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The Problem Solving Approach to Teaching: Has It Outlived Its Usefulness?

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During World War II the British were afraid that Germany might cross the English Channel and invade Britain. The British defenses guarding the English coast were weak. In an effort to make the British defenses appear more formidable, old horse drawn artillery pieces were removed from storage and put into service. At night, these artillery pieces were pulled by trucks along the coast and were periodically fired. Five men were required to fire each gun. The British were displeased with the amount of time required to fire these guns. A time efficiency expert was brought in to see if the firing rate could be improved. After photographing each crew in operation, the expert was curious as to why two men came to attention before the firing of each gun and remained that way for several seconds after the gun was fired. Upon investigation it was learned this procedure had been taught to the men in their training. No one had ever questioned why they were doing it - they had always done it that way. Finally a retired calvary officer provided the answer - when the artillery pieces were horse drawn, two men had to hold the horses during the firing of the gun. Even though the guns were no longer horse drawn, the training of the soldiers remained the same; they were still holding the horses. The moral of this story should be clear - from time to time we need to evaluate what we are doing. We shouldn't adhere blindly to the past without carefully evaluating what we are doing and why we are doing it. And now a few words about the problem solving approach to teaching.

For years the problem solving approach to teaching has been espoused as THE way to teach vocational agriculture. Generation after generation of agricultural educators have been exposed to the gospel of problem-solving. Few have ever questioned this "traditional wisdom" and those who do so may be viewed as being heretics. At the risk of being cast out of the profession these writers would respectfully suggest that we carefully and thoughtfully examine the problem solving approach to teaching. Perhaps we will discover that problem solving has indeed outlived its usefulness as THE approach to teaching vocational agriculture.

In the Beginning - The Problem Solving Approach

Early education in America was characterized by teacher/authority centered teaching. The Puritans and other early settlers organized schools in which students were taught primarily through memorization and rote drills. The primary text was *The New England*

Primer which is described by Frost (1966, p. 261), "There was no happiness, no joy, no love of life in the first reader for New England children. They are pictured as sinners who must be on watch every minute, lest they doom themselves to eternal damnation." Each student sat quietly at his/her desk and did exactly as he or she was told. The child was passive and the teacher was definitely in control.

During the late 1800's and early 1900's a new philosophy of teaching began to emerge. Memorization and drill was still popular but the progressive educational movement characterized by the work of Dewey was gaining wide acceptance. Dewey believed the child should be more actively involved in selecting what should be learned and should be allowed to learn through what was called the problem solving approach (Dworkin, 1959).

The problem solving approach advocated by Dewey consisted of five steps which required the student to: (a) recognize a problem; (b) define the problem; (c) offer many possible solutions; (d) test the hypotheses; and (e) verify the final conclusion (Colman, 1967, p. 112). This approach to teaching was welcomed by many as more humane and a more enlightened way to teach. America was entering a new century and this new approach to teaching was viewed favorably. The time was right.

During the early part of this century high school programs of vocational agriculture were becoming common in schools in many states. The Smith-Hughes Act in 1917 legitimized the profession and allowed states to start teacher preparation programs in agricultural education. Since the profession was in its infancy the first professors hired to prepare vocational agriculture teachers were often trained as "traditional academic" educators. Since Dewey was at his prime during this period of time and the educators charged with providing leadership to agricultural education were products of the Dewey era it was virtually assured that the philosophy of Dewey, including the problem approach, would permeate the foundations of vocational agriculture. This point is illustrated by Wiseman (1930, p. 7) in the second volume of *The Agricultural Education Magazine*. The first sentence in his article reads, "Doubtless most vocational agriculture instructors have a rather firm faith in the 'problem method' . . ."

However, not all agricultural educators shared Wiseman's "firm faith" in problem solving. There was some concern and disagreement in the early days of our profession about the adoption of problem solving. Alexander (1929, p. 5) writes, ". . . there are three rather clearly defined schools of thought among teacher trainers in agricultural education as to what are acceptable methods of teaching in vocational agriculture. These schools of thought may be indicated roughly as: 1. Teaching by means of enterprise and job analysis. 2. Teaching by means of the so-called problem method; and 3. Teaching by means of a combination of the above named two." Even though there are different schools of thought, problem solving emerged as the primary vehicle for teaching vocational agriculture.

A Critical Look at Problem Solving

It is our view that the adoption of the problem solving approach to teaching in vocational agriculture occurred primarily as a historical accident. If vocational agriculture had not come into existence during the peak of Dewey's career our profession would probably not have embraced problem solving so readily. If vocational agriculture had emerged at some other point in time the "method of that time" may well have been the hallmark of vocational agriculture today. Let us take a critical look at problem solving.

What is the Basis for the Problem Method in Vocational Agriculture?

The primary basis for the problem solving approach to teaching appears to be philosophical. The writings of Dewey, Kilpatrick, Comenius, Rousseau, and Pestalozzi all support the problem approach to teaching. However, there appears to be virtually no research base to support the problem solving approach to teaching. We were amazed as we delved into the literature of problem solving in search of empirical evidence to show the superiority of the problem solving approach to teaching. Little evidence was found.

Crunkilton and Krebs (1982, pp. 55-67) reviewed several studies "related" to problem solving in *Teaching Agriculture Through Problem Solving*. The studies reviewed dealt with people putting together picture puzzles, the construction of a device to suspend two pendulums, an experimental elementary school curriculum, and the Eight-Year Study of the Progressive Education Association in thirty experimental high schools. Although it is true the first two studies dealt with how people solve problems and the other studies were concerned with an overall approach to structuring the total curriculum of schools it would be stretching the point to say these studies prove the value of the problem solving approach in the vocational agriculture classroom.

We could find only two studies actually concerned with the problem solving approach to teaching in the area of vocational agriculture. H. M. Hamlin (1922) wrote his Master's thesis on "An Adaptation of the Problem Method to High School Animal Husbandry." In this research Hamlin compared four different types of problems in teaching animal husbandry. The purpose of his research was to see which technique of problem solving was best; not to see if problem solving was better than another method.

Thompson and Tom (1957) conducted an experimental study involving 22 vocational agriculture teachers. Eleven teachers taught an instructional unit using a teacher-centered approach while 11 other teachers used a pupil-centered approach to teaching. The pupil-centered group was superior in terms of gain in content but not significantly different with respect to measures of problem solving in agriculture.

Several "related" studies were found which showed problem solving was not better and no worse than the other methods of teaching used for comparison. In the *Handbook of Research on Teaching* Wallen and Travers (1963, p. 477) reviewed several studies (including the Thompson and Tom study) concerned with the problem solving approach to teaching. Their conclusion was, "Proponents of the intellectual merits of less authoritarian procedures [methods] for the public schools have yet to ground their case on research with school children." Colman (1967, p. 117) is more blunt in his assessment of problem solving, ". . . advocates of progressive education (a much inflated and amorphous term) attempt to have one think that it [referring to problem solving] is the only way to learn. To believe that knowledge is gained only in this manner is educational fallacy."

The research available supporting problem solving as an approach to teaching in the classroom could hardly be classified as overwhelming. It is our opinion that problem solving does not have a solid empirical base of support. Our profession appears to have "bought" problem solving because of historical coincidence and philosophical leanings without questioning the true efficacy of problem solving.

Are the Basic Premises for Using Problem Solving Still Valid?

The use of problem solving in agriculture was based upon certain assumptions put forth by the pioneers in the profession. Are these assumptions still valid?

The Farming Assumption. One assumption was all the students enrolled in vocational agriculture were from the farm and wanted to be farmers. Alexander (1929, p. 3) writes, ". . . the teacher should teach his class as if every member has decided that he is to farm for a living." In Stewart's (1950) *Methods of Good Teaching*, in which the problem-solving approach to teaching is advocated, the "typical" agricultural class is defined. The teacher will find ". . . among his forty boys there are thirty who have sow and litter projects; twenty are growing corn; fifteen have poultry flock management; eight, dairy cattle management; three may be growing potatoes; six growing an acreage of soybeans, not to mention the various new practices. . ."

A person would have to be in hibernation for the past 20 years to realize the above assumptions about students are no longer valid in vocational agriculture. Many of our students do not plan to become farmers and are enrolled in speciality programs such as agricultural mechanics and horticulture. Even the students who are enrolled in production agriculture today often do not have an agricultural background. It is not uncommon in a class of 20 students to have only two or three from the farm. The changing content of vocational agriculture and the changing background of the student has serious implications on the continued reliance on problem solving as "the" teaching method. Problem solving may no longer be appropriate.

There are those who may argue that the content taught or the background of the student should not deter the use of problem solving. It might be argued that a good teacher can develop "problems" to be solved regardless of the content to be taught or the background of the students. The pioneers in our profession might not be in full agreement with this view. Lancelot (1944, p. 144) conceded that certain school subjects are more amenable to problem solving than other subjects. Stewart (1950, p. 128) describes the characteristics of a "good" problem, "It is true to life. Ideally, of course, the problem should come from the immediate needs of the members of the class . . . Problems should never be used in the abstract, impersonal form. Such a problem might be referred to as a problem without a heart." Trying to use the problem solving approach on topics which are not appropriate or trying to "create" problems will be viewed as being artifical by the students and may lead to problems for the teacher.

The SOEP Assumption. Another invalid assumption is that all students have a supervised occupational experience program which provides the foundation for the problem solving method. Phipps (1972, p. 78) states, "Good teaching in agriculture is based to a considerable extent on problems that become meaningful because of the supervised occupational experience programs of the student."

Leising (1983), Clary (1977), and others have found that many students in vocational agriculture do not have a supervised experience program. In the research conducted it has been found that about 40% of the students do not conduct an experience program in vocational agriculture in the states studied. It is educational heresy to claim that SOEP provides a basis for problem solving since many students do not have a SOEP.

A Few More Thoughts About Problem Solving

Problem solving is a sophisticated teaching procedure. It takes a good teacher to motivate students, skillfully develop the problem, help students identify possible solutions, determine the correct solutions, and arrive at approved practices. Watching a master teacher use the problem solving approach to teaching is like watching an artist at work. Many states have resorted to hiring teachers with little or no training in education. These people often undergo a crash course in teaching. They have enough trouble surviving without worrying about all the intricacies of problem solving teaching. Even the graduates of a four year teacher education program may lack in-depth knowledge of agriculture which is needed in problem solving teaching. The profession's insistence on using the problem solving approach may lead to feelings of guilt or inadequacy for new teachers who are unable to implement problem solving teaching the way it should be.

Mosston (1972, p. 166) reinforces this idea by stating "Problem solving as a teaching style requires problem solving as a learning style. This transaction creates conditions of risk for both teacher and student." Mosston identifies three levels of adjustment which have to be made by teachers and students when problem solving is used: philosophical, cognitive, and emotional. After discussing these threats Mosston concludes "These cognitive and philosophical threats or challenges often makes the teacher uncomfortable, distrustful, and, in the extreme, give a feeling of inadequacy." Is it possible the emphasis on problem solving teaching in vocational agriculture could be contributing to the high turnover of teachers? Is this contributing to the shortage of vocational agriculture teachers?

Another item to consider is the amount of time required to use the problem solving approach to teaching. While it may be desirable to have the students formulate problems and seek solutions, this is time consuming. Would the students be better served by exposing them to additional concepts, facts, skills, and knowledge in agriculture?

The emergence of computers and other new technology available to teachers and students may be replacing the traditional problem approach. When the class tries to answer the question "Which ration is best for Bill's dairy cows?" the student can input a few items into the computer and get an immediate answer (and possibly a more accurate answer). This new technology raises the question, How wise is it to doggedly pursue the approach to teaching which was prescribed for the profession 60 years ago?

Conclusions

It is time for the profession to face facts. The problem solving approach to teaching in vocational agriculture came about through historical accident. The emergence of vocational agriculture happened during the height of the progressive movement which brought with it the philosophy of problem solving. There is little empirical evidence to support the problem solving approach as the best method for teaching vocational agriculture. Several of the basic assumptions which provided the foundation for problem solving in vocational agriculture are no longer true. Problem solving is a sophisticated technique which teachers may find difficult to use. Insistence on the problem solving approach to teaching may be causing frustration for vocational agriculture teachers. It is time consuming and new technology may provide use with better alternatives.

We do not advocate throwing problem solving completely out the window as an approach to teaching. It should be viewed as one of many approaches to teaching. If the situation warrants problem solving there is nothing drastically wrong with using it, but remember, it does have limitations. Don't try to force a square peg in a round hole!

If we, as teacher educators, are serious about our roles as producers, seekers, and disseminators of knowledge then we will educate our students to use a number of different approaches to teaching. If we teach our students only one way to teach vocational agriculture, the problem solving approach, then we are being intellectually dishonest with our students.

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