

# Developing New Techniques for Conveying Basic Concepts to Animal Science Majors

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Dr. Samuel Johnson, a great writer in English literature, was asked by an apprentice to review a manuscript. After the lapse of several days, the apprentice asked Dr. Johnson for his comments. The reply was, "Your manuscript is both good and original." This pleased the apprentice very much. Dr. Johnson continued, "I must make one further comment - that portion which is good is not original and that portion which is original is not very good." My comments today can be so judged. I have not originated any new techniques for conveying basic concepts to students, but I am always eager to learn of another's accomplishments so that I may use the techniques myself.

As we approach the subject of **New Techniques for Conveying Basic Concepts to Students**, we must acknowledge that those who have constituted the profession of animal science since its beginning have been quite successful. Techniques that have been effectively employed to advantage thus far should not necessarily be replaced with unproven ones just for the sake of change.

Almost every speaker or writer on any subject today attempts to challenge his audience with some phenomenal statement or figures to show how rapidly society is changing in all its aspects. Life is always changing; persons are always changing; our profession of animal science is always changing. We would readily admit that adaptability to changing environments and changing human needs is basic to all animal science. Young (9), in his presentation at the symposium on undergraduate teaching in animal science held at Reno, Nevada in 1967 said that our major goal should be to develop a state of mind in our teaching philosophy that nurtures innovation and adaptability to changing conditions. If we as individuals are to qualify as teachers, we must keep on learning, perhaps even at an accelerated rate, and we must further recognize that the students now and in the future are and will be quite different from those of previous generations. The teacher must attempt to understand and relate to the student as he exists in this rapidly changing environment.

One aspect of college and university programs which at present is being adversely attacked from both within and without the university, is the nature of teaching. Equally as important as the continual need for more and better information is the need for better techniques to disseminate the information that we already have. We must develop techniques to better professionalize teaching and to promote individualized learning in higher education. Professional people in all aspects of agriculture have been in the process of examining the instructional programs in recent years.

Many persons in animal science have spent much effort in recent years trying to interest young men and women in our profession; unfortunately, however, innovations in classroom techniques and new media for teaching as motivating influences in attracting and keeping students, are too frequently ignored or condemned before any effort is made to explore **their practicality** and effectiveness. Since we know **that there is a big gap between** the theory of learning and the practice of teaching, it should be the desire of every teacher to explore ways and means to narrow that gap. Techniques are conveyed by the teacher who himself is by far the most important audio-visual aid available. Both the teacher and the student are colleagues in a common pursuit. The central goal

is that knowledge be taught, learned, carried away, and put to use. In addition to an adequate fund of knowledge, a teacher must have ways of making principles and concepts very clear and precise. The very essence of good teaching is the teacher's ability to clarify and to illustrate.

The teacher must also know and understand the characteristics of the students, especially those which most influence the learning process. We know that animal science students are problem oriented. Our profession, as are most professions, is problem oriented. We exist to solve economic and humanitarian problems. We in our discipline should try to direct the thought and learning processes of the student by proposing problems which in the end can be solved by solutions contained in the subject matter offered. The hows? and whys? need to be linked together. This seemingly is the best way to stimulate the student's curiosity. If subject matter has to be memorized, and much of it has to be, it must be preceded by understanding and insight. Therefore the teacher must be the catalyst, and not just a lecturer calling for regurgitation of hastily memorized facts.

Acker (1) writing on the subject of excellence in a professional school relates an example of one teacher who wanted to acquaint his students with the **Journal of Animal Science**. His objectives were (1) to make the students aware of the broad coverage of the **Journal** and (2) to help them appreciate the **Journal** as a future source of information. He assigned specific topics for oral reports. He received some good ones and some poor ones. This teacher failed miserably in the accomplishment of his objectives. In contrast to the first teacher's procedure, a second teacher asked his students to prepare a list of subjects which they wanted to learn more about, guiding them to choose fairly narrow topics. He then asked them to find their answers in the **Journal**. They reported that they were amazed at the extent of the information on the subject which was contained within the **Journal**, and they were excited about having found this information for themselves. The second teacher's approach was more successful. His technique had worked. He had skillfully led his horses to water; they drank. Ideally the college student should be allowed to do his own work in his own way with such help as he may ask for. We counter such a statement as this by saying that it is fine as regards utopian theory but it won't work in practice, other than with the gifted students. I think that the technique of independent study should be employed more liberally and much earlier in the course of study. We as teachers are guilty of too much "spoon feeding" primarily because this appears to be the course of least resistance. We dish it out; the student can take it or leave it. This is the all-too-common approach to higher education. Such techniques might have had some merit when only a small elite percentage of a population were partakers of a formal education, but such techniques will not work when we are involved in educating the masses. We human beings have trouble when we are held to the breast too long, or when we are ripped from the breast too soon or held to breast and pushed away at the same time. Since with all animal life there is encouragement toward an independent existence to take care of itself, there must be some intermediate way of achieving this independence that would approach the ideal. The technique of independent study, properly initiated and followed through, can be mutually rewarding to both the teacher and the student, whether he be good, average, or poor. The poor student can be improved at a more rapid rate than the average or good student, when he becomes involved



perhaps for the first time, in the learning process.

We can look upon teaching as an attempt to influence others psychologically. An effective teacher tries to capture the spirit of the group, just as a successful performing artist knows instinctively, without regard for purely intellectual criteria, when he has reached his audience.

There is a growing body of evidence that supports an optimistic view about the extent to which people can be trained in the "art of empathy." Lundstedt (8) defined the art of empathy as the imaginative apprehension of another's condition or state of mind without actually experiencing or absolutely knowing the feelings of the other. There are laboratories that provide experiences in which people can learn to be sensitive to others. People can learn to achieve empathy and rapport in their communications with others because they can learn to interpret (through feelings) the signs of effective communications. In order for a teacher to achieve any degree of empathy he must be sensitive and responsive to the students' feelings. His responsiveness to their feelings will be reflected by the expression on the students' faces. It can be told at a glance whether there is understanding or not. This is one audio-visual aid that few teachers use. We spend too little time learning the characteristics of our students, and addressing our courses to a "known" audience. This technique is essential for effective communication and we have known it since the beginning of civilization, yet we have become so highly, but narrowly, specialized that we concern ourselves more with further developing ourselves professionally and trust that the student will be so impressed with our vast reservoir of knowledge that he will be inspired to develop himself into our mirror image. The masses of people have never responded to this instructional approach and it is not likely that they ever will.

The development and use of techniques for conveying basic concepts must be a continuous effort pursued by the individual teacher. The most effective techniques may vary from time to time depending on various factors such as composition of the class. More certainly there will be variations in techniques employed from course to course.

Some techniques such as the familiar blackboard and chalk have been used for a long time; however, the average teacher needs to improve his blackboard technique. The blackboard may impair progress if it is used in a fragmentary and erratic manner. Teaching technique is poor when a teacher fumbles and jumbles material on a blackboard. The blackboard can also encourage too much copying. One effective use of the blackboard is to present in the beginning of the lecture or laboratory a skeletal outline which can be further expanded as one proceeds.

Recent developments in organization and content of curricula and in teaching methods have opened up a variety of resources that seemingly have great possibilities for instructing college students. Every means that offers some possibility toward improving the teaching-learning process needs to be investigated. All instructional resources must be sought out. Old resources need to be re-evaluated and newly developed ones must be tried out just as basic animal science research information is sought out and evaluated.

The practice of team teaching is not new to agriculture, but it appears that many facets of this teaching method should be more completely studied, particularly with the advent of more and more consolidation of courses. (2) It is possible that basic concepts can be more thoroughly conveyed through the team teaching approach. Variety is the spice of life. When more than one teacher is willing to give of extra time, possibly coffee time, to assist in the conduct of a course, this added effort will have a favorable psychological impact on students. In most cases the students will respond by putting forth more effort themselves. We involve several teachers in advanced undergraduate and graduate seminar. Could not the same approach be used in teaching some of the less advanced courses? When the team teaching method is employed the

student is no longer totally dependent upon the competence of one teacher. In true team teaching two or more teachers would be directly involved. Therefore each teacher would be able to study from the strengths and weaknesses of his colleagues. Beginning teachers can have an opportunity for a type of apprentice training under capable veteran teachers by sharing some of the responsibility for the conduct of the course; however, the greatest share of the responsibility should be assigned to teachers who are the best informed and experienced in accepting leadership. Less expert teachers, while working with effective teachers, can prepare themselves to assume more responsibility in the future. This is somewhat the same pattern that has been so successfully followed in the research laboratory for a long time. There is certainly nothing wrong with one teacher receiving directions from another teacher. It has not been practiced extensively, but this approach does not violate the concept of academic freedom in any manner. Each teacher should definitely be an integral part of the team from the beginning to the end of the course. Team teaching could cost more than individual teaching; however, if we made an attempt to improve our efficiency of operation, I'm sure that we could find lots of wasted motion that could be justifiably channelled to the route of a reorganized method of teaching. There is little prospect for significant advances in effective communication without increased cost. Attempts at improved communication mean more time, more hard work, more facilities, which summed up means more money.

Numerous audio and visual aids are used in classrooms today, such as audio tapes, slides and super 8 film loops. The major function of these educational media should be to help the student learn at his own pace with the idea of further developing the concept of independent study. In its growing use independent study, supported by available audio-tutorial devices, is being encouraged as a technique for effective teaching. It now seems possible with supplemental use of tutorials to more closely approximate individualized education in a mass educational system. Certainly we in higher agricultural education would like to individualize instruction as much as possible. With our conventional teaching arrangements, individualization is almost impossible. The students are not homogeneous enough, the classes small enough, nor the majority of teachers able enough to adjust to individual differences. In our conventional lecture approach it is possible that every student would be presented a situation short of the ideal. The most capable would be held back by the pace of the less capable and also more alarming to me is the fact that the less capable are being forced to move more rapidly than is possible for adequate comprehension. Personal experience with the use of various technological devices has demonstrated for me that by using equipment the most capable student moves ahead at a pace adjusted to his capability and that the less capable student is given the opportunity to dwell more extensively on the subject before he is allowed to move ahead. They apparently come to the audio-tutorial center on their own elected time, possibly in a more receptive frame of mind. Missing links of their fragmented understanding of principles and concepts when first presented, can be brought together and more clearly understood.

Many people engaged in teaching higher agricultural education believe that with the extensive use of new technology the student will become more passive than he is now. This could be true, but in my opinion it is not inevitable.

The supplemental use of what is commonly called "hardware" requires a real understanding by the teacher of both the learning process and the subject to be taught. Imagination coupled with the best ability that we have will be demanded as never before. Consequently greater demands will be placed on the creative teacher. Certainly students who are really learning demand more from their teachers, not less. The role of the teacher will undoubtedly be modified. Some teachers will be engaged primarily in the preparation of

instructional programs. It will necessitate cooperation with a wide array of specialists. The technology approach to teaching the Swine Production course, discussed by Professor Harmon and associates at the University of Illinois, at the 1968 meeting of this group and reported in the *Journal of Animal Science* recently (6), involved much technology and several technologists.

Computerized instructional methods represent another attempt by animal science teachers to provide instruction tailored to each student's learning abilities and needs. Borden (4) in discussing the use of computers in education for colleges of agriculture presented four separate categories of educational uses for computers. They were: (1) courses in computer science, which provided in-depth training in the use of computers, and, (2) computer-assisted, (3) computer-supported, and (4) computer-dependent instruction.

Computer-assisted instruction involves the direct use of the computer in the educational process where the basis is student-computer dialogue. The computer is programmed to process the dialogue and will output appropriate responses to the student during the course of the session. The system must be organized and programmed so that a response by a student will cause varied actions to be taken by the computer. A correct response will lead to the next step ahead. An incorrect response will cause a repetition of the problem stated differently or in more detail or returned to some earlier point for remedial learning.

Computer-supported instruction can be used in courses to provide relief from routine calculations. In addition a greater number of more complicated, yet realistic problems, can be solved. Each student can be supplied with a different set of data illustrating the same or different points.

Computer-dependent instruction embraces courses in simulation and courses based on programmed games. Simulation can be defined as the imitation of important aspects of some real phenomenon by use of mathematical and logical models applied by programs to computers. The simulation technique can be used for various management objectives. A *properly* constructed and directed game focuses attention on decision making and on the integration and evaluation of things learned in supporting courses. Computer simulation has been used for several years by some instructors in animal breeding courses where genetic variation of certain traits in livestock are sufficiently additive to recommend selection as a primary tool. The competition among students and the opportunity to do a lifetime of breeding in rapid fashion stimulates students and gives them a deeper appreciation for courses in population genetics.

The computer technique, which can be used effectively for the integration of vast quantities of knowledge and data, is an important tool in helping the student make correct, intelligent and timely decisions.

One successful technique for conveying basic concepts to animal science majors has been the use of the laboratory for both demonstration and practical participation. Nothing will ever take the place of student participation in laboratory activity. When the former King Edward of England abdicated his throne, he found that he was deficient in his capability to perform small routine chores for himself. He had read lots and observed much about the tying of shoes and dialing of telephones, but as a grown man had to learn both these little techniques through repeated performances with his own hands. Howath and Inskip (7) concluded their paper on the role of the laboratory in the teaching of animal science by stating that the laboratory can be an effective means to sharpen the *insights* of students, whether their interest is in animal production or in the basic sciences. These authors stressed the importance of adapting both classical and recent experimental reports in the field of animal science research to laboratory exercises for undergraduate courses in meats, nutrition, physiology, population genetics, and livestock production.

Since we are stressing a greater emphasis on principles and concepts, it would appear to me that our laboratory offerings should be re-evaluated and up-dated in order to more closely join research with teaching. Some few animal science teachers have reported stimulated student response on their attempts to adapt research techniques and results for presentation in the undergraduate laboratory. The committee on the evaluation of teaching materials in animal science that was appointed by the Commission on Education in Agriculture and Natural Resources of the National Academy of Sciences has recommended the development of laboratory guides or workbooks as one of several suggestions for improving teaching in animal science. The committee further recommended that a project proposal be submitted to an appropriate funding agency by a major land grant university with a strong department in animal science for the establishment of a teaching materials center for the animal sciences.

Even though the laboratory will continue to play a basic role in all animal science courses, it is evident that more and more of our students will come from non-farm backgrounds and will need more practical experiences than the conventional laboratory can afford. Rapid advances in automation and technology make it virtually impossible to maintain certain types of laboratories on a college or university campus in as up-to-date a fashion as those facilities industry maintains for efficiency. These facts, a student with a non-farm orientation, and a most rapidly changing industry seem to necessitate strong consideration toward the development of cooperative internship programs with various facets of our industry. The student should be under joint supervision of both a college faculty member and a capable and qualified employee representing the cooperating agency or business. The intern should be paid for his services and in my opinion college credit should be given for this experience. After all, most industries in which cooperative plans could be developed are operated by college graduates or people with leadership qualities who have demonstrated their capability through practical experiences. Certainly the college teacher per se has no monopoly on this teaching-learning process nor is the sophisticated atmosphere of the formal lecture or laboratory room the only environment that is conducive to learning.

The teacher in animal science must be continually on the alert in recognizing ways of stimulating our students to become self-motivated, self-directed, independent learners. If we are going to compete as a profession in the world of constant and rapid change, then encouragement on the part of the teacher toward self-development of the student is one of the most important outcomes that we could desire. This does not mean that the student will work only in splendid isolation. Some have the vision of the student sitting in a little booth with earphones on his ears and various buttons to push at a prescribed time with the ultimate elimination of the classroom teacher. In order to learn we must communicate. We must have contacts with other human beings. A communicating relationship among people is the vital force in the stimulation of ideas. Students must certainly come together with teachers. Such contacts might not occur as regularly as is the custom now, but the experiences might be far richer because of more extensive preparation on the part of both the student and the teacher.

Bentley (3) in his address on the New Challenge for Animal Science Teaching encouraged us to revise and adapt teaching methods and techniques in such a manner as to accommodate the breadth and quantity of knowledge germane to the student's future career. Projecting new dimensions for education is an ongoing responsibility that must not be treated in an insignificant fashion. Some techniques employed to convey basic concepts might be superior to others. Some techniques that are suggested and tried might result in total failure. How will we know until we try? The teaching-learning

complex is plagued with many knotty imperfections and we are not going to plane these imperfections out by merely talking about them. It is going to take trial with some error and some success. Any technique, to be of value in conveying a basic concept, must be one jointly supported by both the teacher and the student. It must be one that will encourage a closer teacher-student relationship. The close relationship between the teacher and student is a necessary motivating force in the teaching-learning complex. The procedure for improving this relationship might be as simple as revised blackboard technique or as sophisticated as the use of audio-tutorial devices and computers. The learning process might be best facilitated through the team teaching approach or the extension of the laboratory through an internship experience or other techniques that have not been presented in this paper.

If we as teachers will put forth more effort, I'm firmly convinced that the majority of our students will respond by matching or exceeding our efforts. People tend to learn at whatever level is demanded. We as teachers get about what we ask for. We should resolve to require our students to think, to react critically to what they hear, and to go into some depth in their studying. We should employ whatever techniques are

necessary to accomplish this end. If nothing more, the reward will be one of appreciation and gratitude from our students. They will be like Henry W. Longfellow in his praise for the village blacksmith when he said "Something attempted, something done, has earned a night's repose, Thanks, Thanks to thee my worthy friend for the lesson thou has taught."

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## Teacher Dialogue With Students and Business

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Food production and marketing businesses are firmly established as basic and traditional entities in our society. Their need is unquestioned in furnishing our daily sustenance, yet as our society becomes more urbanized the entire agricultural complex is further removed from mainstream social and political influence. Specialization in agricultural training complemented with increasing complexity in the marketing structure creates an ever widening communications gap that necessitates concentrated efforts on the part of teachers, students, and business to insure a proper dialogue. Problem areas can be highlighted with three key issues: (1) do students understand business and their needs?, (2) should teachers get involved in business?, and (3) does business have a social and moral obligation to agricultural education?

Student understanding of business and business needs are initially faced in business, economics, and marketing courses. More direct contact comes through summer or part-time employment, family association, and personal entailment. Such a superficial impingement may create a remote attitude or even a fear of business. Organized plant tours, business seminars, and trade show visitations combine to improve student-businessman dialogue. Teacher-business accord is aided through consultant activities and public service to the business community. Agriculture dignitaries seek these opportunities as they recognize its importance in developing new leadership and a firm base from which industry growth and development can take place. Lower echelon industry representatives may present a more day-to-day operations outlook and tend to present a more "this is the way it is" discussion.

Teacher involvement in the commercial world is expected in many professions such as medicine and law. Agriculture teacher industry involvement more often reflects past experience with business opportunity rather than current involvement. Although public service work through agriculture extension and vocational education related activities are fully

practiced, large agriculture enterprises require proportionally fewer of these services. Business oriented research projects and consultant activities improve teacher-business dialogue through responsible involvement. Field testing of products and ideas provide suitable engagement for nonbasic research oriented agriculture educators.

The moral and social obligations of business toward education are not easily defined. Certainly business as a taxpayer and employer has an inherent *interest in* the community. Socially, industry provides a large portion of the leadership and financial base of the community at large. Its moral base has been less evident, yet very necessary for improvement in urban ghettos and rural deprivation areas. Businessmen relations with academic institutions are usually of a personal rather than a policy nature. Creating business opportunity for the underprivileged and undertrained is the solution sought by many, yet the dialogue toward this end is completely lacking. Developing the entrepreneur spirit is a worldwide problem which offers one of the greatest potentials for agriculture business, students, and teachers to approach as a team and fulfill a neglected obligation to society. Agriculture is traditionally oriented toward the entrepreneur: business encourages it, and students desire it. Yet a lack of knowledge superimposed on inadequate capital destined to failure many who strive for their share of success. To overcome the despair, business should provide the incentive, teachers the knowledge, and students the exertion.

A successful dialogue ought to achieve a high fluency level creating business-teacher-student categories so intermingled that their activities disguise their identity. Teachers become business people, students convert into teachers, and businessmen, through the continuing education process, transform into students. All are strengthened for it. An approach emphasizing humility, diligence, and perception generates discourse and *success to both individuals and communities*. Business-teacher-student interrelationships yield social and moral character. Thus new dimensions of trust and understanding spread throughout the community.