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Developing a Science Curriculum in a Small School

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Developing a workable curriculum for a school with a total enrollment of 607, kindergarten through twelvth grade, is not quite as easy as it might seem. Bigger schools have a better systematized core program than most small schools.

Fleagle

The revisions that have to be made must:

1. Meet the demands brought about by the teaching of BSCS courses.
2. Eliminate as much duplication from grade to grade with a unified program stating which units are taught at each level.
3. Coincide the number of classes with the number of teaching personnel presently on the staff.
4. Encompass a full range of contemporary knowledge and ideas.
5. Enlighten the teachers on what is expected, so distortion of the material will not occur.

A detailed study was made of each grade's science scope as presently taught in the Hudson public schools. This was done in order to point out our weaknesses in each area as well as what duplications we now have. The results were as expected. The teachers really had no idea of what concepts were being taught even in their own grade. The results are as follows:

Grade	Biology	Astronomy	Geology	Physics
Kindergarten	Leaf coloration Feeding animals Care of pets		Show & tell rocks	
One	Trees Insects	Air and atmosphere Seasons, day and night Moon, stars & sun	Earth	Matter & energy Machines
Two	Trees Insects Birds Seeds	Water and Evaporation Seasons		Airplanes Electricity Magnets
Three	Plants Animals	Earth Universe	Earth	Machines Energy
Four	Classes of plants Classes of animals	Universe	Land changes	Friction Magnets Energy
Five	Evergreens Animal groupings	Atmosphere Climate Space	Solid part of earth	
Six	Microscopic plants Conservation	Atmosphere Climate		Air travel Machines Kinds of energy Electricity

Grade	Biology	Astronomy	Geology	Physics
Seven	Iowa trees & weeds Conservation	Water Air	Rocks & soils	Fire Machines Electricity
Eight		Weather Earth in space		Electricity Intro. to Physics (3 weeks) Intro. to chem. (3 weeks) Psychology (3 weeks)

The following have a course of study published in the annual report to the board and therefore is not listed at this point in units:

Ninth	BSCS Biology (Blue)	Earth Science
Tenth	Advanced Biology Gen. Biology	
Eleventh	Advanced Biology	Intro. to Chem.
Twelvth	Advanced Biology	Intro. to Physics

It should be noted that according to concepts now being presented that they are much too general and vague. In order for a more unified curriculum it was decided that new concepts must be developed especially for grades K-8. Book publishers were notified for samples of their textbooks as it was felt that textbook recommendations should be made at the same time. While waiting for textbooks to arrive, a list of concepts were developed to better enable one in selecting a text.

Two elementary teachers were called in as consultants to go over the list of concepts and to help evaluate the textbooks. The series which we felt was best for our particular interest was the Row, Peterson series. It is a new series organized in such a way to be of interest to students and above all to be teachable by the teacher. The series also eliminated the duplication that is now present.

These concepts were divided into biology, astronomy, chemistry, physics and earth science. Each concept for each grade was then placed on a scroll to enable us to get an overall view of our science program in the elementary grades. This also enabled us to work on individual units for the proper sequence. The concepts were organized into the following unit titles:

Grade:

One
1. Sound Around Us
2. Magnets and Battery Electricity
3. Wheels and Their Uses
4. Sources of Light and Color
5. Developing a Scientific Attitude

Two
1. Work of a Scientist
2. The Seasons and the Effects On Plants and Animals
3. How Plants Grow
4. How Animals Grow
5. Formation of Soil
6. What Is Heat and Its Sources
7. The Nature of Sound
8. Gases and their Lifting Power
9. Effects of the Rotation of the Earth On Time
10. Simple Machines and Work
11. Ears, Eyes and Nose

Three
1. Experiments Completed by Scientists
2. Properties of Air
3. Fire and How To Control It
4. Plants and Animals Living Together on Land
5. Plants and Animals Living Together in Water
6. Space Ship Travel
7. The Simple Machine: The Pulley
8. Insects and their Collection
9. The Purpose and Function of the Skin
10. Fair Weather; Stormy Weather
11. The Noises We Make and How

Four
1. Scientific Method
2. Growing of Plants and Animals on the Desert
3. Microorganisms, Bacteria, Molds and Fungi
4. The Stars and Why They Seem To Move
5. Rocks We Can Find
6. Life Where It Is Cold
7. What is Electricity?
8. Gravity and the Airplane
9. The Effects of Exercise on Our Bodies
10. Plants and Animals on the Seashore

Five
1. Heat As a Form of Energy
2. The Milky Way and Our Solar System
3. Developing Bernoulli's Principle
4. The Parts of the Earth
5. Types of Engines and Motion
6. Changes Brought about by Seasons
7. Food and Growth
8. Manufacturing of Food in Plants
9. Simple Machines and their Functions
10. Communications, Today and Yesterday
11. The Atom and Its Parts

Six
1. Conservation
2. The Function of the Nervous System
3. The Atmosphere
4. Introduction to the Anatomy of Man
5. Magnetism
6. Animal Growth and Development
7. Satellites and Space Travel
8. Light and Energy
9. Chemical Composition

These units are not too specific but do limit what is to be taught in what grade. The concepts developed are not listed at this point so a more overall view of the program may be seen. The next area of study was concentrated in the area of junior high science. It was very evident that this area was and is not meeting the demands placed upon it by high school science courses. Students are inadequately prepared for most high school science classes.

It is in this area that much distortion from any schematic order of presentation exists. The distortion even goes so far to include a unit on psychology. This unit basically includes aptitude tests as well as one day on extra-sensory perception. It is felt that this unit is of little value in the overall betterment of the science curriculum. There are other areas of distortion, but this seemed to be the major one.

It is with the belief that biological science is emphasized in the elementary grades that ecological biology has been placed on the seventh grade level. The students are not inhibited at this age to collect material from nature. This would be in terms of pond sampling, insect collecting and the like. The book selected for this new course is **Basic Life Science,** published by Singer in 1964.

Earth science is an area which has been slighted. It is presently being taught to the lower sections of the ninth grade. The high ability students then by-pass the course to take BSCS biology. It is felt that earth science should be in the eighth grade to broaden the scope of the students' background. The textbook used would be the same one used by ninth graders now. The book, **Basic Earth Science,** published by Singer in 1964, should not be overlooked, as it is a very good text.

The past year I have taught the Blue version BSCS to the top ninth grade section. It has presented problems in presentation. Some of the problems are the students:

1. Inability to grasp chemical concepts
2. Inability to grasp energy concepts
3. Inability to do much in any form of critical thinking
4. Inability to do constructive laboratory experiments

To overcome some of these difficulties, the BSCS biology is going to be moved back to 10th grade. In place of biology on the ninth grade level, a new course comes into being called "Introduction of Chemistry and Physics". Notice the title is being somewhat specific and not as general as saying physical science or worse yet—general science. The textbook selected for this course will be **Basic Physical Science,** published by Singer in 1964.

The name was picked to enable any new teacher into the system to know what is being taught. This course then will give more background for the high school classes. It will be of interest to find out if this actually im-

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 psysiology, 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

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

Krohn

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