SUMMARY

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Dr. George A. Gries, Professor of Biological Sciences and Head of the Department, University of Arizona, Tucson, Arizona made the following observations about an introductory course in general agriculture and natural resources:

1. Such a course should have an interdisciplinary approach to meet the needs of students.
2. More of the enrollment in agriculture is coming from urban centers. A course in general agriculture can be extremely meaningful to these young men and women as well as to non-agriculture majors.
3. Since more is being written about the agriculture problem on an international basis, it is only logical that a good course in general agriculture and natural resources be made a part of the curriculum offered by the Schools or Colleges of Agriculture.
4. With more college students working toward advanced degrees, it is important to provide an acquaintanceship with the international opportunities for this body of students.
5. Dr. Gries indicated there should be a broad introduction to agriculture and the students should have an opportunity to enroll in agriculture courses their first year.
6. The need for just an orientation course was questioned.
7. It was pointed out that a good course in general agriculture should attempt to relate why the sciences are essential in the agriculture curriculum and that some attempt should be made to relate how they fit into the animal and plant sciences and to such areas as Ag Economics, Ag Engineering, and mechanized agriculture.
   Dr. Gries stated that agriculture can best be taught if the student has a greater appreciation for and an understanding of the sciences.
8. Most schools require a pattern of courses referred to as general education. A course in general agriculture and natural resources, if structured properly should be appropriate in general education.

The Use of Computers in Education in Colleges of Agriculture and Natural Resources

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INTRODUCTION

There is no facet of today's society which has not directly or indirectly felt the impact of the computer revolution. To what degree the introduction of computing technology will ultimately mold our economic, cultural, sociological and national future collectively and individually can only be conjectured, but it can safely be predicted that it will be substantial. Education is certainly not excluded and the influence will penetrate to the very fundamental tenents upon which education is based. Many of the changes which will take place will be dramatic and will likely occur with the same rapidity which is typical in computer technology. The majority of teachers and their administrators practicing today have had little exposure to educational uses of computers other than through the public communications media. For them the effect of computers on education may be alarming and uncomfortable unless measures are taken to keep pace with developments.

One purpose of this presentation is to encourage teachers and administrators to participate or next best to maintain a keen awareness in the advances being made in the use of computers in education. The present state of matters concerning the use of computers in education will be covered and projections will be made only where such predictions can be made with reasonable certainty. The problems which do or will likely occur will be pointed out and possible means for solution proposed. Most of the material herein covered appears frequently in the public communications media and in popular publications, however the emphasis here will not be general, but specifically directed toward the influence and use of computers in education in Colleges of Agriculture and Natural Resources.

CLASSIFICATION OF EDUCATIONAL USES OF COMPUTERS

For the purposes of this paper four categories of the educational uses of computers will be defined. These are 1) computer science, 2) computer-assisted instruction (CAI), 3) computer-supported instruction (CSI), and 4) computer-dependent instruction (CDI). Computer science and CAI are names which are in general usage, however CSI and CDI are terms which are defined primarily for the purpose of this paper.

By computer science is meant courses or educational programs which are dedicated to training in depth in the use of computers, and to education pertinent to information, computers and computation *per se*. Such courses form the basis of curricula administered by computer science departments.

Computer-assisted instruction is defined as the direct use and involvement of computers in the educational process where the basis is student-computer dialogue. Although a broader definition is generally applied, for the purposes here it shall be as defined in order to consider CAI as distinct from CSI and CDI. In CSI and CDI student-computer dialogue is not a requirement.

By computer-supported instruction is meant courses or parts of courses where computers are used to augment the instruction in a non-trivial way. In such cases the computer usually plays an indirect role in that library programs are used for the solution of problems posed in the course and neither the teacher nor students need necessarily be directly involved with the computer processing.

Computer-dependent instruction applies to an emerging area of education and instruction which will increase in importance as time passes. CDI is defined as courses or parts of courses which are designed specifically to use computers and which could not be taught at all, or at best would be inadequately taught without their use.

The reasons for considering CAI, CSI and CDI as separate entities are that the kinds of courses for which each is appropriate, the difficulty and expense of implementation, the computer science background for the teachers, and the degree and form of involvement of computers are all quite different.

COMPUTER SCIENCE

Atlhough computer science *per se* is outside the scope of the educational mission of Colleges of Agriculture and Natural Resources, the influence of happenings in computer science will be felt in a number of important ways. The demand for computer science skills continues to exceed the production of qualified people. It has been estimated that 500,000 to 750,000 will be needed in this occupation by 1970. This projection is generally believed to be an underestimate. Qualified personnel are not being trained at a rate to meet this demand, and as a result the competition for talent will continue to increase in intensity.

The computer science needs of industry, business, colleges and research enterprises in the area of agriculture and natural resourses can be expected to grow parallel to the general demand. The curricula of Colleges of Agriculture and Natural Resources must respond to this demand to at least fulfill part of their needs in computer science. It is completely unreasonable to anticipate the demand being met by computer science graduates; the competition for their skills will be too strong from other employment areas. The colleges must encourage the development of B.S. as well as advanced-degree graduates who are well qualified in computer science, but who nonetheless have major interest and education in one of the areas of Agriculture and Natural Resources. This is not to say every graduate must be so trained, but possibly in the neighborhood of 20% should be. Such education should begin at the undergraduate level for potential graduate students because as with mathematics and statistics, postponement until graduate programs are underway is too late to be effective. For graduate students there are few graduate programs which can justify not having some computer science courses. Possibly as many as 30% overall should be encouraged to adopt computer science or more appropriately a computer science-mathematics combination as a minor studies area.

Not every college or university has a computer science department and even for some that do the computer science department may not be responsible for the programming and computer usage service courses which have become so vital. Colleges of Agriculture and Natural Resources must offer such courses for their students if the courses are not available or adequate elsewhere on campus. In the past, the similar situation has occurred with statistics courses. As with statistics, Colleges of Agriculture and Natural Resources must give serious attention to maintaining or acquiring competency in computer science in its faculty. Again the competency is less likely to be satisfied by computer scientists *per se*, than by agriculture and natural resources personnel who have been well trained in computer science.

Even if adequate service courses in computer science are available, it is highly desirable that the Colleges of Agriculture and Natural Resources offer more advanced courses in applied computer science. These courses are certainly justified by the needs of research, education, and industry, and although similar courses may be offered elsewhere on campus, it is unlikely that the orientation or applications in those courses would be as satisfactory as in such courses offered by the Colleges of Agriculture and Natural Resources.

Courses of this nature are already being offered at some universities; for example, Agricultural Economics courses in mathematical programming and operations research which have a strong computer science basis.

COMPUTER-ASSISTED INSTRUCTION

Computer-assisted instruction (CAI) promises to be a valuable innovation in education from elementary through continuing adult education. CAI is a practical reality even in its infancy as evidenced by its employment in selected elementary and secondary schools. Most people are well aware of CAI as a result of the wide publicity given by the public communications media. Certainly CAI is the most glamorous of the uses of computers in education and the research and expansion of scope of applications for CAI is intense. One cannot yet say that CAI is truly beyond the experimental stage; it is too soon for even strong positive evidence to be conclusive. One of the more important effects of CAI already has been to emphatically focus attention on the basic fundamentals of the learning and teaching processes. If CAI is not already making entrance into courses in Colleges of Agriculture and Natural Resources, it is a certainty that it soon will be.

The technique is basically one of direct dialogue between each student and a computer. The computer of course is programmed to process the dialogue and output appropriate responses and queries to each student during the course of the session. The principal attribute of CAI is individualized instruction and herein lies the major difference between CAI and traditional classroom teaching. CAI is similar to the tutorial method of education which originated in distant antiquity and reigned supreme until the demands for more widespread education made it obsolete. The tutorial method may be the best method from the point of view of an individual's education, but the cost and inefficiency make it entirely unsuitable for mass education. CAI holds forth the promise of overcoming these problems. It is unlikely that CAI will ever become dominant over other educational methods because much of knowledge and intellectual development cannot be placed in a suitable framework for automated teaching.

CAI has become generally available for specific course development only within the past two years as the result of the introduction of the necessary computer hardware. The basic requirements for CAI are 1) a central computer which can process requests from one to many remote stations, 2) a large essentially random-access bulk storage attached to the central computer for storage of course material, individual student information, etc., 3) terminals, each of which is connected to the central computer by some data transmission means such as voice-grade telephone lines, and 4) a program to handle the curricular material in a dialogue format.

The terminal serves as the student-computer interface. At this device information is input by the student according to specifications for use of the specific CAI application. Output from the computer is also displayed for the student at the device. There are at least thirty models of terminals available at the present time. The terminal may be simply a typewriter-like component with all input and output being essentially through the keyboard or it may be composed of more elaborate input/output means. One of the more important features which can be added to a terminal is a cathode ray tube display device whereby the output from the computer can be projected on the face of the tube. This feature expands the capability of the terminal to allow graphical or pictorial information to be displayed. Beyond this, an electronic device known as a light pen can be added which allows the student to input information via the cathode ray tube or to respond to the computer output display by modification of the display. Earphones may be incorporated for audio output and other visual aids may be integrated directly or indirectly with the terminal facility.

The most challenging aspects of CAI are to define the curricular material in such a way that it can be programmed in the required dialogue format and more importantly to do it in such a manner to meet sound educational objectives. The system must be organized and programmed so that a response by the student will cause any one of a number of possible actions to be taken by the computer. A correct response would lead to the next step ahead. An incorrect response would cause a repetition of the problem stated differently or in more detail by the system or a return to some earlier point for remedial learning. Review, reinforcement and expansion or contraction of topic coverage also must be programmed for appropriate inclusion based on the student's performance. Overall, the system must be extremely flexible. Allowance must be made for an indeterminant number of pathways from the beginning to the end. Each more or less circuitous route will be determined by the step by step performance of the student.

The individual or more likely the team who can do this must have considerable skills and understanding in computer usage, the curricular material, and educational objectives and means. In courses in Colleges of Agriculture and Natural Resources, it will take faculty members in these colleges for implementation of CAI. It would therefore behoove these colleges to encourage interest in CAI and to make sure some of their faculty and students are undertaking educational programs to develop the required skills.

In CAI there are three levels of applications. These are: 1) drill and practice, 2) tutorial and 3) conversational. Drill and practice applications of CAI are the easiest to implement in that routine problems are posed by the computer in an orderly manner for the student to solve. Automation of drill and practice has two distinct advantages. First the teacher is relieved of the rather mundane function as director and checker of drill and practice exercises. Second and more important is the capability for each student to perform drill and practice in whatever amount is necessary to gain the desired competency. Since the suitable amount varies substantially from student to student, group drill and practice has the obvious shortcoming that some students are bored by too much and others who require more are not given enough.

Although most of the present applications to drill and practice are at the pre-college level there are numerous opportunities for application in at least the introductory courses in Colleges of Agriculture and Natural Resources.

By using CAI for the drill and practice parts of a course, the number and variety of applications of the drill and practice material can be extended to make these fundamentals more relevant. Moreover, the gap between procedural-oriented problems to text-oriented problems can be bridged more easily by simply making the change at the pace most comfortable for each student. Parallel to this change in emphasis, after mastery of the basic procedures, focus can be shifted from a procedural view toward problem soving to one based more on concept.

The tutorial use of CAI covers the applications where the computer acts as the tutor for each student, posing statements and queries in such a way that the student, by his responses, learns under the guidance of the computer. This level of CAI is more difficult to program and the material more difficult to organize than for drill and practice. Such applications bring into consideration the concepts of learning concerned with reinforcement, review, relearning and acceleration to mention a few of the important ones.

In Colleges of Agriculture and Natural Resources, use of tutorial CAI can be made in courses where there is a large body of content and factual material which must be weighed and evaluated in the process of solving practical problems. Many of the introductory and intermediate courses offered in these colleges are of this type. For example, a course in field or forage crops contains a large amount of content which must be integrated and consolidated to be used in formulation of crop, rotation and farm practice recommendations according to soils, economic and various other conditions. Covering the bulk of the content material may or may not be a very efficient use of CAI. The course can strongly benefit from the use of the tutorial method though in the evaluation and integration of the material into a useful body of knowledge for applications. This can be done by CAI by the careful guidance of the student through a series of increasingly difficult and complicated practical problem situations.

The conversational level of CAI is the most difficult to implement simply because of the breadth of its scope and required flexibility. Either the computer or student may make statements or pose questions for which the responses are not required to be brief or simple. This would be much like the conversation between a scholar and his protege. No applications at this level have been completed at this time. Because of the difficulty of implementation, there is some doubt that the computer will be a satisfactory means for teaching in this mode. At least the widespread use of the conversational form is at some distance in the future.

At the present stage of development it can be expected that CAI will be applied most frequently in a content and/or training context as contrasted to a context of intellectual development. These applications are much more simple to implement, as well as generally much more refined in the organization and structure of the curricular material. Certainly there is the advantage of CAI in releasing teachers from a certain amount of instruction in routine methods and training in order to allow them to concentrate more on concepts and the intellectual development aspects of education. Every baccalaureate curriculum in the Colleges of Agriculture and Natural Resources has a large portion of training and methodology in it and CAI should therefore be a valuable aid in teaching.

Although it can be used to a large extent in this part of a curriculum, CAI does not have to be so limited. The intellectual stimulation which often is lacking in present-day college students can be cultured by CAI mainly by the capability of individualized pacing. In a well-constructed CAI system each student is moved through the material at the pace which is most comfortable for his abilities and speed of comprehension. In this way the self-confidence of the student can be developed, thus leading to or allowing for stimulation of intellectual curiosity. On the other hand, the traditional classroom methods, because of the practical necessities in dealing with a large group, may in reality effectively stifle intellectual curiosity, particularly in students who do not innately possess much intellectual motivation. If the preceeding statements are reasonable, then CAI should be fostered in those courses where intellectual stimulation is possible and this could well be the greatest advantage in its use.

There is one further consideration along this line which should not be overlooked. It is in relation to the reserved attitude toward asking questions and the lack of participation in class that numerous students have. The reasons for this problem are often personal such as fear of embarrassment, or lack of confidence in front of a class or instructor. If the proper attitude toward the computer can be developed, namely that it is simply a machine, then CAI can be employed to remove the personal constraints exhibited in class which are restrictive in the development of intellectual curiosity.

In progressing one step further, that is from intellectual curiosity to creativity and innovation, it is in this context that CAI may have little to offer. At some time in the future such may not be the case. In order to be able to inspire creativity it first must be understood and recognizable. In terms of CAI, the program must make allowances for creative responses and innovations and this implies that the originators of the programs must foresee the creative patterns and innovations and incorporate these into the program. Or, as an alternative a very sophisticated response evaluation scheme would have to be devised in order to be able to identify and evaluate unusual responses as creative rather than just as wrong answers. In any event, creativity and innovation are entities which pose extremely formidable, if not impossible, tasks for incorporation into CAI.

The impact that CAI will have on teaching will most assuredly not be to replace the teacher by a computer. The teacher will be placed in a more important role than ever and at the same time be presented with a much greater challenge. The teacher will serve as the special consultant to each student and work with each student individually. The teacher will be faced with the hardest questions, namely those that are beyond the scope of the CAI program or those topics which, for some individual reason, a student cannot master with the aid of the computer only. One can assume that all of the simple questions will be handled without external help during the course of student-computer dialogue. Because he will work with individuals, the teacher will have to be quite versatile in his role, being able to respond to each student according to his individual traits of personality, capability, level of confidence, frustration, and depth of understanding to mention a few.

The teacher will have to keep up to date with the progress and problems of each student. Fortunately because the computer will have processed all the information input by each student, the system will also be capable of compiling the appropriate statistics and performance information. The teacher may obtain such reports either on demand or routinely over short periods in order to keep up to date on student performance. With such information the teacher will be in a position to foresee difficulties in a student's performance before a crisis develops and be able to supply the necessary guidance and help before, not after, a poor learning experience develops.

COMPUTER-SUPPORTED INSTRUCTION

Computer-supported instruction is the easiest to implement of the applications of computers to education. This application came into being in the early years of computer development and is now widespread. The uses are quite numerous and varied in Colleges of Agriculture and Natural Resources. CSI is used predominantly in courses where there exist substantial routine computations which formerly were done using desk calculators. CSI does not change the basic nature of a course necessarily, but may modify it in some beneficial ways. The case for CSI will be presented as a very pertinent example.

One of the typical applications of CSI is in the procedural or applied statistics courses usually offered in the Colleges of Agriculture and Natural Resources. If one reviews a typical textbook used in such a course, it is discovered that a very substantial portion is devoted to procedure compared with basic concepts and interpretations of applications. In the era of desk calculators such emphasis on procedure was necessary. Because of the number of pages required to present the procedures satisfactorily, the concepts and interpretations were relatively subdued. In courses using these texts and organized in a pattern for which these texts were designed, the courses cannot help but to overemphasize procedure. The words "cook-book statistics" are all too familiar and have come into being as a result of the strong procedural orientation of applied statistics courses.

In the area of applied statistics CSI is acquiring an important role by the use of statistics routines for computers to perform the computations formerly done using desk calculators. This change is consistent with the similar changes occurring in the statistical processing of data in research and industry. Although procedures are important at least for the understanding of typical procedures, by the use of computers for routine computations the procedural overemphasis need not continue. More time in the courses may be spent on the initial design considerations, the underlying concepts and interpretations of analyses. These are the aspects of applied statistics which really are of importance for the future scientist and technologist.

In addition to relief from routine calculations, CSI allows a greater number, more complicated and more realistic problems to be entertained in the courses. If computer programs which generate data conforming to specified distributions are employed, the further use of computers relieves the courses from using the often inappropriate problems found in the limited repertoire offered in the texts. Furthermore by the use of data generators, each student can be supplied with a different set of data, illustrating the same or different points. Now students can be encouraged to work together if they so desire without the shadow of bent ethics cast over their work.

Applied statistics courses are not the only ones which can benefit from computer support. Any course in which substantial computation is required or is desirable can make advantageous use of computer support in the same way as applied statistics courses. The courses in economics and management which employ linear programming, and the courses in agricultural engineering which have the same computational requirements as similar courses in other engineering curricula are prime examples where computer support can play an important role.

In many applications of computer support for existing courses intensive training in computer science is not necessary for the teacher. Library programs which do not require much training in order to be used are available at most university computation centers for general purpose computations in statistics, economics, management and engineering as well as for other applications.

For specialty applications where library programs are not available, the teacher would have to be competent in programming to develop the programs for use in the course. Graduate assistant support may be enlisted for this task where the competency exists. Funding by the educational budget is as justified as any other similar expenditure for visual aid or course materials development. Although the development of programs for CAI application is an imposing project, programming for CSI application is relatively simple and can be done in easy stages.

COMPUTER-DEPENDENT INSTRUCTION

Computer-dependent instruction is an area which is different from CAI in that dialogue with the computer is not basic to the method. It is different from CSI in that courses classed as CDI could not be offered without the use of computers and the courses in reality are the result of the intrusion of computers in present day science and technology. Two of the well-known applications of CDI are courses in simulation and courses based on programmed games.

Simulation has become one of the important research and management tools within the past few years. Simulation can be defined as the imitation of the important aspects of some real phenomenon by the use of mathematical and logical models applied by programs to a computer. A broader definition of simulation could be made, but this one is preferred here within the framework of computer usage. Since simulation has found an important place in research and management it is only natural that it be introduced as curricular material in educational programs.

Simulation courses may be of two kinds. A course may be organized to teach the art and science of construction of simulations. In such a course, model construction, data generation, programming procedures, simulation testing and methods of evaluation would receive major emphasis. In the second kind of simulation course, the use of existing simulators for various management objectives, simulation evaluation, parameter selection and evaluation and possible simulator modification would be emphasized. At the present time such courses could only be offered at the graduate or upper-class level because of the broad base of knowledge required for such courses to be meaningful. As the field progresses, simulation material may be incorporated to some extent in freshman and sophomore level courses. As simulation applications increase in number and variety, courses also can be expected to multiply and diversify. The effect on teaching will be the same as for any other new research or applied subject introduced into the curriculum. That is, the experts who have become thoroughly familiar with the subject area will likely be the teachers.

With regard to Colleges of Agriculture and Natural Resources, it is quite probable that each department will, in the near future, offer one or more courses in simulation. There remain only a few subject areas where simulation is not being applied. One finds simulation being used in such diverse fields as genetics, hydrology, economics, population dynamics, farm and forest management and plant growth and response.

In CDI, although simulation will gain in importance as curricular subject matter, the use of games may bring about a revolution in undergraduate education in many colleges, including Colleges of Agriculture and Natural Resources. The basic idea of a game in the sense used here is the imitation of some real environment in which students perform as they would in the real situation. Most games at the present time are business or management-oriented in which the students function in various business or managerial capacities. Games do not have to be limited to these areas even though they may be of greatest general utility for these uses. Games may be constructed for sociological, governmental, natural or political environments. The great stress of games is on decision-making; not on competition and winning. As with real-life situations, environmental constraints and limitations exist in games and must be taken into account. In addition, the whole gamut of personnel relations, which is of vital importance in real situations, is introduced in games via teams composed of students, each possibly with a different functional responsibility. Each team may represent an industry, a governmental agency or some other kind of unit, depending on the game. The success of games as teaching tools very strongly relies on the guidance and direction given by the teacher.

In every curriculum there exists one great deficiency for which the sundry attempts at correction have not been generally successful. The deficiency is experience. Games offer the potential for making the acquisition of experience a part of the baccalaureate education. One of the reasons this is possible is that the time scale of a game can be contracted compared to the real environment. The real time increment may be in units of months or years, whereas the monthly or yearly simulated counterpart may be accomplished in a class period.

A properly constructed and directed game focuses attention on decision-making and on the integration and evaluation of all the things learned in other supporting courses as more or less isolated content, facts or concepts. The integration and evaluation of knowledge is an extremely important goal in education and is the prerequisite to making correct, intelligent and timely decisions in the realm of one's responsibility. In addition to these major objectives, the development of satisfactory and productive personnel relations through games is a secondary objective often overlooked otherwise, but which is of no minor importance. If games can accomplish these objectives and evidence so far indicates they may do so very satisfactorily, then the effect on education will be very great.

AN ASSESSMENT

In general Colleges of Agriculture and Natural Resources compare favorably with other colleges in the use of computers in education. More curricula in science and engineering colleges require computer science training of their undergraduates and graduate students than in agriculture and natural resources curricula. On the other hand, because of the widespread use of computers in research in Colleges of Agriculture and Natural Resources, a substantial number of graduate students are taking a programming course for its applied utility in research. It would be desirable, considering the projection of demands for well-trained computer science personnel, if more graduate students were encouraged to adopt Computer Science as a minor. Furthermore, for the same reason, it would be desirable to encourage a number of undergraduates to include more computer science courses in their programs either for preparation for graduate studies or for advantageous use in jobs after the baccalaureate degree.

In Colleges of Agriculture and Natural Resources computer-supported instruction is not uncommon, being applied in a variety of courses. It can be expected that this form of computer use will continue to grow since there are many courses in which CSI can be used in the colleges and CSI requires only minimal computer science capabilities for use. In the future one would hope to see more texts and teaching materials become available which are distinctly oriented to specific applications of CSI, for example, in applied statistics.

The rate at which computer-dependent instruction develops in Colleges of Agriculture and Natural Resources can not be predicted. The needs and value are clearly evident, but the implementation of specific CDI uses will be dependent on the skills, dedication, and interests of faculty members. In many colleges, preoccupation with non-education research precludes the opportunity for faculty with adequate capabilities from becoming involved with CDI applications.

The same statements concerning CDI can be made for computer-assisted instruction. Although there are numerous uses for CAI in courses offered in Colleges of Agriculture and Natural Resources, the demands in terms of computer hardware, number of personnel, competency, and financial support are much greater for CAI than for any other of the methods. The application of CAI is a major undertaking and can not be done successfully without substantial organization and support.

Up to now the primary driving force in implementing computer usage in education has been the individually interested faculty member. In general the roles of the department and college administrations have been essentially passive although they have been undoubtedly interested. Traditionally the colleges have maintained strong research programs, but for various entirely valid reasons these have been directed mainly to topics other than collegiate education. It would be desirable in light of the recent revitalized interest in collegiate education in Agriculture and Natural Resources that the research programs be diverted in part or augmented toward education in general and specifically toward the uses of computers in education. Administrations should encourage this to take place, for without such encouragement, developments in the use of computers for education will be piecemeal.

If advancement is to be made in the more sophisticated uses of computers in education, the administrations will have to give active direction and support because of the magnitude of the projects, the diversity of skills and personnel required, and the interdisciplinary nature of the projects. The acquisition and training of enough qualified personnel in computer science can be overcome with adequate emphasis placed on this need by administrators. There is no doubt that the Colleges of Agriculture and Natural Resources have many places in their curricula where computer support can be applied beneficially. With their applied orientation, emphasis on research and variety of interests, they are possibly better endowed to be leaders in the use of computers in education than any other colleges.