

1964

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Recommended Citation

Krohn, Milbert (1964) "Spirit Lake High School Junior Research Program: A Course of Study," *Iowa Science Teachers Journal*: Vol. 2 : No. 1 , Article 6.

Available at: <https://scholarworks.uni.edu/istj/vol2/iss1/6>

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proves the quality of high school science education.

Biology then will be offered to the 10th grade students. The blue BSCS biology will be for college bound students and human biology for the terminal student. Here again the terminal student has more interest in himself than anything else. This would be a simplified physiology-health course with information the student could use for his own benefit. He has studied ecology, earth science, chemistry, physics and has a fairly good understanding of himself at this point.

The college bound student then would continue with the science program taking chemistry in the 11th grade and physics in the 12th grade. These two courses are aligned

like this to enable the physics student an additional year of mathematics before he or she takes the course.

Presently, advanced biology is offered to 10th, 11th, and 12th grade students who have a "B" average in general biology. The BSCS block program is utilized in this particular program. Advanced study is also included in the areas of plant physiology, space biology, and radiation biology.

In conclusion, I find that my plan is only a step in the right direction. It is by no means the final end product for a permanent science curriculum. It must be enlarged each year as well as re-evaluated at the end of each year. Over a period of time then a very workable plan will be developed for the betterment of science education in the local school system.

Spirit Lake High School Junior Research Program: A Course of Study

MILBERT KROHN

Spirit Lake

To begin with, I had felt that the time had come in the curriculum development of Spirit Lake High



Krohn

School to offer some further incentive to the science talented student to go beyond the regular offering of the curriculum, and to engage in activities which would teach him more of the true essence of science than he

could receive in the regular classroom procedures—at least to approach it in a different way. A chance should be provided for the youngster to feel and do science in a setting that is not garnished with 55 minute periods, lab partners to satisfy, or test questions and answers to be prepared.

The course to be developed as a result of this thinking is to be called the

Junior Research Program. The basic idea of the program is to engage the help of outside professionals to guide and direct the talented youngster in the pursuit of the solution of a problem. Generally speaking, the classroom for the youngster might be the laboratory of the local medical clinic, the workshop of the local electronics man, the aquarium of the state fish hatchery, the laboratory of the chemist at the local manufacturing plant and so on . . .

several years ago when it was recognized that, unless the staff of the high school was large and the training of the individuals such that a specialist in each field was available, it was an impossibility to supply a fund of technical knowledge that would suit the needs and meet the interests of all the science talented students who might be interested in doing research work. It was further recognized that there was a vast reservoir of technical and scientific talent in the community that



Kenneth Bedell is working on an infra-red spectrometer under the direction of Dr. Ray Worthen, head chemist for Berkley & Company of Spirit Lake. He is working on a problem of synthesizing some polymers by oxidation-reduction methods. He has attended a summer science institute and is now hard at work in the laboratory at Berkley's. This is his second year in the program.

We see Paul Bryan working in his laboratory that he has set up in his basement at home. Paul is working with bacteria. His problem involves staphylococcus. He is doing some ecology studies. His supervisor is Dr. Eugene Johnson of the local medical center.



was not being tapped and utilized for purposes of inciting to riot the appetites for research-type thought in the science talented. The local professionals were contacted and asked if they wished or would consent to help us in producing a course for the science talented youngsters which would let them get their feet wet in studying basic problems of science and let them use their own design in solving problems. Medical men, veterinarians, engineers, dentists, electronics technicians, and biologists were contacted and asked their feelings. They unanimously felt that it would be a good

idea and wished to indicate a desire to help. The Spirit Lake Science Department and the Administration like to think of this as a team approach to teaching.

Having received the encouragement from the local men, it was necessary to further decide on the requirements of the course and to be cognizant of the fact that the pedagogical and methodological aspect of the course must be in the hands of the school authorities at all times. The basic philosophy being, at the risk of being redundant, that the people outside the school supply only technical knowledge and as-

sistance with the mechanics of setting up the project (such as use of facilities and acquisition of skill).

These are the basic ideas of the course:

1. It is to be made available to entering juniors only. They will enter the program after finishing a sophomore physical science program.

2. It will be available to only the top 10% of the sophomore science students and then only to those who pass a screening by the administration, the guidance director and the science faculty.

3. Students selected will undergo a briefing period of two weeks during which time they will be informed of the essence of the program; the work required and the possibilities of success as well as failure. This will come at the end of the sophomore year. This will give the student time to think about it and to definitely decide on enrollment beginning the junior year.

4. The course will run two years. This means that the student will select a problem of sufficient magnitude so that he may spend an extended period of time working on its solution.

5. Once the student is enrolled, he will select a counselor from the professionals of the community. They will meet together along with the head of the science department and discuss problems that might be considered.

6. Once the student selects a problem, he must submit, within six weeks, a preliminary plan of attack. In the plan, (it might be called an abstract) he must state his problem clearly; he must state what he plans to do to solve it; he must state what equipment he will need; he must give reasonable indication of how he intends to acquire knowledge to pursue his subject; he must state where he intends to work on the problem; he must list the possible shortcomings that he may meet; he must suggest what practical applications he feels his work will have for himself and for people in general.

7. The paper submitted in item 6 will be carefully surveyed by the head of the science staff. The advisor will also give his comment on the paper. If, at this time, either of them feel the student has not fulfilled his obligation in completing this phase of the program, he will be dropped from the program.

8. The student must keep a complete log of his work. After the initial paper is submitted and approved, he must report at a designated time to his supervisor to discuss his work. Once a month has been tentatively set as the minimum number of times to report. The supervisor will submit

a written report to the head of the science department concerning the conference he has had with the student. This report will be brief in nature and indicate only whether the student is showing the technical competency and progress in this scope.

9. At the end of each quarter of the school year, a session will be held with the student by the head of the science department. If, at this time it is felt that the student has not made sufficient progress, he will be dropped.

10. Continuing surveillance of the work being done is an important aspect of this program. It will be up to the instructor to best decide how this may be accomplished. Many times it is worth while to let the student make mistakes and learn this way. Scientific methods are of supreme importance. If errors are made while performing with this technique it will be because of miscalculation, not because of poor quality of work. Failure of this type is necessary to achieve success.

11. The student will submit to the head of the science department at the end of the first semester of his senior year, an outline of his work to that date and suggestions as to what the outcome will be. After consultation, he will finalize this paper into a report to be submitted to a symposium of local professionals who will pass on its validity and quality. If they judge the work to be of worth, the student will be given credit for the course. (One semester) If the student cannot successfully complete the work, he will not be given any academic credit. Even though he had been involved for two years.)

12. No more than two students will be assigned to any one advisor.

13. It is expected that no more than three or four students will be in the program from any one class. This would make, at the most, eight students.

14. The time spent on this program would far exceed the time spent in the conventional classroom. The work would be done outside the school and on the student's own time. This does not mean that he could not be involved in this during school hours if it necessitated doing so. This would not be necessarily encouraged, however.

15. It is important to emphasize that no credit is due by enrollment only. Completion of a satisfactory study is an absolute necessity.

16. Evaluation will be on a continuing basis and all specific permanent evaluation will be conducted by school staff; primarily the science instructor. Also, the students who are involved in this program will be closely followed throughout high school and after graduation. They will be surveyed constantly to see if there is any change in

their general attitude towards the rest of their high school work, and to see if they enter into science related fields; to find out if they do as well or better in college science courses than students who were not involved in this program.

We are talking about a program of science that involves performance and creative art. We are not concerned at this point with our basic program of technical and mechanical know how. We have this well under way. Our need is for stimulation of talent to perform beyond the boundary of the classroom. This is how the scientist

buds and blooms. We need not worry to a large degree whether the student will get or not get a great deal of substance from this work. Those who cannot, will not . . . ; those who care not, will not . . . ; those who wish to know and will pay the price will benefit beyond words.

The experience gained in working to produce people who are interested in science has shown that there are few who can work independently. Those who can, will, and are eager to do so without constant surveillance. We wish to offer these youngsters their chance.

APP Science in Davenport

WARREN CLASSON

Davenport

Advanced Placement Program Biology was introduced at our Davenport Central High School last fall. This course, taught at a college freshman level, is designed to correlate with the APP operated by the College Entrance Examination Board.

The introduction of this course into our secondary science curriculum represents the culmination of a plan originated several years ago to meet the special needs in science of our capable students. In the fall of 1960 we made biology available to selected ninth grade students in one junior high school, and in 1961 this program for selected students was placed in operation at all of our junior high schools. During succeeding years many of these students have progressed through chemistry and physics a year earlier than the "typical" student. Each student's records and capabilities were carefully evaluated before he registered for each course in the sequence. If experience with the student merited it, he was encouraged to progress in the accelerated sequence. In a case where potential and student achievement were not compatible, the student was counseled relative to making modifications in his program which would better fit his needs. Prior



APP Science Students at Davenport

to the student's registration in APP Biology, his records were again carefully evaluated; and he was invited to apply for enrollment.

Mr. Frank Gorshe, Central High School Science Department Head, was given the responsibility for developing the course and was allowed time with pay during the summer of 1963 for this purpose. The Coordinator of Science obtained freshman biology courses of study from colleges and universities and APP courses of study from high schools to build a resource of content and ideas from which Mr. Gorshe could draw. In addition, the suggested course description published by the College Entrance Examination