative correlation than positive is predicted, so that the prediction is not simply that all measures of growth will be positively related.

Results and Discussion

Summer Growth: The standing of the pupils at each of the testing periods is shown in grade level norms in Table 1, and in residual gain in grade level months in Table 2. Although the results differ somewhat from one to the other, in general the relative growth for Vocabulary was approximately 8 months for the first year, 4 months for the intervening summer, and 7½ months for the second year. For Reading, the same periods showed approximately 6½, 3½, and nearly 7 months; for Arithmetic Concepts, 6½, 3, and 7½; and for Problems, approximately 7, 5, and 8.

The relative amount of growth shown for the summer as contrasted to the two school years needs some qualification. The schedule for testing did not permit encompassing the whole nine months of the school year between tests; rather, the period was approximately seven and a half months. The summer, then, covered about four and a half months, which included the opening and closing month of two school years. In addition, the year began with a review of the previous year's work which presumably resulted in an advantage for the fall testing which followed. It is possible, as well, that the second fall testing, which was done by the classroom teacher rather than an outsider, may have resulted in somewhat higher scores, because of a more familiar situation.

Beggs and Hieronymus (1968) indicate that in the norming of the Iowa tests one month of growth is arbitrarily assigned to the summer months. However, it still seemed worthwhile to examine the norm tables to identify the changes in raw score necessary

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* p < .05

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<td>5.51</td>
<td>4.11</td>
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* In grade-level months.

Table 4. Analysis of Variance for Vocabulary Summer Growth for Two Classroom Behavior Dimensions

March 1969
to maintain the same grade level standing at
the beginning and end of the summer. The
relevant data are shown in Table 3. Since
pupils start at different points in the test each
year, direct comparison is not possible, but
the table shows the item that would be
reached if a pupil got all items right (including
those preceding his starting point) up to
the raw score required, and missed all items
beyond that point. This is an unrealistic as-
sumption, but if similar proportions of items
were missed each year, with few of the misses
in the early material, then the data seem to
suggest that beginning sixth graders must
perform at a higher level than ending fifth
graders to earn a grade six equivalent score.

The growth shown by pupils in this proj-
et is in addition to whatever growth the
norms assume, however, since their standing
is reported in grade level terms.

Relation of Teacher-Pupil Interaction to
Summer Growth: In the analyses of variance
relating classroom behavior to pupil growth
the following summer, the results for Vocab-
ulary partly conformed to expectation, but in
part did not (see Table 4). Differences in
emotional climate in the preceding year’s
classroom produced no significant differences
in growth over the summer, but differences
in teacher control produced a significant dif-
ference in favor of indirect control—the chil-
dren in direct classrooms grew slightly more
than three months during the summer, while
pupils from indirect classrooms grew five-
and-a-half months. The interaction of the
two factors was not significant.

For Reading, emotional climate, control,
and interaction were all non-significant
(Table 5). The only differences in growth
large enough to be of possible interest were
differences between cells of the analysis, in
which somewhat higher growth occurred for
the combinations of low hostility-direct and
high hostility-indirect than for the other two
combinations, although these differences may
be chance ones.

The finding that indirect teaching in a
classroom during the school year produced
significantly higher Vocabulary growth the
following summer followed the same pattern
as for growth during the year (Soar, 1966;
Soar, 1967); but hostility expressed in the
classroom during the year did not have a
continuing effect on the pupil’s growth during
the summer, nor did the interaction of the
two.

It is not certain why indirect teacher
control produced more Vocabulary learning
during the summer—whether the experience
of greater pupil involvement in the classroom

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* In grade-level months.

Table 5. Analysis of Variance for Reading Summer Growth
for Two Classroom Behavior Dimensions
led to later learning, or whether the freedom
and openness in examining ideas was the
supportive element, or both.

Although the results for Reading were
not statistically significant, they followed the
pattern for growth during the year in some
respects. During the year, indirect teacher
control produced more growth than did direct
teacher control, but this effect was not shown
during the summer. The emotional climate
dimension did not produce significant differ-
ences in either case. The largest difference in
learning during the year was in the joint
effect of Climate and Control (significant be-
beyond the one percent level), and although the
interaction was not significant for summer
gain, the pattern was the same. The tendency
for Reading to be less affected by classroom
conditions was also parallel.

For Arithmetic Concepts and Problems
(Tables 6 and 7), only the interaction of
Climate and Control was significant. For
Arithmetic Concepts, the combination of
low hostility-indirect produced the greatest
growth, with the other three combinations
differing relatively little. For Arithmetic Prob-
lems, the greatest growth was again for low
hostility-indirect, but with high hostility-
direct intermediate, and the other two com-
binations apparently producing less learning.

The results for Reading appear during
the year, and perhaps during the summer,
to support the interpretation that the com-
binations of (presumed) optimal and non-
optimal conditions produced the most learn-
ing. The direction of this difference appears
to require an interpretation which is more
complex than a simple summative effect of
two optimal conditions.

The findings for the year were inter-
preted by a post hoc hypothesis which dealt
with two problems—why the results for
Reading and Vocabulary differed, and why
presumed less-than-optimal combinations of
conditions produced the greatest growth in
Reading. That interpretation was made by
referring to the finding of simpler, less ab-
stract learning being facilitated by moderate
levels of tension which hindered more com-
plex learning. Added support for this inter-
pretation can be found in further analyses of
the school year data (Soar, 1968).

These findings appear in some ways to
agree with the findings of others and perhaps
to extend them. Early researchers suggested
that summer growth was more likely for
bright pupils than less able ones, and more
likely for abstract material than concrete. It
is clear that the pupils in this study were
advanced, and the Iowa Tests of Basic Skills

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**p < .01

Residual True Gain Means *

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* In grade-level months.

Table 6. Analysis of Variance for Arithmetic Concepts
Summer Growth for Two Classroom Behavior Dimensions

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were chosen because they were believed to measure higher level skills rather than factual information.

These results appear to extend previous understanding in indicating that at least one aspect of classroom process (indirect teaching) during the school year made a significant difference in the amount of growth that occurred in the pupils the following summer. And there is some support for the idea that the emotional climate of the classroom contributed to and/or interacted with indirect teaching in influencing the amount of growth that occurred. There is also evidence (Soar, 1966) that these classrooms, as a group, were unusually indirect. It appears, then, that three influences favored summer growth for these pupils—they were an able group, the tests were abstract, and the teachers were indirect.

**Individual Differences in Summer Gain:**
The variability associated with the summer growth (Table 2) suggested that there might be pupils who, during the summer, grew as much as, or more than, in either school year. Inspection of the data showed examples of what appeared to be individual differences in the periods within which a pupil tended to show most of his growth. It was easy to find examples of pupils who grew at the expected rate during both school years but little, or not at all, during the intervening summer. Yet examples of the reverse pattern were also easy to find.

In the attempt to discover whether these were isolated cases, a count was made of individual children whose summer gain was as much as, or more than, their previous year's gain, with the finding that this was true for 33 percent of the group for Vocabulary and 43 percent for Reading. A portion of each of these percentages presumably represents unreliability of measurement (as well as the qualifications cited above), but the possibility of consistent patterns, or "styles of learning," still seemed a real one, and provocative in the extreme. As a way of testing whether such a pattern existed, the gain scores for the three periods were intercorrelated.

The prediction, again, was that if pupils really differed in their preferred mode of learning, there would be positive correlations between Vocabulary and Reading within each time period, and between the first year and the second year, but that both years should correlate negatively with summer growth.

The analysis of the three periods of gain for the verbal tests (Table 8) produced 15 correlation coefficients, every one of which

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**p < .01

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* In grade-level months.

Table 7. Analysis of Variance for Arithmetic Problems
Summer Growth for Two Classroom Behavior Dimensions

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was in the predicted direction. This is a result which could occur by chance less than one time in a thousand, as indicated by the sign test. A similar analysis for the arithmetic measures (Table 9) produced 11 of 15 signs in the predicted direction, which was not significant ($P < .06$).

When the two sets of results were pooled, 26 of 30 signs were in the predicted direction, which was significant beyond the one-tenth of one percent level.

These results suggest that perhaps we can posit a continuum of learners from the conventional learner who does most of his learning in the classroom under the teacher's direction, to the other (the summer learner?) who shows most of his growth during the summer, on his own.

There is evidence of what may be a similar continuum of differences in learning styles identified by Torrance (1965). He cites results from several studies which he interpreted as pointing to two pupil styles of learning—learning by authority and learning by discovery. When one style or the other was favored by instructional procedures or examinations, different sets of pupils did well, and correlations with measures of intelligence were significantly different.

While it is not clear that the continuum of differences identified by Torrance is the same one apparently effective here, the two sets of results do appear to support each other in agreeing that different styles of learning are present.

Perhaps the finding of summer learning should not be surprising, since educators have always expressed the hope of initiating a learning process which will be continued beyond formal schooling. The possibility that practically important amounts of growth for some pupils may occur outside the school year raises, however, some provocative questions.

What effect would extending the school year have on the "summer learner"? Educational programs are regularly changed on the basis of "conventional wisdom" with little or no data, but these findings suggest that a massive commitment of resources might actually decrease growth for some pupils.

Lacking information about summer growth, as the school usually does, is it not likely that a pupil whose growth occurs primarily in the summer would be labeled an "underachiever"?

Is it possible that some children are more self-directed learners than others and so continue learning on their own during the summer?

Is it possible that some children find the classroom a source of stimulation which later results in growth, but requires a period of time for something like integration, synthesis, or consolidation?

Is it possible that some children tire of school by the spring and no longer perform up to their potential? Or that such an effect as the Hullian concept of reactive inhibition may be at work?

Is it possible that a part of the progressive falling behind which is typical of the

<table>
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<th>Second Academic Year</th>
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Table 8. Correlations of Vocabulary and Reading Residual True Gain for Three Time Periods

* $N = 189$, fifth-sixth grade pupils.

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culturally deprived child occurs because of lack of environmental support for out-of-school learning?

Is it possible that the concept of good teaching needs more emphasis placed on the potential of the classroom for initiating learning which continues later? This has been a part of theory, but it has received little attention in empirical studies.

In summary, it seems clear that practically important amounts of pupil subject-matter growth occur outside the classroom in some cases. It also seems clear that the nature of the previous year's classroom can significantly affect the amount of summer growth, and there are suggestions that the teacher style which produces more classroom growth may also produce more summer growth, although the latter conclusion is not completely clear.

It seems likely that there are pupil differences in the tendency for most growth to occur during the school year versus during the summer, although the correlates of this difference are unknown.

But even if summer growth only occurs for some pupils under some classroom conditions, the phenomenon seems important. And if the suggestion that the same teacher style which produces most school-year growth also produces most summer growth is validated, then the importance of studying both questions is increased.

It seems reasonable, too, that the pupil learning style which is associated with summer growth might interact with the teacher style which is most productive, so that the teacher who is best for one group of pupils (school-year learners) might not be the best for the other group (summer learners). And the size of the differences in growth for pupils in general which were associated with differences in teacher style suggests that an interaction between teacher style and pupil style might have practical consequences of considerable importance. And further, if this effect should continue across the school year and the summer in similar fashion, then the three effects would be pyramided.

References


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Table 9. Correlations of Arithmetic Concepts and Problems Residual True Gain for Three Time Periods*

* N = 189, fifth-sixth grade pupils.
Humanizing the Secondary School

By the ASCD Secondary Education Council

NORMAN K. HAMILTON and J. GALEN SAYLOR, editors

Spotlights humaneness as the most critical need in American secondary education. • Deplores the vast gap which exists between thinkers and scholars, on the one hand, and practitioners in the field, on the other hand. • Shows the need to close this gap if secondary schools are to survive the student revolution for relevancy, the teachers' insurrection for professional status and welfare rights, and the social revolution which would take the schools away from professional educators.

Preface by Muriel Crosby, ASCD President


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