

# computers: a service or a teaching tool?

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A. Gene Nelson

Yes, there is "a method to the computer madness." And that method is an educational one. The potential for using the computer in Extension education should be more fully explored and developed.

## Computers Still Underused

Computers are used in Extension to do some rather routine chores such as keeping track of staff time, budget accounts, payrolls, publication inventories, etc. Other examples of their use with Extension audiences include computing least-cost dairy rations, managing food purchases, family financial planning, and income tax management.

In most cases, these applications involve using the program with an individual client. The objective is usually to provide information, or speed up calculations. While these are important uses, the educational potential of computers hasn't been reached.

The greatest potential impact from the use of the computer isn't in providing information as described above, but rather in teaching people how to analyze their problems. This involves helping them recognize problems and explore alternatives. This is more than the simple transfer of information. It requires the integration of this information in a decision-making process involving logical reasoning to arrive at a decision consistent with the objectives of the decision maker.

## Why Underused?

Computers have been with us now for over 20 years. Why are they still underused? There are three components of instructional packages using the computer . . . hardware (equipment), software (computer programs), and personnel. Of these, it seems that the lack of trained personnel and the availability of adequate software are the primary constraints to fully using the computer as an educational method in Extension.

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**Hardware** During the first 10 years of our experience with computers, the availability of hardware at affordable costs was a significant constraint. However, this isn't the case today. There's a broad range of computer equipment available, from the remote computer terminal with centralized time-sharing equipment, to "micro" or "home" computers, and programmable calculators. Costs range anywhere from \$250 to hundreds of thousands of dollars.

**Software** With the hardware now available, there's a lack of ready-made software that can be used in local educational programs. While some states have vast libraries of such programs, they're often not readily transferable to other states. Software development is an expensive process requiring interdisciplinary input in many cases, and special considerations must be given to designing software for use as an Extension method.

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**Personnel** The other constraint is the lack of adequately trained manpower. Time and manpower are always scarce. Extension educators must establish priorities for the use of their time. Gaining experience and learning the potential for computer applications haven't received high priority. Many educators fear getting bogged down in the details of quantitative analysis and the computer sciences, but many are now learning these details. This issue of the *Journal* is a significant step toward a better understanding of computers by Extension educators.

### **An Educational Method**

It's important here to distinguish between using the computer to provide a service and using it as a teaching tool. More efficient record keeping or information retrieval with the computer doesn't contribute *directly* to learning. We're interested here in using the computer to teach concepts involved in attaining an educational objective.

The computer allows us to teach the process of analyzing and making a decision, as well as providing the relevant information. By providing a framework for analysis, the computer program increases the need for information and promotes an understanding of the problem situation and its related elements.

We can view the computer in the same way as other educational methods such as lectures, discussions, publications,

television, slide presentations, farm visits, tours, and demonstrations. Within this context, the computer can be used in a variety of ways, just as other educational methods.

It can be used with individuals or it can be used in group settings. It can be used as a complement to other educational methods. It can involve the use of a very simple computer program to facilitate routine farm budgeting calculations, or it may involve very sophisticated calculations for evaluating the impact of a different taxing structure on the state's economy. The computer can be used to analyze a simulated situation, or it can be used by individuals or groups to analyze an actual decision situation.

To illustrate the use of the computer as an educational method, let's suppose we have a computer program that calculates least-cost dairy cow rations. To use this computer program to greatest advantage, dairymen must understand the basic nutritional relationships, so this subject matter should be included in the educational program. They also need to know how to determine the nutrient composition of the feeds available and to estimate the costs of these feeds.

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Then, by using the computer program to calculate rations under various assumptions, they can more fully understand the implications of changes in nutrient requirements, feed costs, or feed composition. In the future, they'll be better able to determine when a change in feed rations should be considered and to make sound decisions about their feeding practices.

### **Two-Edged Sword**

The computer is expensive to use, but then so are television and slide-tape presentations. The computer can facilitate number crunching and put the audience in the position of devoting time to understanding the concept and procedures rather than adding and subtracting. It allows participants to enter their own numbers and analyze their own situations. It can also provide for "real-time feedback" (they can get the results right away). While the computer has an attraction for some and gains their attention, it has a negative image for others.

### *Advantages*

The computer is a flexible educational method, and can be used with a wide variety of subject matter and audiences. With a printing terminal in a large group meeting, everyone won't be able to see the result being generated. However, it's a simple matter to transfer the results to an overhead transparency, or touch-tone terminal with an amplifier, which allows everyone to hear the results.

Mail-in and batch processing can be used when a series of meetings are scheduled. The input is mailed to the computer center, processed, and the results returned in time for the next meeting. The advantage of immediate feedback is lost with this system, however.

### *Disadvantages*

A disadvantage of the computer, as compared to other methods, is the personnel training and software development time required. This can represent a significant investment that must be weighed against the less tangible and hard-to-measure benefits of motivation and more effective learning. The advantages to our audiences will be better decisions based on more accurate information and more logical decision-making processes.

### **Designing Learning Packages**

Here are some considerations to keep in mind when designing computerized learning packages:

1. Specifying the objectives for any educational program is crucial, but is particularly important where the computer is involved. There's a tendency for the computer program to become an end in itself, rather than a means to an end. To avoid this, think about the role of the computer in relation to the stated objective. Is it simply to provide information or does it go further in helping the audience integrate and analyze the information in seeking a solution? In other words, does the computer help in developing decision-making skills?
2. Has a significant problem or educational need been identified? The problems people face aren't of equal importance. In identifying these problems, it's not possible to simply ask people what help they'd like to have. They don't always need the information they want. To avoid disseminating irrelevant information, some exploratory communication is needed to identify the specific nature of the problem and the knowledge and skills needed to solve it.
3. Computer software should be designed to be no more complicated than required to meet the objective. The

audience must have a basic understanding of what's going on within the computer. By keeping the computer program as simple as possible, they can follow the assumptions and procedures that lead to the computer result. The audience must have some notion of what happens in the "black box" to place any credibility on what comes out of it.

4. To provide for maximum reality, a multidisciplinary approach is advised. Computerized educational programs that contain related and relevant information from more than one discipline, with informational gaps filled in by designers, will be more successful than single discipline programs.<sup>1</sup> This development process can be further reinforced by field testing with selected clientele and Extension professionals.
5. The software needs of Extension are more demanding than for other uses, such as research and accounting.<sup>2</sup> To adequately serve Extension purposes, software must be clear, speedy, and reliable. The information that the participants are required to supply and the results given to them must be reliable and easily understood. For the uninitiated, one "funny" answer can reduce the credibility of all the other answers. It is also desirable that there be a minimum delay between data input and the availability of an answer.<sup>3</sup>
6. Educators need comprehensive training to acquaint them with the mechanics of using the hardware and software. They also must understand the underlying principles and have the latest data available for input to the computer. Again, keep in mind that the objective isn't to train the educators how to use the computer, but how to use it as an educational method.
7. Provision should be made to revise, evaluate, and update the computer software. This is necessary to maintain a successful software package, and to learn from experience what can be applied in the development of new educational methods using the computer.

### **Logging Off**

As we learn more about its potential, the computer will take its place alongside other more traditional educational methods. The computer can be used to generate information for use in an educational program, or it can make calculations using information provided by the learner. It helps provide prompt feedback of results and promotes understanding of the decision-making process. Realizing its potential will

provide Extension educators with a high quality teaching tool and enable them to solve problems more effectively.

**Footnotes**

1. Harlan Hughes, "Remote Computer Terminals, Micro Computers, and Programmable Calculators—Where Do They Fit into Extension Programs?" (Paper presented at Western Farm Management Extension Workshop, Calgary, Alberta, September 20, 1978).
2. Wilfred Candler, Michael Boehlje, and Robert Saathoff, "Computer Software for Farm Management Extension," *American Journal of Agricultural Economics*, LII (1970), 71-80.
3. Eddie L. LaDue, "Impact of Alternative Remote Access Computer Systems on Extension Programs," *American Journal of Agricultural Economics*, LX (1978), 135-39.