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VOCATIONAL AGRICULTURE SUPPORTS SCIENCE

by

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Agriculture is a biological science. It is a universal expression and application of biology, the science that deals with the study of plant and animal life. The Latin word "agricultura" is a combination of "ager" (field) and "cultura" (cultivation). It is the art and science of cultivating the soil and producing crops and livestock. The production of crops and livestock is biology in action. Webster's college dictionary uses the word "science" in its definition of agriculture. In cold fact, the art or science of survival and the level of living attained by any people depend finally on the biological science of agriculture (agricultura).

One may safely assume, on the basis of even a casual survey, that food and fiber are basic to many of the critical problems facing Minnesota, the United States, and the world. This supports the hypothesis that agriculture is a subject of high priority in our public schools. What is more important than an understanding of the source, production, distribution, and utilization of the basic ingredients of any standard of living? Spiritual, moral, and ethical values cannot be separated from the facts of living in our time. My colleagues and fellow agricultural educators in vocational agriculture may have failed to make the point clear, but this does not change the fact that agriculture is a biological science of fundamental import that should be included in our secondary school curriculums.

Where should these lessons begin? They should begin as early as possible in primary and secondary education. Students should be exposed to as much mathematics, biology, and agriculture as it is possible to schedule in the high school program.

There are many reasons why the study of agriculture, biology, and mathematics is important in our schools. One very practical reason is that the future of high school students is unpredictable in large degree. A certain percentage will find a place in farming. Some will become research scientists. Others will go into an agricultural business. Many will accept the challenge of agricultural education and become community leaders. Whatever the case, the study of mathematics, biology, and agriculture in high school increases the chance of success. Agriculture today is more than farming. It is a science and a business. Indeed, it has always been so. Approximately twenty-five percent (25%) of the population of the United States is engaged in agriculture and farm-based occupations, such as food processing, farm chemicals, teaching, and research. Approximately forty percent (40%) of the total employment in Minnesota falls into this area. The opportunities in agriculture are numerous and diverse, covering every facet of human life.

Consider the specialized fields of study in agriculture. Scholars in agricultural research must study botany, zoology, chemistry, genetics, microbiology, radiobiology, mathematics, physics, and statistics. Mathematics, for example, is as essential to the understanding and interpretation of agricultural science as it is to any other science.

Agricultural Engineering

Farm machines are designed and built by agricultural engineers, but the machines harvest and handle biological entities. They must be designed with agricultural phenomena in mind. A sugar beet harvester must be built

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to harvest beets of different sizes and it tops beets that have different ways of growing their leaves. Crop dryers must be designed to dry a variety of crops that have various drying characteristics. All of this applies biological and mathematical phenomena in a strictly agricultural framework.

Agricultural Economics

An agricultural economist, as the name suggests, should be conversant with the vagaries and verities of economic laws and principles as they function in agriculture. He should be proficient in mathematics in order to treat the data he gathers from agricultural (biological) phenomena. One function of agricultural economics is to project plans and policies that are basically biological although they accumulate political overtones. It will stand an agricultural economist in good stead to have a thorough understanding of the practical aspects of farming and the biological phenomena he is analyzing. Vocational agriculture in the high school program will provide invaluable background and preparation for this very important field. The basic problem of farming is management which, in essence, is the adjustment of biological factors to changing economic conditions.

Rural Sociology

The rural sociologist studies the behavior of people in a rural society such as we have in Minnesota, the Midwest, and most of the world. The human subject is a biological entity. His behavior, and the causal factors thereof, might well be better understood if the sociologist knows something about genetics, physiology, and biochemistry and their functions in conditioning human behavior. But all of the knowledge in the universe remains academic unless the application meets the prerequisite of intimate and pragmatic union with reality. This is a contribution vocational agriculture can and does make.

And Other Specialties

Specialists in agricultural botany, agronomy, horticulture, soils, plant pathology, forestry, livestock, biochemistry, and all of the biological sciences have much in common. If they understand basic biology and mathematics and can relate them to practical agriculture, they are better equipped to interpret the phenomena that are common to all areas. The scientist with a vocational agriculture background may properly be expected to have a better background and find it easier to transfer his thinking from one area to another. For example, an agricultural scientist of any special field who has a knowledge of basic genetics should have less difficulty understanding the inheritance of characteristics of any living organism whether it be animal, plant, bacterium, or fungus. The study of agriculture in high school will help open the doors to these aspects of agricultural science. Radiobiology is a field which illustrates another application of certain of the sciences in mathematics and biology to agriculture. Radiobiology is an area of science grown to a significance far beyond anything dreamed of only a decade ago. It is now one of the important tools in solving farming problems. This science embraces a marvelous combination of biology, physics, and mathematics and is enhanced by a background of agriculture at the secondary school level.

Any scholar in agricultural research or teaching at any level must study botany, zoology, inorganic and organic chemistry, genetics, mathematics, physics, statistics, and soil science. Without a working knowledge in these fields the application of economic principles basic to sound management becomes sterile.

In Summary

It would appear to be in the best interests of all individuals concerned, to provide maximum opportunity for high school students to study agriculture, biology, chemistry, physics, and mathematics during their high school careers. Anyone who pursues an agricultural vocation in farming, business, research, or teaching will apply scientific principles every day. No matter what a student may do, he will surely be confronted with things scientific. Thus it may be said that the common good is best served if all those responsible for planning education in Minnesota orient their thinking with these principles in mind. In this venture vocational agriculture in the high schools must assume a responsible role. It can contribute much to unlocking the secrets of science in the future of agriculture.

Paul Marvin Joins Ag Ed Staff

The Visitor notes with pleasure that Mr. R. Paul Marvin has joined the staff of the Department of Agricultural Education at the University of Minnesota with a rank of Instructor. Mr. Marvin previously was on the staff of the Department of Agricultural Engineering. Prior to coming to the University of Minnesota, Mr. Marvin taught agriculture in the high schools at Faribault and Hastings, Minnesota. His experience also includes teaching in the elementary schools. Mr. Marvin served as navigator in the Air Force during World War II and completed his training in agricultural education for the Bachelor of Science degree in 1948 and the Master of Science degree in 1957.

Mr. Marvin will assume responsibility for teaching, research, and developing materials of instruction with major emphasis in the adult education area. He will work closely with the area vocational schools and the regional analysis centers in support of the Minnesota Vo-Ag Farm Management Program. *The Visitor* welcomes Mr. Marvin to the staff and wishes him success and good fortune in years ahead.

THE MYTH OF THE "SOLIDS"

by

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For several hundred years now, a surprisingly large number of people have worshiped at the shrine of a venerable educational assumption. Assumptions have a way of being taken for fact if they survive over a long period of time. This seems to be the case with the myth of the so-called solids in education. Devotees of this mystic myth have rather blindly accepted the dogma that the "solids" of mathematics are endowed with some unique mysterious attribute which enables people to think, reason, and solve problems. In the process of this myopic acceptance, worshipers of the mystic myth have ignored the inescapable fact that many many other types of educational training are capable of training minds to rationalize and solve problems. Some of the greatest problem solvers of all times have managed to be surprisingly competent in using mental processes which have enabled the world to be a better place in which to live. They were not remarkably handicapped by missing the mythology of the "solids." Neither Abraham Lincoln, Benjamin Franklin, Shakespeare, Cervantes, Beethoven, nor Thomas Edison qualifies as being adequately educated under the criteria of the "solids" proponents. One of the greatest engineers of our times, Charles W. Kettering, had absolutely no patience with the mind so disciplined by the irrefutability of the known that it feared to step boldly into an area of new concepts where the values were not so precise as they are in a known mathematical formula.

The processes which enable a learner to solve a complex problem in human relationships involve logic, reasoning, evaluation, perspective, application, and testing. These same processes are also applicable to solving a mathematical equation. This does not mean that proficiency in mathematical computations is necessary before the learner may solve a complex social problem. It may mean that he can solve the complex mathematical problem more quickly as a result of having had experience in application of these processes to some other type of problem.

The amazing thing about the proponents of the absolute virtues of "solid" mythology is that they almost invariably close their minds to any other possibility. The true disciple of the "solid" principles of problem solving always admits to a belief that something is not yet known—something beyond the horizons of human knowledge which could make his present values invalid. In a sense this represents the true scientific mind.

The real truth of the matter is that no subject matter area possesses an inborn mysterious characteristic which trains minds to rationalize and solve problems. No subject is any more solid than its instructor is capable. Given a mediocre mathematics teacher and a good civics teacher, the civics course will be the "solid" course. Given a good mathematics teacher and a good literature teacher, the good student will likely develop more life-applied concepts and abilities in the literature course than in the mathematics course. The disciplines are no greater in one than in the other.

Proponents of the "solids" school might be surprised at how very few advanced mathematical problems there are to work in life situations by those who do not make their livings in a field where applied mathematics is constantly utilized. By like token they might be exceedingly surprised to find that the processes whereby most problems are solved are not necessarily always those applicable to mathematics. The principles of problem solving used in mathematics were not even originated in mathematics. They were discovered through the centuries of non-mathematic human experience and gradually applied to mathematics. These principles are also inherent in almost all of the mental processes necessary in any subject and can be learned as readily in other subjects as they may be learned in mathematics.

A good mind will make any subject "solid," but there is no mysterious alchemy in any subject that will transfigure the mediocre mind. There is no mental discipline inherent in the mathematic "solid" that cannot be gained in English grammar, civics, a book of Emerson's essays, or a mechanics manual on the working of the automatic transmission.

Searching curiosity may be given credit for most of the great developments of this world. The subject is truly solid which stimulates a permanency of curiousness. The tools necessary to satisfy this seeking hunger are found in many many subject areas. It cannot be said that a course in calculus would necessarily engender more curiosity than a good course in microbiology. Nor can it be effectively argued that the means of satisfying that curiosity are any more inherent in solid geometry than they are in the natural sciences or history.

Subject matter serves only two purposes—use and enrichment. The enrichment gained from any subject is truly enhanced when it is also usable to the individual who acquires it. Without use, enrichment quickly fades. The "solid" purist argues that the principles learned in an arduous mathematics course enrich because problem solving knowledge and disciplines gained are always applied or used. Again our mythology worshiper makes the assumption that these principles were invented with mathematics and that they exist in no other area.

The true problem solver is curious. He is not complacent about the efficacy of formulae no matter how well they work in a known situation. He does not restrict the flight of his mind to the barriers imposed by accepted verities. He does not believe that all problems now present or those to come will succumb or respond to known values and formulae. He has little respect for discipline for discipline's sake alone. He believes that the ends of discipline are neither self-contained nor a product in themselves. He is truly fascinated by the unknown values of life. He is curious and he seeks. He accepts mental regimentation as an orderly component of system, but does not worship it as inherently good.

These things were old before the science of mathematics was born.