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An experiment was conducted to determine whether special reading instruction integrated with agricultural instruction would result in improved reading ability and increased achievement in subject matter. random assignment was made of vocational agriculture classes in 12 Maryland schools to experimental and control groups. Units on soil sampling and agricultural cooperatives were prepared and supplied to teachers in all groups. In addition, the experimental group teachers followed suggestions for improving reading ability as set forth in a written guide. The "Diagnostic Reading Tests, Survey Section," "Kuhlman-Anderson Intelligence Test, 7th Edition," and "Sequential Tests of Educational Porgress" were used in pre- and post-testing. Reading abilities of students in the study were below national norms. Statistical treatment of data showed no differences between experimental and control groups in performance on reading, social studies, and science standardized tests, when scores were adjusted for I.Q. and pre-test scores. Subjective responses to teachers suggested that the reading guide might have merit, if revised. It was concluded that the length of the experiment was inadequate and standardized tests in agricultural subject matter was a serious limitation to interpretation of results. (JM)

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Integrating Reading Instruction Into VOCATIONAL AGRICULTURE CLASSES

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INTEGRATING READING INSTRUCTION INTO VOCATIONAL AGRICULTURE CLASSES

by

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Although education has profited from the addition of many audio and visual techniques, the printed word remains the basic educational tool. The student who cannot read is at a marked disadvantage.

For a number of reasons, students enrolled in vocational agriculture throughout the country read below the norms for their classes. The reasons are doubtless varied, but prominent is the practice of guidance counselors to direct low achievers to vocational agriculture and other vocational courses.

In a study in North Carolina, Davis (1951) found that 75 percent of the ninth grade students in vocational agriculture were below the 30th percentile on national norms; 50 percent were below the 15th percentile and 25 percent below the 5th percentile. Cardozier (1958) found in Tennessee that 85 percent of the 10th grade vocational agriculture students read below the 10th grade level, and 50 percent read below the 8th grade level. Galloway (1960) found that 760 vocational agriculture students in grades 9 - 12 were reading from one to three grade levels below their peers.

Reports from teachers, plus other observations, suggested that the reading abilities of vocational agriculture students in Maryland were similarly retarded. There are students in many classes of secondary school vocational agriculture who cannot read the most simple books and other educational materials. Maryland vocational agriculture teachers report that a number of students in the state cannot read tests -- the test must be administered to them orally if they are to achieve at all.

Beutall (1961), in a study of 1500 students in 9th and 11th grade classes of mathematics, English, science and social science, found that achievement in those courses increased with improvement in reading proficiency. Gartley (1952) found a positively significant relationship ($r = 0.63$) between achievement in vocational agriculture and reading ability.

Pupils who cannot read not only perform unsatisfactorily in school but are doomed to serious occupational and personal difficulty throughout life if their problem is not corrected. For most this means correcting the problem before they leave school. Thus,

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the problem to be faced was how to improve the reading abilities of pupils enrolled in vocational agriculture who could not read or whose reading abilities were below normal.

THE EXPERIMENT

Rather than set up special classes in reading, it was decided to find out whether teachers of agriculture could incorporate selected reading improvement practices into their normal teaching activities which would result in the improvement of the reading abilities of their pupils.

Rationale. The basis for the experiment was the assumption that improvement of reading would more likely occur when pupils read materials in which they are interested. Most of their earlier instruction in reading involved materials in which they were not necessarily interested, and much of it was unrelated to their experience. Presumably, most pupils in vocational agriculture classes are interested in that subject and would approach with more motivation reading material related to agriculture than they would an excerpt from "Beowulf," or the like.

The fact that improvement in reading results in increased achievement in course work also has been demonstrated by Finck (1935), Corrigan (1942), and Gaston (1956).

In addition to general academic improvement following reading improvement, it has been demonstrated that increased achievement is particularly affected when reading instruction is integrated or related to instruction in courses. Jacobsen (1932) found that reading lessons in general science not only improved students' reading performance but increased achievement in general science and in general scholarship. Stright (1938) found that reading instruction applied to algebra problems resulted in improved ability to read algebra problems among the experimental group compared with the control group. Witt (1962), in a study of 7th grade pupils in the University School of Florida State University, found significant gains in reading and understanding social studies concepts as a result of classroom reading instruction related to social studies.

Objectives. The first step in the study was to determine the abilities[1] of vocational agriculture pupils in Maryland. Although it was known that reading problems existed, the nature and extent of the problems were unknown.

The main objective of the study was to determine whether special reading instruction integrated into the teaching of agriculture would result in both improved reading ability and increased achievement in subject matter.

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[1] In this report, the term "reading ability" is used in the sense of "reading proficiency," not as inherent ability.

Design. The design was a simple classical design of randomly assigned schools. Twelve schools in Maryland were used in the experiment. Two were selected from each of the major socio-economic cultural areas of the state --- Western Maryland, Upper Piedmont, Lower Piedmont, Southern Maryland, Upper Eastern Shore, and Lower Eastern Shore. Schools chosen included teachers with more than one year of experience, schools which were not atypical in the state, teachers who were subjectively considered not atypical in the state, and schools which did not have student teachers in vocational agriculture. Assignment of the pair in each region to experimental and control groups was based on chance.

Prior to the beginning of the experiment, the first author and a graduate assistant in agricultural education[2] met with the selected teachers and chose two units to include in the experiment. A unit on soil sampling and a unit on agricultural cooperatives were chosen by the teachers. Teaching guides for the two units were prepared in the Department of Agricultural and Extension Education and supplied to teachers. The two-week unit on soil sampling was taught in October 1963; the three-week unit on agricultural cooperatives was taught in late November and early December. All classes were taught in the usual manner except that the teachers of the experimental classes followed the suggestions for improving reading ability set forth in the written guide they received.[3] In addition, teachers of experimental classes were supplied copies of 16 "Self-Helps" for their pupils. These materials reached teachers in experimental schools in September 1963.

Teachers using the written guide were supplied no information orally concerning its use. If the guide proved valid for the purpose, it would be supplied to teachers all over the country, most of whom would receive no oral instructions concerning its use. Thus, teachers in the study received only written instructions on how to use the guide most effectively.

One of the major problems, and limitations, in the study was the attrition of pupils in both experimental and control schools between the May 1963 general testing and the beginning of the experiment in the fall of 1963. The numbers of subjects, by school, are shown in Table I. Some of the attrition was due to absence from class when the tests were given in the fall of 1963 but most of it was due to transfer from vocational agriculture to other courses or school dropout.

Measurement. In order to determine the nature and extent of reading problems, 9th and 10th grade vocational agriculture pupils throughout the state were tested in May and June, 1963, using Diagnostic Reading Tests, Survey Section (grades 7 - 13). Of the 45 predominantly white vocational agriculture departments, 38 participated, and five of the 15 predominantly Negro departments participated.

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[2] John F. Thompson, formerly teacher of agriculture, Margaret Brent High School, Helen, Maryland, now assistant professor, Department of Agricultural and Extension Education, University of Wisconsin.

[3] See the Appendix for an outline of the guide for improving reading which was supplied teachers.

TABLE I

NUMBER OF SUBJECTS IN EXPERIMENTAL AND CONTROL CLASSES AT THE BEGINNING OF THE TESTING PROGRAM AND THE NUMBER COMPLETING THE ENTIRE TEST BATTERY

Experimental Classes	Subjects taking initial measure in reading in May, 1963	Subjects taking complete test battery
School A	27	20
School B	26	14
School C	16	11
School D	15	4
School E	7	3
School F	12	10
Subtotal	103	62
Control Classes		
School G	17	12
School H	11	6
School I	14	7
School J	9	4
School K	11	7
School L	8	3
Subtotal	70	39
TOTAL	173	101

Prior to the teaching experiment, 10th and 11th grade pupils in the 12 schools were given the Kuhlmann-Anderson Intelligence Test, 7th Edition, H Form. Since no adequate standardized test in agriculture was available, the Science and Social Studies Tests of the Sequential Tests of Educational Progress, Level 2, Form A, were also given the pupils. It was assumed that improvement in these would most nearly parallel improvement in agriculture.

In January 1964, after both units in the experiment had been taught, pupils in the study were given a second form of the Diagnostic Reading Tests, Survey Section, and a second form of Sequential Tests of Educational Progress, Level 2.

During the last two weeks of May, a third form of the Diagnostic Reading Tests, Survey Section, was administered to measure the residual improvement in reading, if any.

Upon completion of the study, teachers in the experimental group were asked to evaluate the written guide. This was done with a questionnaire and subsequently by personal interview with each teacher by the senior author of this report.

READING ABILITIES

Tables II and III show the percentages of pupils whose scores placed them below specified levels, based on national norms. A large majority of both 9th and 10th grade pupils read below their grade levels. In both grades, the largest percentage were deficient in vocabulary and in overall reading ability.

Since the reading test was standardized for grades 7 - 13, no norms were available below grade 7. More than one-half of the pupils in both the 9th and 10th grades were below the 7th grade level in speed of reading, but based on their own year norms, vocabulary was the problem for the largest percentage. However, the differences among the three problems were not great, and one must conclude that students needed improvement in reading speed and comprehension as well as vocabulary. It should be pointed out that the data in Tables II and III are based on reading scores of 9th and 10th grade pupils in 43 schools whose pupils took the reading test in May, 1963.

Teachers in both experimental and control schools were supplied copies of materials that would be used in teaching the two units. Vocational agriculture reference materials were examined and teachers, both in the study and others, were interviewed to obtain insight into the nature of pupils' reading difficulties. These procedures and data in Tables II and III provided the basis for the guide to be used by teachers in the experimental group.

MENTAL ABILITY

In order to compare student performance, with I.Q. controlled, a test to measure mental ability was given to all subjects in the study. The test used was the Kuhlmann-Anderson Intelligence Test, 7th Edition, Form H. Results of that test appear in Table IV.

TABLE II

MEDIAN GRADE-LEVEL READING PERFORMANCE* OF MARYLAND NINTH-GRADE VOCATIONAL AGRICULTURE STUDENTS

	Percentage of students below seventh-grade level	Percentage of students below eighth-grade level	Percentage of students below ninth-grade level
Rate of reading	61	73	76
Vocabulary	46	67	81
Comprehension	47	65	70
Over-all reading ability	46	68	79

*Median grade-level performance is the raw score at the fiftieth percentile rank of the national norms developed for the Diagnostic Reading Tests, Survey Section, for Grade IX.

TABLE III

MEDIAN GRADE-LEVEL READING PERFORMANCE* OF MARYLAND TENTH-GRADE VOCATIONAL AGRICULTURE STUDENTS

	Percentage of students below seventh-grade level	Percentage of students below eighth-grade level	Percentage of students below ninth-grade level	Percentage of students below tenth-grade level
Rate of reading	51	65	68	74
Vocabulary	38	61	75	84
Comprehension	42	58	66	73
Over-all reading ability	39	61	73	82

*Median grade-level performance is the raw score at the fiftieth percentile rank of the national norms developed for the Diagnostic Reading Tests, Survey Section, for Grade X.

The wide variation among schools in mean I.Q. is apparent in Table IV. This is true between the experimental and control groups as well as within those groups. However, an analysis of variance of mean class scores between groups produced an F value of 3.26 which is less than that required for significance at the 5 percent level. When the data were analyzed in terms of individual I.Q. scores, rather than class means, an F value of 9.18 resulted. This is significant at the 5 percent level. Thus, it is apparent that the mean I.Q. of the pupils in the experimental group was higher than of those in the control group.

While the subject is not directly germane to this study, an observation on the I.Q. levels of the various classes is in order. It is usually assumed that all or almost all classes of vocational agriculture are composed of students with lower I.Q. scores. If one can assume that the schools concerned in this study were composed of students with "normal" distributions of I.Q. scores, then it is evident that not all of them are abnormal. The mean scores of Schools C, E, F, K and L are sufficiently near 100 to suggest "normality." This suggests that vocational agriculture students in those schools are not atypical of the total student population in each school. Yet, in toto the scores of both the experimental and control groups are significantly below 100.

TABLE IV

INTELLIGENCE QUOTIENT SCORES OF STUDENTS IN EXPERIMENTAL AND CONTROL CLASSES

School	N	I.Q. Scores		
		Mean	Range	S.D.
EXPERIMENTAL GROUP				
School A	20	89.90	78 - 103	7.97
School B	14	94.07	72 - 108	11.17
School C	11	100.55	91 - 110	7.61
School D	4	92.25	81 - 103	9.07
School E	3	98.67	89 - 113	12.66
School F	10	97.30	68 - 109	12.92
CONTROL GROUP				
School G	12	84.92	71 - 96	7.26
School H	6	78.50	74 - 91	6.95
School I	7	85.86	72 - 100	10.68
School J	4	82.50	70 - 101	13.28
School K	7	99.86	89 - 118	10.95
School L	3	101.33	94 - 105	6.35

RESULTS OF TREATMENT

Data were analyzed in terms of class means and by subjects (i.e., individuals). In general, experiments of this design most probably would be analyzed in terms of class means, alone. However, wide variations in numbers of students in the various classes plus other factors suggested that class means would not adequately serve for the comparison. Thus, analyses were made with subjects as units of measurement.

Class analyses. Analysis of variance of differences between pre-test and post-test scores in reading, science, and social studies were not significant. Although class means of I.Q. and pre-test scores were not significantly different, analysis of covariance of post-test scores adjusted for I.Q. and for pre-test scores were made. As shown in Table V, none of these values were significant. Even if significant differences occurred, using classes as units of measure, the serious imbalance in class size would cast doubt upon the validity of the statistical inferences.

Therefore, in terms of class means, the improvement of the experimental and control groups did not differ significantly in reading, science, and social studies.

Subject analyses. The apparent differences in Table VI between pre-test scores of the experimental and control groups, using subject means as units of measurement, are substantiated by the F values. Differences between experimental and control groups were significant on pre-test and post-test scores in reading and social studies, and in science on post-test. Only in the case of pre-test scores in science was the difference not significant.

What might at first glance appear to be differences between the experimental and control groups were yet to be examined in the light of differences in I.Q. and in pre-test scores. Analysis of covariance, adjusting for I.Q. and for pre-test scores, showed that with these adjustments differences between the groups were not significant.

Therefore, analysis in terms of subjects also showed no difference between the experimental and control groups which might be attributed to the experimental treatment.

TEACHER RESPONSES

In addition to objective measures and statistical analyses, the six teachers in the experimental schools were asked to respond subjectively to the experimental procedure. They first responded to a questionnaire and then each was interviewed for additional data concerning his views.

Most of the teachers felt that the suggestions in the Guide were useful and that they had profited from them. However, several limitations and suggestions for improving it and the procedure were offered by teachers. The Guide is 39 pages in length. Most of the teachers suggested that it be shortened but could not identify portions that

TABLE V

PRE-TEST AND POST-TEST SCORES, STANDARD DEVIATIONS, ANALYSIS OF VARIANCE AND COVARIANCE OF MEAN SCORES, EXPERIMENTAL AND CONTROL GROUPS IN READING, SCIENCE AND SOCIAL STUDIES, CLASSES AS UNITS OF MEASURE

		Pre-test		Post-test		Differences between groups		Analysis of covariance, post-test scores	
Measure	N	Mean	S.D.	Mean	S.D.	Pre-test F value*	Post-test F value*	Adjusted for I.Q.*	Adjusted for pre-test scores*
READING						1.57	1.69	.44	.12
Experimental	6	43.87	7.14	47.73	10.14				
Control	6	37.83	12.52	39.53	12.69				
SCIENCE						2.03	3.78	.60	1.31
Experimental	6	272.33	3.40	273.80	3.17				
Control	6	269.61	6.61	271.49	5.27				
SOCIAL STUDIES						4.44	2.69	.12	.01
Experimental	6	265.62	4.67	265.63	7.28				
Control	6	259.86	4.38	260.18	4.85				

*F = 5.05 required for significance at the 5 percent level.

TABLE VI

PRE-TEST AND POST-TEST MEAN SCORES, STANDARD DEVIATIONS, ANALYSIS OF VARIANCE AND COVARIANCE OF EXPERIMENTAL AND CONTROL GROUPS IN READING, SCIENCE AND SOCIAL STUDIES, SUBJECTS AS UNITS OF MEASUREMENT

	Pre-test		Post-test		Differences between groups		Analysis of covariance, post-test scores	
Measure	Mean	S.D.	Mean	S.D.	Pre-test F value*	Post-test F value*	Adjusted for I.Q.*	Adjusted for pre-test scores*
READING					4.5	6.6	.33	2.05
Experimental	42.3	13.6	45.4	15.3				
Control	36.1	15.3	33.3	15.3				
SCIENCE					3.6	5.4	.50	2.17
Experimental	272.4	9.4	274.3	10.3				
Control	268.5	11.3	269.9	7.8				
SOCIAL STUDIES					8.2	8.6	2.70	1.87
Experimental	264.3	10.2	264.6	9.2				
Control	258.8	8.2	259.4	7.7				

*F value of 3.94 required for significance at 5 percent level.

might be omitted; in general, the reactions seemed to suggest that it be made more compact. Only one teacher conducted Flesch readability tests on materials used in teaching, as recommended in the Guide.

According to the teachers, the 16 "Self Helps" (each consisted of one or two page suggestions for students) were used little by the students.

Teachers indicated that they used the portions of the Guide relating to vocabulary development and to independent reading more than other portions of it. They suggested that the procedure would have been more effective had they been furnished sample teaching plans which included directions and ideas for improving reading and which also clearly set forth the objectives of the teaching.

CONCLUSIONS

The findings, with reference to the reading abilities of students enrolled in high school agriculture classes, parallel those of previous studies of this question in other states. It is clear that the reading abilities of students in this study were so far below national norms as to make the extent of the problem apparent. Some kind of remedial action is essential if students like these are to profit most from their agricultural instruction.

With respect to the experimental treatment tested in this study, the conclusions are less definite. The statistical data show that there were no differences between the experimental and control groups in performance on reading, social studies and science standardized tests, when scores were adjusted for I.Q. and for pre-test scores. Thus, statistically it is concluded that there were no differences.

Subjective responses of teachers suggest that the Guide may have merit, if revised and variations are made in its use. A shorter, more compact Guide would likely have been used more effectively by teachers.

It became apparent that the length of the experiment was inadequate. A full year would have been more desirable; while the results might have been no different, more opportunity would have existed for differences to develop.

Lack of standardized tests in agricultural subject matter was a serious limitation. In the absence of such tests, standardized tests in social studies and science were used, on the assumption that changes which occurred in these disciplines would parallel those that occurred in agriculture. This, of course, is speculative.

The procedure set forth in the present Guide does not appear adequate to accomplish its objectives. This experiment suggests, however, that further research should be undertaken with variations in the approach set forth in the Guide.

APPENDIX

READING IMPROVEMENT THRU VO-AG

A Guide

(This is a brief description of the 39 page guide furnished teachers in the experimental classes. The table of contents of the guide follows the description. A copy of the complete guide may be obtained from the senior author at the Reading Clinic, University of Maryland.)

The written guide, Reading Improvement Thru Vo-Ag, describes the physiological and psychological nature of the reading process as well as factors affecting the reader in order to help teachers understand the nature of the skills essential for effective reading and the teaching of these skills. Reading objectives appropriate for agriculture teachers are outlined in light of the reading levels of vo-ag students and the reading demands placed on the students by the printed materials available for teaching agriculture units.

The reading skills are identified. Specific methods on improving these skills in the classroom are presented. The areas of word recognition, vocabulary development, comprehension, rates of reading, and functional reading are covered in detail.

Procedures for planning vocational agriculture units include selection and use of vo-ag reading materials based on reading levels and the nature of the materials. Consideration is also given to working with the specialized vocabulary of agriculture units and reading skills needed for working with various types of materials. Guided reading procedures, supervised study, and independent reading assignment procedures are outlined.

A set of sixteen Self-Helps are included to provide teachers with additional material for helping students improve their reading skills. These are designed for student use with teacher direction. The Self-Helps relate to such topics as word attack skills, scheduling time for efficient study, preparing reading assignments, reading to remember, locating information, preparing reports, and reading and taking a test. The written guide concludes with an abbreviated summary outline of unit planning procedures incorporating reading improvement procedures.

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