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ogy to culture media for microorganisms.

The first year's use of Molecules to Man has been successful because of its aims and ideas. The students are more enthusiastic than they ever have been before. More are interested in an advanced biology program than previously. The course then has proved successful and will be extended next year to all the biology classes at West Delaware County Community School.

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Comparison of Performance of Eighth and Tenth Year Students with Concepts of General Biology

HERBERT P. BRIGHAM
Skokie, Illinois

The secondary science curriculum at the University High School in Iowa City, Iowa, is designed to include a required three year junior high sequence which consists of seventh grade chemistry/geology, eighth grade biology, and ninth grade physics/astronomy. In grades 10 through 12 there are three tracks for the various abilities. The upper track consists of chemistry, advanced biology, physics, and science seminar. The middle track consists of three single semester courses in earth science, biological science, and physical science. The lower track consists of a single year course in applied science. (Yager, 1961).

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One of the purposes of the laboratory school is to experiment with curriculum design. Since the present curriculum has evolved with the first students in the seventh grade course in chemistry/geology progressing each year, it has been possible to compare achievement of various groups of students. This has enabled the completion of a series of studies concerned with grade placement.

Yager has reported the greater achievement of ninth grade students in general biology compared to tenth grade students. (Yager and Dessel, 1962). In another study he has shown that the retention of subject material by ninth grade students is as great as tenth grade students (Yager, 1962). These results have prompted other analyses of previous data from the past six years as well as having stimulated additional questions and comparisons with other grade levels such as grade eight. (Yager, 1963).

Establishing the changed curriculum as previously described has permitted a two year comparison of eighth and tenth year biology students. The last tenth year biology student who will not have had general biology in grade eight has now completed biology in grade ten. During each of the two years in question the same teacher was involved with the two grade levels in the same classroom with the same course outline. Different sections of eighth and tenth year students were instructed

using material which explored different levels of biology.

The purpose of this study is to collect data which will characterize differences in achievement between eighth and tenth year students in general biology. In two years two groups of eighth and tenth grade students each studied an advanced but more traditional general biology course as well as the new Blue Version of the Biological Sciences Curriculum Study (BSCS) course. (Teacher's Handbook, 1961).

Two groups of tenth grade students consisting of forty-six and twenty-five students each studied courses in conventional biology and the new BSCS biology, respectively. Paralleling these sections were two groups of eighth grade students numbering fifty-eight and fifty-six students. Each of the groups was also involved with the same two types of biology courses. The same fifty-six minute periods, the same laboratories, the same textbooks, the same laboratory experiments, the same examinations, and the same teacher were all involved with the eighth and tenth grade groups studying conventional biology. This was similarly true with the eighth and tenth grade groups which studied BSCS biology. The course was required by both groups of students. No attempt was made to section the students or to match them with any external criterion.

All students in the study were given alternate forms of the Nelson Biology Test (World Book Company) and the Cooperative Biology test .Educational Testing Service) as pre- and post-course examinations. As reported by Yager and Dessel, the Cooperative Biology Test is less desirable because of low correlations with means of pupil aptitude and Otis I.Q. scores Iowa Tests of Educational Development, and Iowa Test of Basic Skills. (Yager and Dessel, 1962). These scores were not used except for comparison with the results secured with the Nelson Biology Test. Since the second year of instruction will not be completed until June, end of the year scores for the two groups using the BSCS materials are not available. Final means were adjusted by using Otis I.Q. scores as a measure of aptitudes. An analysis of covariance was used to determine inations which are in keeping with the philosophy of science as inquiry. These are being administered nationally; norms for the examinations are available. These examinations consist of four general tests with one for use at the end of the year. The first two of these examinations have been arbitrarily selected as effective measures of achievement in the BSCS course. Class means were determined and adjusted with Otis I.Q. scores used as a measure of aptitude. An analysis of covariance was used to determine the significance of the final adjusted means between the two groups.

Examination means and growth scores for the eighth and tenth grade groups in the conventional biology courses are reported in Table 1. It is apparent that the eighth grade group displayed less growth after the year's course in biology although initially they had a higher mean than the tenth grade group. The difference in final adjusted means between groups was significant at the ninty-five per cent level of confidence.

TABLE I. Means, growth scores, and covariance adjustments of final means for eighth and tenth year students on the Nelson Biology Test.

Group	Number of Students	Initial Mean	Final Mean	Growth Score	Adjustment	Adjusted Final Mean
8	58	31.31	41.14	9.83	+1.62	42,76
10	46	29.70	44.69	14.99	-1.17	43,52

Table 2 reports the difference be-

tween eighth and tenth grade groups on the two BSCS examinations. It can readily be seen that the tenth grade group achieved more, as evidenced by both examinations, than the eighth grade group. Again the difference in final means proved significant at the ninty-five percent level of confidence.

TABLE 2. Means and covariance adjustments of means for eighth and tenth year students on the Biological Sciences Curriculum Study Tests.

Group	Number of Students	Observed Means Test 1	Observed Means Test 2	Adjustment	Adjusted Means Test 1	Adjusted Means Test 2
8	56	14.03	12.59	+.274	14.304	12,864
10	25	16.72	15.88	-1.253	15.467	14,627

In addition to these results, teachers report that the performance of eighth grade students compares favorably with that of tenth grade students on recall examinations concerning the descriptive aspects of biology. The level of comprehension is somewhat more sophisticated for the tenth grade group, especially concerning more abstract phases of courses. This was particularly true of the BSS course which requires more understanding of the abstract.

Teachers report that in many respects the eighth grade students are more enthusiastic in their approach to biology. More eighth grade students request added assignments with respect to special projects, assistance with laboratory setups, and suggestions for continuation of certain classroom laboratories during other than regular school hours. Tenth grade students have been more active in the use of special references suggested in the text or by the teachers.

As would be expected the tenth grade students achieve more than the typical eighth grade student who is two years younger. There appears to be little difference between the performance of eighth and tenth grade students whether a conventional biology course or the BSCS course is used. Although the tenth grade students achieve significantly more than eighth grade students, the fact that the eighth grade students achieve in a degree which compares favorably to tenth grade students at University Schools and others throughout the nation, there seems to be justification for comprehensive biology instruction at the eighth grade level. There are many tenth grade students who fall below the eighth grade mean. Contrastingly there are many eighth grade students who compare favorably with above average tenth grade students.

If students who completed a year's course in biology at grade eight were to complete another year of biology at grade eleven, it is anticipated that this high school graduate would possess a high degree of awareness of the nature of biology and much of what comprises it. It would be hoped that following this comprehensive experience with biology as many as eighty percent of the high school students would elect a second course during the upper three grades of their secondary education. This figure compares favorably with the number of students who complete biology in tenth grade currently. This would mean that some students would graduate from high school completing biology only in grade eight. There are now students who graduate from high school with no biology in grades seven through twelve except for a few units in a general science course. An improvement in biology education could be expected for students completing a one year eighth grade course as well as a more advanced eleventh grade course.

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How do you get student help in the lab? . . .

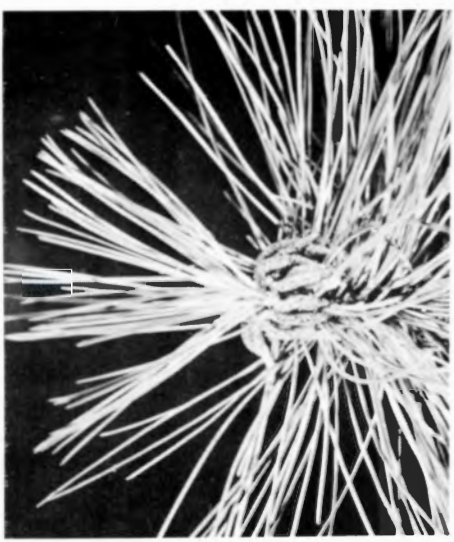
With the increased emphasis on laboratory work, one of the teacher's big problems is finding enough time to make the necessary preparations. Student assistants can be a big help. Some schools pay student assistants, but many teachers must devise a plan that doesn't involve money. Prestige is the secret.

One plan allows the superior students to substitute laboratory preparations for some of the regular work. Another plan makes use of students who have already completed the course, but who are still vitally interested in biology and like its laboratory aspects. One student assistant should be scheduled for each class.

"Give your assistant a lab coat for prestige," remarked one teacher, "and he'll work as hard as you do!"

One of Our Christmas Conifers

A native of Europe and Western Asia, Austria pine has been cultivated for many years in the United States as an ornamental, having been introduced as early as 1759. The symmetrical stout, spreading branches and thickly set, dark green needles of a well-developed tree make a handsome appearance. In its native habitat Austrian pine attains a height of 100 to 150 feet with a trunk diameter up to six feet. In the United States, however, trees more than 50 feet tall are exceptional.



The male or pollen-bearing flowers, in clusters of three to 10 or sometimes more are borne on the lower half of the branchlets of the current year's growth. The female flowers, bright red in color, occur singly or in two's or three's at the top of the young branchlets. They develop into small, globular cones, which ripen at the end of the second year.