# FRANK P. BESAG
# LEONARD P. LEVINE

# COMPUTER LITERACY FOR TEACHERS

# TEACHERS' GUIDE TO THE COMMODORE COMPUTER
## BASIC Programming and Classroom Applications

**by SUSAN ELSHAW THRALL,** *Computer Science Program, Santa Fe Community College, and Dept. of Geography, University of Florida—Gainesville*

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Unlike other microcomputer manuals slanted for student use, this practical guidebook is designed specifically to provide elementary and secondary schoolteachers with a quick, thorough understanding of basic microcomputer operations. Clearly and concisely, the authors explain the fundamentals of BASIC, the primary programming language; emphasize hands-on practical exercises; and provide effective applications to prepare teachers for using microcomputers in their classrooms. This comprehensive how-to manual is designed for use with the popular Commodore series (PET, C64, VIC 20) and is tailored particularly to teachers with little or no prior exposure to microcomputers. A glossary of terms, extensive resource list, and many helpful tips on buying software are also included.

**CONTENTS:** Preface / 1. Introduction / 2. Preprogramming / 3. Basic Programming / 4. Educational Applications / 5. Programs for Fun / 6. Getting the Most from the Microcomputer / Appendix A: Solutions to Chapter 3 / Appendix B: Glossary / Appendix C: Bibliography / Appendix D: Screen Format Sheet / Index

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# BASIC FOR TEACHERS

**by FRANK P. BESAG & LEONARD P. LEVINE,** *both at University of Wisconsin—Milwaukee*

Besag and Levine help you understand an integral element of your teaching profession—the computer. **BASIC for Teachers,** part of their two-volume set designed to promote computer literacy, guides you through every aspect of BASIC computer programming. Assuming no previous knowledge of computer language, the authors give clear descriptions of concepts and definitions, statements and programs, BASIC variable types, designing problems and solutions, and finding and correcting program errors. Programming procedures are demonstrated through course list management and grade averaging; "tasks" and exercises in each chapter illustrate the techniques while encouraging practice, imagination, and trial and error.

Coupled with their volume **Computer Literacy for Teachers,** Besag and Levine's work provides complete familiarity with, and knowledge of, BASIC computer skills and literacy.

**CONTENTS:** Introduction / 1. Values, Computer Literacy, and the Machine / 2. Computing and Operating Systems / 3. PRINT, LPRINT, RUN, LIST, and LET / 4. REM, IMPUT, and GOTO Commands / 5. Data Types / 6. Designing Problems and Solutions / 7. The IF-THEN-ELSE Logic and GOSUB / 8. Errors and What to Do About Them: The Diagnostic PRINT Statement / 9. Looping and Arrays / 10. Advanced Systems and File Structures

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**by JULIE CHAN & MARILYN KOROSTOFF,** *CompuKids Learning Centers, Seal Beach, California*

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- how to market and sell your software product

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# COMPUTER LITERACY
## FOR
### TEACHERS

## FRANK P. BESAG
## LEONARD P. LEVINE

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# INTRODUCTION:

# THE VALUE ORIENTATION OF THIS BOOK

**There are two books in this set:** The book you are reading, *Computer Literacy for Teachers,* and *BASIC for Teachers.* The BASIC text teaches a skill, while the Computer Literacy text discusses ethics, values, and computer theory.

Originally we wrote one rather large book. However, after some discussion, it became clear that some people might want only the skill and others only the theory, so we divided the material into two smaller books.

Both books do have the same general value orientation, namely, that information has always been a source of power and that the computer revolution has made information an even more available source of power. There is now about 1 microcomputer to every 250 families. Unfortunately, these microcomputers are not evenly distributed throughout our society and, therefore, information is not equally available to all. If the schools do not intervene and teach computer skills to those children who are not fortunate enough to have computers in their homes, there could be a further division in our society on the basis of those who have the money, skill, and influence to access, create, and make use of computer information.

The schools must again come to the rescue of those who would otherwise not have information skills available to them. The United States' schools have traditionally played this role. Ours is the only society that educates all of its citizens in free public elementary, junior/middle, and senior high schools (without division at the high school level into vocational and academic tracks), and also includes relatively inexpensive public higher education for those who want it.

This has led to a society where we believe in equal protection under the laws and equal access to "life, liberty, and the pursuit of happiness." The Supreme Court has defined education as part of that pursuit and the Court has told the schools that all children must be given equal access.

In general, we, as educators, welcome those Supreme Court decisions because we believe that all children should have the opportunity for a good education, not only for their sake but for the society's as well. A democratic society cannot exist without an educated populace, and teachers as a rule believe in a democratic society.

The computer revolution has again put educators in the forefront, and we will again have to learn a new skill so that we can pass it on to the children, particularly the children of the have-nots. This is our role and many of us see it as both a challenge and a joy.

These two books, then, one skill and one theory text, are designed to help educators become computer literate so that information skills can be passed to others. However, just knowing how to program in BASIC is not enough: The values, ethics, history, and technology of computers are just as important. Thus the two companion volumes.

Neither this nor the other is the first volume in the set. They are designed to be used together but can also be used exclusively. In either case, we hope two things occur:

(1) That the skills and literacies you learn will be used for the benefit of all children, particularly those who are less fortunate; and,

(2) That learning the skill and theory will be fun and interesting. Too much education is like work. We hope this is play.

# 1

# Knowledge, Power, and the Teacher

- Computer Literacy
- Three Ways of Knowing: Mystery, Magic, and Science
- The Three Types of Explanations
- Teaching and the Three Types of Explanations
- The New Technology
- The Teacher and the Computer
- The Two Cultures and the Computer
- Summary

**This chapter discusses** knowledge as power. Three ways of knowing and the power connected with each are discussed: mystery, magic, and science. We discuss the change from mystery to magic and magic to science and the meaning of those changes for the art and skill of teaching.

Information is a source of power for the teacher as well as the stock in trade of our profession. We, as teachers, need to understand the uses and abuses of the power of information.

Finally, the computer has dramatically changed the type and degree of knowledge and power available to the teacher. The teacher is now a generator of information as well

as a purveyor of information and knowledge. This leads to ethical questions that the computer literate educator must face.

## COMPUTER LITERACY

We, as teachers, teach more than just subject matter: We teach values and understanding. This is no less true when we teach computer languages. We need to know the background of a subject just as much as we need to know the subject itself.

On the simplest level, literacy is the ability to read and write in our native language. A broader definition however, implies that we are not just able to read, but that we use that ability. Literate persons are those who have read widely and have used that reading to increase their understanding of the world around them.

The same distinction exists in computer literacy. On the simplest level we can learn to program computers, understand the file structure, and so on. However, on the broader level, we should be just as familiar with how we intend to use that knowledge and how it will increase our understanding of the world around us. The truly computer literate person is one who understands the role of the computer in the world and how to use that knowledge.

Of even more concern to the computer literate person is that we must understand the computer's power over our daily lives—How will it affect our right to privacy? Will it generate an elite knowledge class? Will that knowledgeable elite have power over those who are not knowledgeable? Should computer knowledge be disseminated widely or should it be limited to a smaller group? These are value questions that should concern the computer literate person.

As with any subject, there is a skill level and an interpretive level. Just as a student must learn to read in order to be literate, so we must learn the basic terminology and primary skills of computers before we can become computer literate. In this text we will combine the two levels: As we learn the skills, we will also discuss the implications for the broader computer literacy.

That is the purpose of this book: to make educators computer literate in the broader sense of the phrase, To that end, we begin with different ways of knowing, the cultural implications of those ways of knowing, and, the value implications for educators of these ways of knowing. After the value discussion, we will introduce information and information theory and the way the computer works.

In brief, we believe that since computers are so important, we want to understand both their value and danger before we begin to use them. We will begin with ways of knowing.

# THREE WAYS OF KNOWING:
# MYSTERY, MAGIC, AND SCIENCE

Human beings want explanations of occurrences. We rarely leave well enough alone. We constantly ask why something occurs. Explanations involve gathering information about the object of our curiosity. This was as true in ancient times as it is now. Why does the rock roll down the hill? Why does it rain? Why does it not rain? All are simple questions unless we are afraid of avalanche, floods, or droughts. In those cases, the questions become matters of life and death.

The questions remain the same over time. The method used to answer the questions has changed radically. Western thought has used three basic constructs to explain occurrences. We call them Mystery, Magic, and Science although those names are arbitrary and others could have been used as easily.

In ancient times, the answers were often mystical. The explanation for the destruction of Sodom and Gomorrah was that God was displeased with their citizens and wanted them destroyed in a hail of brimstone and fire. This is a mystical explanation. The modern day scientific explanations have run from, "It never happened and is a myth" to, "A comet entered the earth's atmosphere and destroyed both cities." Depending on our attitude toward science and mystery, we find one explanation more satisfying than the other.

Science is not better than mystery, merely different. Scientific explanations would be totally incomprehensible to a native of Sodom and Gomorrah. The statement that it was a myth would prove to that ancient resident that indeed the story must be true. To many ancient peoples, including the Greeks and Romans, myths were more real than what we would today call facts. Fortune-tellers, soothsayers, spells, magic, and myth were real.

Nor should we deny the value of myths, mystery, and magic as explanations. Folk medicine and folk ways have been shown to be of great value. The fact that the ancient Hebrews did not eat pig meat most likely saved them from the very debilitating disease of trichinosis. It is doubtful that those ancients understood the relationship between a microscopic parasite that lives in the muscle tissue of the pig and a debilitating disease that has its onset up to 20 years after eating the pork. There is most likely a good mystical explanation for the behavior that has nothing to do with trichinosis. The success is the same whether the explanation is scientific or mystical. In this case, it may have been serendipity since the behavior was intended to save souls but also saved lives in the process.

Regardless of which form of knowledge the society accepts, those who have knowledge of the explanations have power over those who do not have the knowledge—the priest who knows the sacraments, the scientist who knows the workings of molecular structure, the teacher who knows how to make children learn. The person taking the sacrament, the worker who melts the steel, or the student who sits in a

classroom is often not privy to the special knowledge of how and why the process works. They are forced to perform the tasks without understanding the process. This puts them in an inferior position and gives the priest, scientist, and teacher special power through special knowledge.

All bearers of knowledge are powerful whether or not the practitioner is a mystic, magician, or scientist. The priest who can refuse sacrament, the scientist who can split atoms and cause atomic explosions, the teacher who can help or hinder a child all have their own power, based on their special knowledge. The ancient priest would be helpless in the modern classroom and the modern scientist would be burned as a witch in seventeenth-century Salem, Massachusetts.

The point is that no knowledge is inherently better than any other. We are more comfortable with one than with the other because that is the way that we have been socialized to think. Any knowledge is powerful if the society accepts it.

As a final note about the power of information: Information is powerful only so long as it is withheld. Once the uninitiated are initiated, the information is no longer powerful, for example, when the priest tells the novitiate how to give the sacrament, the novitiate becomes a priest and is no longer informationally subordinate.

Teaching is the one occupation that has at its very core the goal of making the learners equal to the informer. We, as teachers, initiate our students into our mysteries every day in the hope that they will become equal to, or superior to, us. We are proud when we can point to one of our students who has surpassed us. We are in the business of making others equal in the information power struggle.

## THE THREE TYPES OF EXPLANATIONS

Mystical knowledge is the most ancient and venerable. It has two primary characteristics: First, the knowledge is shared only with the initiates and not with the public; and, second, the knowledge is mystical, that is, highly personal and not publicly verifiable. Belief exists only in the mind and soul of a particular person and while it can be described to another, it cannot be understood or seen by another in exactly the same way. In mystical knowledge, both the priest and the practitioner believe in the sacrament.

Magical knowledge, as we will define it in this book, is different from mystical knowledge in that the magician does not believe in the knowledge that is described to the audience. Magicians know that it is a trick and, if they wish to, they can explain the trick to the audience. The audience also knows that it is a trick and that part of the fun of going to a magic show is trying to figure out how the trick is done. While magicians usually do not explain their tricks, they could if they wished.

There are then two distinctions between mystical and magical knowledge: (1) Neither the magician nor the audience believe the magic to be what it seems; and (2) the knowledge is potentially verifiable in that the trick could be explained if the magician chose to. Magic, therefore, is more open to public scrutiny than is mystery.

Scientific knowledge is the most open of the three. Both the knowledge itself and the method of achieving it is supposed to be open to public scrutiny. Results of one scientist's experiments are used by others to further the work. Science is a shared activity. For the sharing to exist, the knowledge must be made public. For the knowledge to be accepted, it must be publically verifiable. That is why so many scientific articles spend more time explaining the methods used than explaining the results. The reliability of the method is the key to the validity of the conclusion.

Sometimes we confuse the three types of knowledge. If scientists believe that only the scientific method has any validity and that no other considerations should be used in making a decision, then the scientist has moved from the scientific method to mystical belief in scientism. They are no more and no less narrow-minded than any other individuals who believe that they have a hammer-hold on the truth.

On the other hand, mystical persons who confuse belief with scientific knowledge will find themselves in similar trouble. When Galileo was tried for teaching that the earth traveled around the sun, he was told that that was impossible because Joshua had commanded the sun and moon to stand still in the Bible. That would have been impossible if the sun were already standing still. Joshua would have had to command the earth to stop rotating.

The problem was that scientific knowledge was in conflict with mystical knowledge. Mystical scholars are not interested in whether Joshua caused the earth or the sun to stand still but only that Joshua was able to call upon God to do something. Astronomers are less interested in whether Joshua could call on God for help and more interested in the knowledge about the movements of heavenly bodies.

Regardless of which explanation is used, the phenomenon remains the same. Which type of knowledge is used is most often determined by expedience. If the mystics believe in their own mystery, they will give a mystical explanation both to the supplicants and to themselves, such as "The Gods wish it so."

If the mystics do not believe in the sacraments but know that they must be performed for the sake of the populace, then they are acting as magicians, that is, they perform a task but they do not believe in it. Further, they could explain to the supplicants if they wished to. Those same mystics-acting-like-magicians may wish to teach a novitiate how to perform the mystical practices, for example, "This is how it works but don't tell the public."

The mystics may also wish to make the sacraments more open to participation by the public. This was the case when the Catholic Church, in Vatican II, declared that the mass could be performed in the native language. The sacrament did not change but the degree of participation by the public in that sacrament did increase. In this case, the mystery of the mass was shared with the supplicants and mystery became shared.

In our definition, that would make the mass scientific. It can now be shared and is open to public scrutiny. Each supplicant can now make up his or her own mind about both the meaning and the process of the mass. It was a major step for the church since it had moved from mystical, to magical, to scientific knowledge.

No one of these forms of knowledge has any particular advantage over any other. The mystical explanation may be far more helpful and meaningful if we are discussing death. The scientific may be most helpful if we are discussing disease, and the magical may be the most helpful if we are discussing politics or magic.

## TEACHING AND THE THREE TYPES OF EXPLANATIONS

In the history of education, teachers have used and been subject to all three forms of explanation. There was a time when teachers were considered to have, and considered themselves to have, mystical knowledge of the processes of teaching and learning. Although teachers were trained, many if not most teachers and nonteachers held that a good teacher was born, not made. Teacher training programs could only go so far, and then the innate abilities of the teacher would either show themselves or would not.

It was more than just a good teacher being born. It was also that good teaching could not be defined in any clear way. Teachers and nonteachers both said that although they could not define the characteristics of a good teacher, they knew one when they saw one.

Because teachers had special and mystical powers, their word was not to be questioned. If they said that a child was not doing well and needed a certain type of help, teachers and parents accepted that statement as fact. The teachers also believed that they were possessed of this special knowledge. It was the age of teacher as priest and teaching as mystery.

After World War I that pattern changed somewhat. With the advent of standardized tests and grades as well as standardized curriculums, maintaining the mystery of teaching became more difficult. Good teaching came to be defined in terms of how well the students scored on tests. If the tests showed that they achieved a great deal, then the teaching had been successful.

Even with the new definition of good teaching, much of the mystery remained since it took a good deal of sophistication to understand the tests, grades, and curriculums. Most of the parents, students, and community people did not have that sophistication. Teachers and schools could still claim that they had knowledge that was not available to parents and students.

The knowledge was not a mystery to the teachers any longer. It was, to use our terminology, a set of magical tricks that the teachers knew and the students and the parents did not. This moved it from mystery to magic because everyone, including the students and parents, knew that if they had the time and money, they could learn how to interpret tests, grades, and curriculums as well.

World War II brought perhaps the greatest single revolution in education and social status in our country's history: The G.I. Bill allowed a whole generation of American men and women to attend higher education. It moved our country from a

predominately working-class, lower socioeconomic status population to a professional, middle-class population in one generation.

This affected education. Tests, grades, and curriculum became part and parcel of the average person's life. They were no longer either mysteries or magic but were part of the public knowledge. This moved teaching from magic to science. The behaviors, skills, and procedures of teaching were now on public display and open to public scrutiny.

Teachers could no longer say, "I have special knowledge that should not be questioned" or "I have special training and I know how these things work but will not tell you because it is not your concern." The modern day teacher has special knowledge and power but that knowledge is shared with others. The teacher as miracle worker no longer exists.

In the past decade, parents and community have become even more sophisticated about education and schooling. More and more parents are college educated, white collar, and professional. This has made them both more knowledgeable and more aggressive in their attitudes toward education and schooling. They demanded that the mystical and magical character of education at least be explained to them. They want to know and understand education and schooling. In effect, they want either to be initiated into the mystery of education or they want education to become a public scientific endeavor.

But no matter how scientific our knowledge of teaching becomes and no matter how broadly that knowledge is disseminated, teaching will always have some mystery connected with it because none of us fully understands what goes on in the mind and soul of a learner in the learning experience. As Alfred North Whitehead (1959: 3) said, teaching is both an art and a science. It is understandable science, and it is mysterious art. Regardless of its art or science, however, knowledge of teaching and schools certainly has become more widely disseminated.

## THE NEW TECHNOLOGY

Just as the community and parents became more sophisticated about education, education itself was going through its most recent massive influx of technology. The influx has been so quick and the technology so different from anything that has occurred before, that the change has almost reestablished mystical and magical knowledge. The change is, of course, the advent of easily obtainable computers as educational tools.

While we all know that computers are science, the uninitiated see computers as doing things that are mystical and magical. The only reason it is not mystical knowledge is that we all know that if we had the time and money, we could learn about computers. We know that computer literacy is a set of tricks that we could learn if we had the time and money. But magic is defined as the ability to do something that the audience does not understand.

Our faith in computer magic is quite extraordinary. It may be greater than our faith in education used to be. Nowadays, if a jukebox says that it has microcomputerized selection of songs, we are impressed. Computerized dating services sell better than noncomputerized services. Our cars have computerized ignitions. In these cases, there is some dispute as to what the word "computer" means. Advertisements seem to define a computer as anything with one or more computer chips, and "computerized" as any process that might somehow be related to computer use, no matter how distantly.

To educators and community person alike, we only need to know that a computer exists and we are impressed. If we understand the computer, it becomes an explainable science. If we do not understand it, then it is magic or mystery and the computer literate person acts as the mystic or magician.

## THE TEACHER AND THE COMPUTER

While we would wish that as many persons as possible become computer literate, the specific purpose of this book is to serve the need of teachers and education. Teachers will be, and are, expected to be computer literate. This literacy will add the further magic of computer literacy to the magic and science of teaching in two ways:

First, computer-based analyses will once again make teachers' statements mysterious and magical. Think of the difference in information power in the following two situations:

A teacher tells a parent that a child is "not doing too well in spelling." That is information that leads to more questions, such as, "How badly?" and "Are the other children doing better?" If, however, the teacher says, "On the basis of the computer printout, your child stands twenty-fourth in a class of 30," or, "Your child stands 1.89 standard deviations below the class mean in spelling," it is more difficult to argue the merits of the information. The magical power of teaching and of the computer have combined to create a "scientific fact."

The use of the computer has created mystical knowledge that is viewed as unquestionable truth by both the teacher and the parent. The fact simply is that parents and teachers are more likely to believe the statement that the child stands twenty-fourth in a class of 30 than the statement that the child is not doing well. If we add to that the statement that the information is computer generated, both the parent and the teacher will be less likely to question it. That is the power.

Second, teachers will become generators of knowledge as well as transmitters of knowledge. Although teachers have always had power, the information they passed on to children was information that teachers had gleaned from others. Teachers have traditionally been purveyors of information not information generators. With the advent of the computer in education, teachers can now create information. The teacher can generate computer-assisted instruction programs that contain material the teacher chooses rather than that chosen by district administration or community. Information about students can be generated in a new way, for example, class records can be recalled and analyzed to form a computerized profile and stored for future reference.