

## Thinking Out Loud About This Process We Call Teaching

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Twenty years ago, I attended my first American Vocational Association Convention in Cleveland, Ohio. It seems just like yesterday, but it is not, and preparing for this presentation reminded me of the old saying, "You live your life only once. You cannot repeat it to correct the mistakes you have made." This distinguished lecture falls into that same category; I have only one chance in a lifetime and thus I hope I can at least match the quality of the previous lectures and also meet the expectations of you who are in attendance today. If I appear uneasy or nervous, it is not because this is the first time that I have appeared before you or that I don't know you. My uneasiness is related to the topic that I have selected. Before I reveal that topic, permit me to share an illustration with you.

Some years ago, I served on the Commission of Undergraduate Studies at Virginia Tech. This Commission reviews and approves all undergraduate courses for the University. Whenever a proposed course came from the College of Engineering, nobody raised any questions with the course. Who were we to question a course where we could not grasp what the course was all about, let alone pronounce the word contained in the course title, for example, Tribology. Members of the Commission, including myself, concurred with the request for these new courses because those faculty from engineering proposing the courses were the experts. But, let a proposed course in education come forth and instantly everybody on that Commission was an expert on the merits or liabilities of the course, how the course could be better structured than those who developed the course had structured it, or that the course could serve no useful purpose in an institution of higher education.

My topic this morning focuses upon an area in which all of you are experts, that is in the area of teaching. Teaching is an activity in which all of you have experience and strong beliefs and the area that serves as the central reason for you paying your professional dues to the American Association of Teacher Educators in Agriculture and being present at this breakfast. I have titled my remarks, "Thinking Out Loud About This Process We Call Teaching." I have chosen to relate my remarks to electricity in making four observations. Each part of any electrical system plays a critical role which contributes to the success of the entire system. For example, if a thoughtless hunter took a pot shot at an insulator and in the process broke one of the strands of wire in that electrical cable, that nicked wire was reduced in its capacity to perform to its potential. In other words, the amount of electricity flowing through the wire was reduced, preventing the entire system from operating at its peak efficiency. Perhaps the same could be said for our agricultural education electrical teaching system. A nick in our teaching system prevents what could have been. In the few minutes that I have, let me share four nicks related to the teaching aspects of our profession which I believe point out areas we have neglected unintentionally over the years, nicks that might prevent us or hamper our attempts to make teaching agriculture a truly professional career.

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Nick Number 1: A limited melt down at our power generating stations. I relate this to our basic research on teaching agricultural education. Your first reaction may be that we are conducting much research in agricultural education and that is true, but let's look closely at the nature of the research reported. For the last five years and not counting this year, 16 research topics of the 145 reported at National Agricultural Education Research Meetings (NAERM) were concerned directly with the teaching-learning process in agricultural education, a mere 11%. For the last five years in The Journal of the American Association of Teacher Educators in Agriculture, 14 out of 162 articles published focused upon the teaching-learning process as it applied to agricultural education, or about 9%. You may react by saying that NAERM and the journal only represent a portion of the research that is conducted, and you are correct. But the story gets worse if we go to the Summaries of Studies in Agricultural Education. Of the 800+ individual research projects and activities reported in the last five years, research that focuses directly upon the teaching-learning process in agricultural education drops to less than 5%. Now I am not saying that research on the other aspects of our program is not important. We need research on how to make the FFA better, how to improve supervised experience programs, what are the characteristics of adult farmers, and other topics. But we must realize that our clients, the teachers, spend the greatest percentage of their working time in classroom or laboratory teaching situations, the situations where they have the greatest opportunity for having the biggest impact on learning of the largest number of students. Several questions are obvious for us to consider.

1. Do we really know all there is to know about the teaching-learning process that we don't need to study it further?
2. Are we satisfied with the way our teachers are teaching?
3. Are we satisfied with the way that we, as teacher educators, teach our students or prepare them for their teaching roles?
4. Are we willing or to what degree are we willing to let non-vocational educators do our research for us in the teaching-learning area?
5. Are we willing or to what degree are we willing to accept the results of research conducted in elementary schools or in academic subjects at the secondary level as valid, applicable, or generalizable to agricultural settings?

I think that our field is different enough in course content, student characteristics, teaching-learning environments and purpose that we need to develop further a sound research base for the practice of teaching agriculture.

We need to encourage research in those areas that have been neglected and perhaps areas that are more important today, research areas that will help our teachers be better at what they do and help us (teacher educators) do our job better at preparing those teachers to do what they are supposed to do. Many of the national reform reports call for the professionalism of teaching. I am not exactly sure what that means, but I would venture a guess that for professionalism in agricultural education, we must be more exact in our standards and expected performances of our teachers and, furthermore, clearly articulate these to the educational community including our prospective and current teachers. Research is needed that focuses upon the teaching-learning environment as it applies to agricultural education. In the end, what I really propose is the development of what is called a knowledge base for

the teaching of agricultural education. Shulman (1987), in the Harvard Educational Review, suggests that the knowledge base ought to include seven categories. Perhaps we might try to use these seven as a starting point in agricultural education, and these categories may also be key elements for us to consider in charting our future once the National Study in Agricultural Education is released. The seven categories are:

1. Content knowledge;
2. General pedagogical knowledge (broad principles and strategies of classroom management);
3. Curricular knowledge (dealing with materials and program structures);
4. Pedagogical content knowledge (mixture of content and pedagogy as applied to teaching the discipline, for us, agriculture);
5. Knowledge of learners and characteristics;
6. Knowledge of educational contexts (governance of schools, community structures, and cultural settings); and
7. Knowledge of educational ends, purposes and values.

Categories 2 and 4 (referring to pedagogy and the mix of content and pedagogy) are two areas we have overlooked. This is partly due to the difficulty we have in learning to teach. Teaching is different than other professions. Medical doctors only use their discipline as a basis for practice; so do lawyers. In teaching, our teachers not only need to know the discipline of agriculture, they must also be able to explain it to others so they understand. It is this dual situation where problems develop.

Nick Number 2: Our transformers are weak. Returning to the electrical system, vast amounts of electricity flow through high-tension lines that spread across our landscape. But the electricity is in a form that is not useable to the consumer. The purpose of the transformer is to take that electricity and change it into a form so you and I can make use of it. Well, our teachers are our transformers. Their job is to take the huge amounts of information available in our society and world and transform it into a form useable by the students, whether those students are adults or youth. And to perform this complex and vitally important transformation task, individuals are needed who can think about this vast amount of information and relate it in a meaningful way to students through this process called teaching.

The act of thinking is so crucial to our success as a profession, yet it is a part in our transformers we have overlooked. Miller (1985) in an editorial in The Agricultural Education Magazine which focused upon the theme of the teacher of agriculture, made this observation of the articles printed. "Conspicuous by its absence throughout the many pages, however, is reference to the teacher as the thinker; the intelligent being." A question could be raised, "Should we at the university level be developing the ability of our students to think?" It would be difficult for any of us to argue against an affirmative answer to this question. But as we prepare our undergraduates to fulfill their roles as teachers, do we really provide the atmosphere for them to develop sound thinking habits?

Let me provide an illustration. In agricultural mechanics classes at our universities, we ask students to develop the skill of welding two

pieces of metal together. Observing the student, he/she goes through certain steps to achieve the objective, the fusion of two metals. If the student makes a mistake by omitting a step, we observe that oversight and call it to the attention of the student. In other words, we are assessing the process the student follows in joining two pieces of metal. When one considers thinking, it, too, is a process, but in teaching our undergraduates, we have a tendency to measure only the product of thinking, that is, a thought, action, or end results. Many times, these outputs might be lesson plans, sample test items, homework assignments or quizzes. We as teacher educators must not assume that measuring the product of thinking by itself also guarantees the development of the student's thinking ability. So, are we really effective in developing the thinking ability of our teachers?

Other situations where we stifle creative thinking of our teachers relate to ready-made lesson plans, Competency Based Education prepared materials and outlines, and fully-developed teaching guides. McCracken asked in his Distinguished Lecture in 1982, "Where are the listings of competencies that require prospective teachers to think and reason. . . ?" While some may argue that materials distributed to teachers assist in performing their jobs, I could also argue that the thinking needed to develop and conduct effective learning situations diminishes with the more ready-made, cookbook recipes that are provided. The more we provide to students or teachers, the less they think about their teaching and about the teaching-learning process. I am not suggesting that we reduce or reverse what we are providing for our people, but perhaps we can do more to help develop their thinking ability. For example, electricity cannot think. When it flows through the line, it follows the path of least resistance and thus transformers are so designed to force the electricity to follow a certain route. We must force our students and teachers into a thinking mode. Ideas from the literature indicate we should do the following to help promote thinking in our students. So let's ask ourselves as teacher educators these questions:

1. When was the last time you waited five seconds after asking a question before you broke the silence in the classroom?
2. When was the last time you required absolute silence in the classroom so students could give their full attention to the question or problem you posed?
3. When was the last time you asked your students to think out loud?
4. When was the last time a student answered your question and you turned to another to ask whether he or she agreed?
5. When was the last time you required all students to write down an answer to a question you just asked during class?

All of these suggestions for developing the thinking ability of students through good questioning techniques are based upon research findings. Furthermore, these are the same practices that our students should follow when they start teaching.

When reflecting upon our undergraduate courses, we have a tendency to measure only our students' thoughts, not the process by which they used to arrive at those thoughts. If the thought is wrong, where did the thinking process break down. We need to practice those activities that bring the thinking process of our students out into the open. I have tried to practice these suggestions on a regular basis. At first,

the students feel very uncomfortable. For example, I put students in separate rooms with a tape recorder where they must try to solve a problem thinking out loud. Flaws in their thinking emerge just like the obvious omission of an important step in welding. Also, many of us video tape our students. Ask why they did what they did in that mini-teaching lesson. This question will help the students focus their thinking upon themselves, and not upon those they are teaching.

Perhaps we need to do two things to help our students and teachers think. First, we must guide them in developing their thinking abilities before we ask them to write lesson plans, develop test items, take quizzes, read assignments, plan an FFA activity, teach a class, or observe a practicing teacher. Henderson (1983) concluded her article on "Professional Commitment to Cognitive Skill Development" with the statement "that critical thinking is a cognitive skill that can be directly developed by specific practices and strategies." And second, perhaps one of the most important teaching techniques we need to develop in ourselves and our students is that of questioning. Questioning is a technique that is used in conjunction with all other teaching techniques. It is the basic professional tool available to us to encourage student input, involvement, interaction, and development of critical thinking. We all are good talkers to start the interaction process, but questioning is the other half of good communications required to transform college students who are expert learners with 17 years of experience to a thinking mode needed by novice teachers with only days or weeks of teaching experience.

Nick Number 3: Termites are eating at our wooden electric poles. The electric pole serves a very important role in any electrical system. It provides a solid foundation upon which the electric lines and the transformers rest. They are rooted firmly in the ground. Perhaps we need to revise a basic belief for the preparation of teachers by accepting the premise that "learning to teach is a developmental process." McCormick (1985) hinted at this in his lecture when he said, "We must provide more assistance to our teachers in the field as they plan, deliver, and evaluate quality programs. . . ." We as a profession need to not only accept this as a position but be ready to incorporate continuing strategies to help our teachers as they teach. Individuals who complete a methods course, student teaching, or a first-year teacher's course do not, as independent activities or even in total combination, yield a fully developed teacher. Learning to teach is a developmental process that occurs over time.

Learning to teach and the act of teaching is not easy, as many of our students and the general public think. Rather, it is a very complex process. To put the teaching process into perspective, it is where A teaches B to C in context D. It is where A (the teacher), teaches B (the subject), to C (the student), in context D (the environment). We must realize that for each factor in this highly interrelated process different forces at different times are influencing these factors, and they will change given the total teaching-learning environment. The point I discussed in Nick Number 2 dealt with the thinking process in and of itself, but my point here is to expand that concept to encourage our teachers to think about the total and complex teaching-learning process. Questions we might raise with the teachers are:

1. What are they doing?
2. Why are they doing it?
3. What are their students doing?

#### 4. How is the environment influencing the effectiveness of the learning right now?

The word currently in the literature that relates to this area is metacognition or thinking about the thinking process. How well do we as teacher educators or how well do our teachers practice this thing called metacognition and, applying it to my point, how much do we as a profession think about the teaching-learning process? I would predict that we do not think enough about the teaching-learning process. For example, when you get ready to teach, you think about two major areas relating to the upcoming class. One area is the content. In other words, what do you really want the student to learn, understand or perform after the lesson is taught? And second, how are you going to teach the content? My guess is that we spend most, if not all, of our intellectual powers on determining the content and very little attention on how best we could get this information across to our students. I just identified several questions we may ask ourselves when Neely (1986) in an article in the Journal of Teacher Education identified 16 questions through research that should be asked when preparing for a class. I would also venture a prediction that the imbalance between determining content and how to teach it would be even greater for our agriculture teachers. For example, let's take a teacher's typical day, teaching X number of periods and then we find this thing called a planning period. My long standing observations and the most recent ones of this past fall would go something like this: in a 50-minute planning period, 12 students came into the office, the teacher went to the front office for 10 minutes, and three telephone calls came in. In some way, we need to convince our teachers that more of their planning periods need to be spent on thinking about their teaching. I am sure most teachers have a mental intention to give some thought to improving their teaching, but planning for teaching is such a low priority. Years of experience do not lessen the need for the teacher to give thought as to how the class could have been better.

We need to incorporate within our philosophy and practices that we must work with our students over a long period of time. Now you may notice that I said students. Two weeks ago, I was watching a TV program called "Sable" with my son. A Catholic sister on the program spoke a line that went something like this. You are always a kid as long as your parents are alive. You never consider yourself an adult until your parents are gone. I liken this to our students who are in our classes and who enter the teaching profession. Since learning to teach is a developmental process, we should always consider them as our students as long as they are actively engaged in teaching. We also need to instill in our students that learning to teach does not stop at the end of the methods course, student teaching, or the first year of teaching. They have not yet perfected what it takes to be the master teacher, for teachers should never stop the quest for knowledge, truth, or what it takes to be the best as long as they teach. There is no automatic, magical, or apex point in teaching. Each new day brings a fresh set of forces interacting within the teaching-learning process which must be dealt with again. In Houston's article in Kappan where he titled his article "Lessons for Teacher Education From Corporate Practice," he states, "In business, career long development is expected, particularly of professional employees. No one is ever considered to be fully trained."

We must somehow get our teachers to realize that continual, professional improvement in pedagogy is a part of the profession in teaching, and that they must intentionally devote part of their professional, working hours to thinking about their teaching.

And finally, teachers (including teacher educators) need to realize that at the end of any class, lesson, or unit, teachers as well as students should have learned something.

Nick Number 4: Automatic circuit breakers are not fool proof. I relate this nick to the situation where we cannot allow ourselves to think that artificial intelligence and computers lessen the need to use problem solving as an approach to teaching and of the value of teaching our students how to solve problems. You are well aware of the debate that Gary Moore and I had in The Journal of the American Association of Teacher Educators in Agriculture several years ago on problem solving. Perhaps the greatest outcome of that exercise was to bring before the profession again a teaching approach that had diminished in popularity. I believe problem solving, both as a method of teaching and as a skill that students need, is more critical today than it was years ago. Solving problems years ago when the world was simpler and without all the gadgetry placed much importance upon the human mind to arrive at solutions to problems. Today and in the future, teachers as well as all citizens will be bombarded with more and bigger computers and sources of information. What bothers me are articles like Bork's that appeared in the December 1984 issue of Kappan. He presented several sketches of school rooms in the future by using phrases such as "the computer in many cases will be the only device for delivering instruction," and "that computers will be in complete charge of determining student's learning activities." I commend many of the national reform movements which include recommendations that we must do more to develop the reasoning, critical thinking and problem solving abilities of our students.

As applied to the future of agriculture and teaching agriculture as a discipline, teachers and students will face tough problems, and computers will not solve problems. Sure, when a message flashes upon a screen, an individual could let that be an answer if he/she so desires. But that answer may not be the most appropriate. We must as educators work with our teachers to promote their problem solving techniques in the classroom. As Sternberg (1985) pointed out in his Kappan article on "Teaching Critical Thinking, Part I, Are we Making Critical Mistakes," problems defy finite parameters. Every day problems faced by our teachers and students: (a) tend to be ill-structured, (b) generally have no right solution, (c) depend upon informal knowledge as well as formal knowledge to solve, (d) often must be solved within group settings, not in isolation, and (e) can be complicated, messy, and stubbornly persistent.

These descriptions of everyday problems, whether they be problems faced by teachers in the classrooms or by individuals in private lives, imply that people must be involved in solving people problems because computers do not have hearts. Teachers as well as students must learn to think with their hearts as well as their brains. A person who thinks with his/her brain, without input from the heart, could end up with heartless thoughts or actions, and a person who thinks with his/her heart without the input of the brain could end up with mindless thoughts or actions. The brain and heart are two priceless natural resources we have to work with in our teachers, and they with their students. The often overlooked aspect of critical thinking is that thinking is to prepare one only for action, when, in fact, thinking should also prepare one for feeling.

For the last two fall quarters, I have taught a special graduate seminar on "Teaching by Problem Solving" with a total of nine students. Administrators in the audience may ask if this was a wise use of my time. But this is how I look at it. When a farmer plants a kernel of corn, if that plant reaches maturity, that farmer may receive an ear of

corn with 800 kernels, or if a kernel of wheat is planted, you may harvest 30 kernels of wheat. If I just obtain a 50% germination rate, then there are at least five more professionals who understand problem solving, its strengths and weaknesses and how it can be integrated into the educational environment. They represent five more kernels than existed previously.

In conclusion, let me review the four points made. Nick Number 1: Trouble at the source. Each of us needs to go home and write an article on what we believe is excellence in teaching agricultural education, similar to the articles in the September 1987 issue of The Agricultural Education Magazine. After you have done that, then ask yourself, "Where are the research findings in agricultural education that support my beliefs, philosophy, and practices?" Or you could do it in reverse, go to the literature first and see what you can find about effective teaching in agriculture, then write your paper. What is your knowledge base for teaching agricultural education? If you cannot find it, you and I need to do something about it.

Nick Number 2: Our transformers are weak, and we need to think about that. Perhaps the reason our transformers (teachers) are weak in the practice of critical thinking is that the designers (teacher educators) are also weak in applying thinking exercises in our curriculum. The next time you prepare for class, spend an equal amount of time thinking about how you are going to teach and how you can force students to think as you do on what you are going to teach, a one-to-one ratio. Promote that same concept to your students and teachers.

Nick Number 3: Our poles are not at full strength, and we need to give attention to this basic foundation. Learning to teach is a developmental process. Teaching does not exist as an exact science, as a perfect situation, or in a controlled environment. Think of agricultural teachers as life-long students, who continue to grow, mature, but who never quite reach the top, whatever or wherever that top might be, if it ever does exist. Professional teachers never cease to grow, and we need to develop their appetites for continual pedagogical growth.

Nick Number 4: There are no foolproof, automatic answering machines in education. We cannot buy answering machines to leave in our classrooms to receive the responses of our students. Computers are another teaching tool in education to be used by the teacher and not where the computer controls the teacher. We need to answer for the agricultural education profession how problem solving, artificial intelligence, computers, and we as professionals, teachers who are humans subject to personal biases, are going to make these four inputs mutually compatible.

I will make one concluding remark that is dangerous, that is dangerous for me and not you. About two-thirds of my professional life is over, and I want to share with you my professional goals for the last third. Am I an expert? If an expert is defined as an individual who knows the absolute truth about a certain area, let's say the teaching-learning process as applied to agricultural education, then I would rate myself as a novice. In fact, I almost titled my comments "The More I Learn About Teaching, The Less I Understand." But I want to become more knowledgeable about this so-called teaching-learning activity. My professional plans are to read, write, research and perform those activities that focus upon Categories 2 and 4 that Shulman identified as part of the knowledge base of teaching, that is the understanding of the pedagogical content knowledge mix as it applies to agricultural education, especially as it relates to using the problem solving approach to teaching. How well will I do this? I don't know. So why don't you join me,

think out loud about teaching with your colleagues and students and help out by selecting an area you would be willing to work on.

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