

EDUCATION FOR AN INFORMATION AGE
Teaching In The Computerized Classroom, 7th edition

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Chapter 11: Funding Technology Projects

Chapter Eleven
Funding Technology Projects

Education pays, unless you are an educator.

Evan Esar (1899-1995)

Money enables a man to get along without education,
and education enables a man to get along without money.

Marcelene Cox

Resolve not to be poor: whatever you have, spend less. Poverty is a great enemy to human happiness; it certainly destroys liberty, and it makes some virtues impracticable, and others extremely difficult.

Samuel Johnson (1709-1784)

LEARNING OUTCOMES

Technology-rich and technology-ready (wired or wireless) classrooms are expensive to build and expensive to maintain. It should come as no surprise, then, that such classrooms still represent only a small proportion of the hundreds of thousands of classrooms in the United States, and the millions of classrooms worldwide.

In some countries, such as France, the education system is standardized at the national level. It always has been since the time of Napoleon. Thus, there is no disparity between one school district and another such as exists in the United States, for example. There is a national curriculum and students are ensured equal educational opportunity by virtue of the fact that the schools are all provided with the same facilities from a pool of taxation shared nationwide. By contrast, as long as school districts have to rely on their own, mostly local, resources, which is the case in the United States, there will be inequities resulting from the disparity of wealth from one school district to another.

In the United States, a few forward-looking, equity-conscious states such as Texas have implemented a so-called *Robin Hood* allocation of school taxes. Wealthier districts share the money raised for schools in such a way as to make sure that the poorer districts get enough to make it possible for them to fund equally competitive educational programs.

Unfortunately, equality of educational opportunity such as states like Texas are trying to ensure is not mandated nationwide. Indeed, in most states it is not even mandated *statewide*. Thus, the gap between the quality of schooling for the haves and the have-nots will continue to widen unless disadvantaged school districts fight for the allocations that will enable them to provide the same level of technological infrastructure enjoyed by the wealthier school districts.

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To this end—no problems, only solutions!—numerous sources of funding can be tapped through the effective writing of grants.

But first, this chapter begins by briefly re-examining the goals of education in an information age. This will underscore the importance of finding the money to pay for the cost of ensuring that children have the opportunity to achieve those goals. The goals are looked at from the perspective of what the working world requires of schools in the way of a well-prepared, employable workforce..

The chapter goes on to list many sources of funding, outlines the key components of a strategy for successful grant applications, and discusses how to get the most out of external sources of funding once they have been won. Finally, the chapter discusses the important subject of evaluating grant-supported projects.

Here then are the topics that will be covered in this chapter:

- Introduction: Everything Points to an Increase in the Cost of Education
- The Goals of Education in an Information Age
 - The five competencies of effective workers
 - The foundation skills required of effective workers
- Sources of Funding and Support
- Preparing Grant Proposals
 - Steps in the preparation of a grant proposal
 - Strategies for successful applications
 - The qualities of a grantsperson
- Evaluating Your Technology Program
 - The purpose of evaluation
 - When should a program be evaluated?
 - The components of the evaluation process

INTRODUCTION: EVERYTHING POINTS TO AN INCREASE IN THE COST OF EDUCATION

Money is only part of the answer to the challenge of incorporating computers into the curriculum, but it is an important part. As Cheryl Williams put it in Branscum (1992): "Schools need funds and it's not a one-shot deal. ... you've got to buy the equipment, you've got to buy the software, you've got to buy the maintenance, you've got to buy the training, you've got to buy the updating, and you've got to phase it in."

Money is thus necessary to meet the needs of the people on the front lines in the struggle to update and restructure education. These are the teachers and administrators at the local level. This chapter discusses these sources of funding, and they are many. Aggressive school districts, many of them in underprivileged neighborhoods, are already dipping into this well of financial opportunity.

It should be remembered, however, that there is one small problem with grants. Once one has been won, the work has just begun. Applying for a grant implies a commitment to the

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effort and innovation that the grant will fund. But as the old saying goes, "Fortune favors the brave."

Bork (1987), after presenting the case for technology-stimulated change in our education systems, estimated that an effort to coordinate full curriculum development on an international scale would cost about \$10 billion over a period of six to eight years. Bork's estimate was made nearly 20 years ago; the estimated sum would be considerably larger now. This might appear to be a prohibitive expense. But, as Bork points out, it represented in 1987 just one-third of the cost of putting one person on the moon and "is about one or two days of the [pre-end of Cold War] military budget each year."

Following are some of the items that have to be factored into the costs of a free appropriate public education for the citizens of tomorrow's world.

- For a host of sound pedagogical reasons, including the effectiveness of technology integration for teaching and learning, the ratio of teachers to students needs to improve. Teacher-student ratios are indeed improving (from 1:27 in 1955 to 1:17.8 in 1995 to even slightly lower (16.4) by 2003)¹. This means that schools need more, rather than fewer, teachers as time goes on, assuming a steady or increasing birthrate. Schools will also need more, rather than less, physical plant to house those extra classrooms.
- In the United States, the No Child Left Behind (NCLB) law means, in effect, that schools must redouble efforts to individualize instruction. Technology can help teachers customize the learning environment for each student, thus enabling individualized instruction in order to help assure that each individual child's learning needs are met. We can no longer pretend that there is some arbitrary, statistical bell curve that condemns an unacceptably high proportion of the population to educational nirvana. NCLB requires of good teachers every day that they ignite a spark of learning in children who formerly may have been given up on by others.
- The only relevant statistics in the schools of the future will be those that promote quality and a policy of continuous quality improvement in the way we serve *each child's* educational needs. The pursuit of quality in education carries a cost, but it is a cost that is recouped a hundredfold in terms of better prepared citizens and a society enriched by their participation in its economic and cultural affairs.
- As will be discussed more fully in the next section and in chapter 12, the changes in society in general, and in the workplace in particular, mean that, more than ever before, children must be given the opportunity for a lifelong education that will enable them to be fully contributing members of the information society.
- Everyone must get a fair slice of the education pie. The money needed for education must be shared equitably among all segments of the population, including children from all walks of life, of both sexes, and from all racial and ethnic backgrounds (Stone, 1990). To quote from *A Nation at Risk*, "We do not believe that a public

¹ According to the US Department of Education—<http://nces.ed.gov> (Digest of Education Statistics, 2005)

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commitment to excellence and educational reform must be made at the expense of a strong commitment to the equitable treatment of our diverse population" (The National Commission on Excellence in Education, 1984).

- More money than ever will be needed to provide effective leadership in schools. Teachers especially must be given the time, ongoing training, and logistical and technical support necessary for them to get the job done. It would also help if teachers were adequately remunerated for their skills and dedication, as recommended in *A Nation at Risk*. After all, it is the children's lives and society's well-being that are at stake.
- Educational technology is attended by a whole gamut of expenses ranging from the cost of the machinery itself, to the infrastructure necessary to support the machinery, and to the training and technical support of those who will use the teaching and learning systems.

Thus, winning grants is necessary to provide adequate funding to help the schools maintain a high standard of educational excellence relevant to modern times. This begs the question: "What is educational excellence and how is it to be measured?" This question has already been asked and answered. The obligation of schools to prepare students to function successfully in an information age is underlined in a report issued by the US Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS, 1991). So before we consider the nuts and bolts of grants, grant proposals, and grant implementation, let us take a look at this SCANS report in order to understand what are the competencies expected of workers in an information age.

THE GOALS OF EDUCATION IN AN INFORMATION AGE

A successful society is one that provides a high quality, lifelong education for *all* its citizens. This is a costly proposition, but the return on such an investment fully justifies the expense. The price that will be paid by a society that fails to commit to this goal will be devastating. This is the message that lies at the heart of *A Nation at Risk (1984)*:

"We issue this call to all who care about America and its future: to parents and students; to teachers, administrators, and school board members; to colleges and industry; to union members and military leaders; to governors and State legislators; to the President; to members of Congress and other public officials; to members of learned and scientific societies; to the print and electronic media; to concerned citizens everywhere. America is at risk."

Education is a key that opens many doors.

- Education prepares one to function successfully in a working world where manual skills are less and less in demand as compared to intellectual skills such as communication skills and problem-solving skills.

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- Education gives one the technical and intellectual skills to access and assimilate information.
- Education opens up a range of opportunities, allowing one to adjust and adapt to changing circumstances in the course of a career that will be subject to frequent change.
- Education enables one to make satisfying use of leisure time, bringing one to the point where one can educate oneself, broadening interests, acquiring new skills, and pursuing lifelong learning.

The Five Competencies of Effective Workers

The SCANS report (SCANS, 1991) identifies "five competencies which, in conjunction with a three-part foundation of skills and personal qualities, lie at the heart of job performance today." The competencies and foundation skills are seen as "essential preparation [for the working world] for all students." They are also essential preparation for further education and for life in general in the information age.

The five competencies required of effective workers are defined in the SCANS report as follows (emphasis has been added):

- Effective workers productively use *Resources*—they know how to allocate time, money, materials, space, and staff.
- Effective workers productively use *Interpersonal skills*—they know how to work on teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds.
- Effective workers productively use *Information*—they know how to acquire and evaluate data, organize and maintain files, interpret and communicate data, and *use computers to process information*.
- Effective workers productively use *Systems*—they understand social, organizational and *technological* systems, they know how to monitor and correct performance, and design or improve systems.
- Effective workers productively use *Technology*—they know how to *select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot technologies*.

The Foundation Skills Required of Effective Workers

The foundation skills that are identified in the SCANS report as prerequisites to competence are:

- Competence requires *Basic skills*—including reading, writing, arithmetic and mathematics, speaking, and listening skills.

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- Competence requires *Thinking skills*—including the ability to think creatively, make decisions, solve problems, mentally visualize situations and solutions to problems, a knowledge of how to learn, and the ability to reason.
- Competence requires *Personal qualities*—including individual responsibility, self-esteem, sociability, self-management, and integrity.

The SCANS report (1991) reminds us of the primacy of education to American democracy:

“For over 200 years Americans have worked to make education part of their national vision, indispensable to democracy and to individual freedom. For at least the last 40 years, we have worked to join the power of education to the ideal of equity—for minority Americans, for the disabled, and for immigrants. With that work still incomplete, we are called to still another revolution—to *create an entire people trained to think and equipped with the know-how to make their knowledge productive.* (emphasis added)

“This new revolution is no less exciting or challenging than those we have already completed. Nor is its outcome more certain. All that is certain is that we must begin.”

Well, we *have* begun to overhaul the way we do education; change, after all, is inevitable. Fifty years from now, learning environments will look very different from what we see today. Computer-based learning is essentially constructive and interactive. It is less dependent on a specific location such as a classroom in a school. Children will still come together, but in smaller units, and in less rigidly regimented environments. There will be a great diversity of types of schools unified only by the requirement of preparing students to measure up to standards established by regional and/or national educational goals.

Teachers, too, will have different goals, different responsibilities. They will be more concerned with education and less concerned with classroom management because children will want to learn. With the technology in place and the teachers trained and committed to its use, we will be able to "pay attention to the needs of each student by individualizing the learning experience" (Bork, 1987).

No doubt, in due course, Herbert J. Klausmeier's dream of Individually Guided Education (Nussel, 1976) will become not the exception, but the rule.

SOURCES OF FUNDING AND SUPPORT

There are two types of sources for funds and equipment to support technology projects: steady sources and ad hoc sources. Steady sources of support are represented by institutions such as the US Department of Education, State Departments of Education, and corporations such as Apple, IBM, Microsoft, Dell, and so forth, which make a certain amount of grant money and/or equipment available every year. Ad hoc support is available

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on an irregular basis from foundations, local businesses and other local fund raising efforts.

Technology & Learning e-zine (<http://www.techlearning.com/resources/grants.jhtml>), an online resource for Education Technology Leaders, includes links to many websites with recommendations for funding for technology projects, including both steady and ad hoc sources. Here is a summary list of the kind of sources any K-12 teacher can consider when in need of funding for classroom technology resources. The list was compiled by Tom Wilson in an early edition of the T&L magazine (Wilson, 1992).

District general funds Money raised from local taxation, especially real estate taxes. A slice of this pie goes to local schools. More and more school districts set aside money from this pot to be allocated specifically for educational technology.

Funds for special educational categories Budgets for Chapter 1, learning disabled, and other special needs students often allow for support of technology-related projects.

State-run educational improvement programs Most states today make some provision for budgetary support of technology-based programs for schools. In Pennsylvania, for example, the Information Technology Education for the Commonwealth (ITEC) Act, passed in 1984 and described in Dunlop (1986), was intended "to (1) provide teacher training in computer information technology, (2) help design computer-oriented elementary and secondary curricula, (3) assist teachers and school administrators in the evaluation of educational computer software, (4) administer and fund individual schools' proposals to acquire and upgrade computer equipment and implement computer-oriented instruction, (5) assist in the coordination of the purchase of microcomputer hardware and software for Pennsylvania schools and (6) loan equipment and computer software to non-public schools." The ITEC program operated in Pennsylvania for ten years, till 1995, when it was superseded by a new series of state-funded programs called Link-to-Learn in support of K-12 technology integration.

Parent-Teacher Organizations All over the world, schools rely on such organizations/associations for fund-raising. Computing technology is an ideal focus for PTA/PTO efforts since it has such a direct impact in the classroom.

Grants There are innumerable sources for grants of all kinds, whether from local, state, or federal government, or from private institutions such as foundations or corporations. The granting agencies send out Requests for Proposals (RFPs) asking interested parties to submit detailed requests for targeted funding. This process is discussed in detail later in the chapter.

Federal Computer Week e-zine noted (January, 2004) that "federal grants for state and local education continue to rise, reaching almost \$35 billion in fiscal 2004 including more than \$700 million specifically for technology programs, according to officials from the market research firm Input." The article goes on to point that "much of the increase comes through the No Child Left Behind Act of 2001, which established several grants programs to improve education through technology and access to technology."

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General obligation bonds Some school districts win electoral support for school bond initiatives to support improvement of capital facilities, including technology-related equipment. School districts have, for example, persuaded the electorate to agree to a one mil increase in local taxation to fund the infusion into the schools of the latest multimedia technology (Foreman, 1991).

Lottery money States that conduct lotteries can be lobbied to allocate some proportion of the supplemental revenue to educational technology.

Partnerships with colleges or local adult-education programs This idea was successfully implemented at the Minute Man Technical High School in Lexington, Massachusetts. The program offered courses for parents and local citizens with revenues allocated to improve technology-based education at the school. Many state and federal technology grants are predicated on collaboration between universities and local school districts.

Vendor contributions Stanton (1992) provides details of generous programs sponsored by Apple Computer, Inc., IBM Corporation, Microsoft Corporation, NEC Corporation, Tandem Computers, Tandy Corporation, and Toshiba America Information Systems, Inc. The combined dollar value of the grants and product donations made by these companies alone came to well over \$200 million a year.

Foundation grants The Michigan State University Libraries maintain a useful web resource at <http://www.lib.msu.edu/harris23/grants/2comptec.htm> listing grants in the area of funding opportunities for computer technology for non-profits such as K-12 schools.

Parent workshops and after-school student instruction This source of funding is similar to the partnerships with colleges and local adult-education programs already mentioned. Basically, the school sets itself up in the *business* of education, offering workshops for a fee to parents, students, and local citizens. The teachers are paid for their services as instructors, so it is an opportunity for them to augment their income. Like any business, the program has to be well-organized and efficiently run. The potential for net profits can be substantial.

Lease/purchase agreements Where the technology is leased from a vendor, rather than purchased outright. This arrangement has the advantage of reduced initial financial outlay, thus spreading out the financial burden involved in the purchase of the hardware, software, and support for technology-based programs.

Local business donations As far as computer-based technology is concerned, the major contribution of local business is expertise and training. Many schools are now looking to develop close liaisons with local businesses for purposes of educational support. Financial donations are also available. Outdated computer hardware and software, which a business may be replacing with state of the art systems, can often be put to good use in a school, especially when there is a teacher or staff member who has the motivation and the knowledge to incorporate it into the curriculum. However, such outdated equipment

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can as often be more trouble than it is worth, and may be best utilized as part exchange for more up-to-date systems.

PREPARING GRANT PROPOSALS

Steps in the Preparation of a Grant Proposal

A useful paradigm for developing a grant proposal is the classic problem-solving model advocated by Polya (1945) which we already applied, in chapter 4, to the problem of designing computing environments. A grant proposal is designed to help solve the problem of coming up with financial support for projects. Once a request for proposal (RFP) has been received from a funding source, Polya's four steps in the problem-solving process can be applied as follows to the development of grant proposals:

Step One: Understand the problem This is equivalent to researching the educational environment for which the grant is proposed. Starting with the current state of affairs, identify the way learning currently takes place: methodologies, equipment used, student profiles, and so forth. This will unearth opportunities for improvement that can benefit from technology. These improvements would be stated as *objectives*. The process of understanding the problem will also identify *constraints*: unavoidable limitations on the scope of the project (budget, physical plant, learning abilities, etc.). Very important at this early stage: *involve the teachers and students who will benefit from the grant*. Continue to involve them throughout the process, thus helping them to commit to the project if and when it is funded.

Step Two: Devise a plan At this stage, you have a reasonably good understanding of the problem the grant proposal is designed to address. Devising a plan involves drawing up in detail the series of steps that will lead to the achievement of the objectives spelled out in Step One, as well as a specification of all necessary equipment and support. It is important at this planning stage to draw up more than one plan. There is never only one solution to any problem. Eventually, of course, you will need to select the one best strategy for presentation in the grant application proposal.

Step Three: Carry out the plan Prepare the proposal. This should be relatively straightforward if you have conscientiously completed the first two steps. In fact, you will already have written much of the proposal.

Step Four: Look back (Evaluate the plan) Review the proposal carefully before signing off on it and sending it out. Especially important is to have others review it, including people who had nothing to do with the preparation of the proposal. The more objective the appraisal the better. Be open to other people's ideas and perspectives. Only a fool thinks he or she has all the answers.

Following these steps will greatly improve your chances of success. The next section outlines some other strategies that are important in winning grants.

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Strategies for Successful Applications

Get to know your grant officer Grant officers are individuals at funding institutions who act as liaisons between those seeking funds and those who determine the distribution of those funds. The grant officer is a key resource for information about the focus of a grant application, about what funded objectives should be emphasized in the proposal, and so forth. It is important to establish a close relationship with a grant officer, and maintain that relationship over the life of a grant, which can span many years.

Each school district and each school should appoint a grantsperson for grant coordination An individual staff or faculty member at the school should be responsible for coordinating grant applications. This individual should be allocated time to do the job. This is the single most important recommendation for success in raising grant money. If something is worth doing, make someone responsible for getting it done. In general, it is a waste of time making announcements and putting up signs encouraging people to do this or that, like write grants and so forth. Everyone knows that there is a lot of hard work involved with winning grants, so it is essential to appoint a staff or faculty member to be responsible for coordinating grant applications. Included in that responsibility will be making other teachers aware of the grants that are available, to encourage them to get involved, and to work with them to develop proposals. This individual “grantsperson” might also be responsible for working with teachers in the implementation and evaluation phases.

Teachers should always know that they will have active support if they apply for grants. The more teachers are involved, the better. Schools that rely on one or two heroes to make things happen are not usually as effective as schools where the administration is able to create a spirit of teamwork among the faculty and staff. Schools should consider the cost involved in freeing up a teacher or staff member to coordinate grant acquisition as *seed money* for the many profitable projects that will result from the investment.

Allow for the hidden costs of grants

- *Grants take expensive time and effort*; to prepare the grant proposal, to implement the grant once won, and to evaluate the impact of the grant.
- *Grants often require a direct or indirect matching investment*. Some grants are offered on the condition of matching funds. This is because matching funds imply a commitment on the part of the institution that receives the grant, thus giving the grantor some assurance that the money, equipment, or services will not be wasted. An indirect matching investment might be the lifetime cost of support personnel, power supplies, peripheral (support) equipment, office supplies, and so forth.
- *Grants carry the cost of resistance to change*. Introducing even one computer into a classroom demands change, unless, of course, the computer is not used. That there are so many unused computers in classrooms confirms the fact that change is always difficult. Schools that acquire and implement grants must factor in the effort

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involved dealing with this very human resistance to change. This is why it is important to involve in the grant proposal process those who will be affected if the grant is won.

Whenever possible, use the computer to write the grant proposal The computer comes in handy even when a special form must be used. The form itself can sometimes be reproduced on the computer. These days, however, forms for grant proposals more often than not are available for download from the grantor's website. Most grant proposals have sections that involve freeform text, which means that they can be quickly filled out by cutting and pasting from pre-used electronic forms.

The school's grants coordinator should keep a database of grant applications and proposals and make them available for reference to those involved in writing grants. This kind of support can take much of the drudgery out of the task of applying for grants. Usually, grant proposals must be accompanied by the curriculum vitae of those responsible for implementing the grant. These should be kept on a computer, too, so that they can be easily updated whenever necessary.

It is surprising how many people fail to apply for grants because of the paperwork involved. The computer can help take a lot of the tedium out of this tough, but important, task.

If at first you don't succeed, try, try again¹ Do not be disappointed if you fail to win every grant you apply for. Bear in mind that there may be hundreds of others who are applying for the same grants. You are selling yourself and your ideas to the grant awards committees. Unless you are applying for grants that are of interest to a very limited number of people, you should expect to win no more than, perhaps, one in five of those you apply for.

The excellence of a proposal is, therefore, no guarantee of success. This factor alone discourages many from applying for grants. This is why grant applications should be coordinated. The more people a school or school district can involve in preparing grant proposals, the easier it will be to generate a critical mass of applications, thus upping the likelihood of success.

The coordinator should not simply encourage people to apply for grants. He or she should actively assist in the development of proposals. Most teachers will not apply for grants on their own. Many teachers will get involved if they feel they are part of a team.

A grants coordinator should try to identify whatever is the current "hot" area for grant/foundation funding The grantor's Request For Proposal (RFP) will usually indicate a general target, such as "N number of dollars for educational technology." The RFP form will ask you to provide responses to a set of questions that will allow you to map out in detail what use you propose to make of the money or equipment. One year, a grant's focus may be multimedia, another year it may be networks. This "hot" area will differ from grant to grant, as well as from year to year.

¹ William E. Hickson, *Try, Try Again*.

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What this means in practical terms is that experience will help you cut down on the hit and miss nature of grant applications. The more grants you apply for, the more you are likely to win; assuming, of course, that you learn from each experience. Hence the next recommendation.

If your grant proposal is turned down, find out why Often an institution funding grants will tell you why your proposal was turned down, even if you do not ask. This is free advice from experts in the business, so you should welcome it as such. Sometimes, indeed, an institution will send a copy of the winning proposal as a model for future applications. When this is not the case, you should write for a formal statement so that you can learn from the experience.

The Qualities of a Grantsperson

A grantsperson must have excellent organizational skills He or she not only needs to be able to coordinate the grant application process, but also must be good at delegating work. This is not simply in order to increase the number of proposals submitted, but also to encourage other teachers to get involved with applying for grants. If teachers are committed to a project, they will be more likely to be enthusiastic when it is implemented in their school.

A grantsperson must be reliable when it comes to meeting deadlines A sure way to lose a grant is to submit the proposal even one hour, let alone one day, late. The first process carried out by people reviewing grant applications is the development of a short list of candidates. Only those proposals on the short list receive close scrutiny. Proposals that arrive late are the first to be eliminated; they are not even looked at.

A grantsperson must be a good writer Much of a grant proposal's success depends on the quality of the presentation. The proposal is designed to sell the project. A grantor will be more likely to look favorably on a proposal that is couched in credible terms. Not only must the writing be mechanically sound, but it must also get to the point, capture the reader's attention, and convey the strong impression that the funded organization will maximize the potential afforded by the grant should it be forthcoming. If your proposal is poorly presented, no matter what its other merits, it will probably be eliminated from the short list.

A grantsperson must be good at working with people So much work is involved in preparing proposals that it makes sense to get others involved early in the process of developing the grant application. This is especially true of those who are likely to benefit most from the resulting grant. People who are good at working with others generally have strong communication skills, lots of patience, and a genuinely friendly personality. These are invariably the qualities of a good grant writer, too.

It may seem that it would be difficult to find someone with this set of qualities. As it happens, because these same qualities are required of good teachers, there should be plenty of potential resident grantsperson candidates in every school!

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EVALUATING YOUR TECHNOLOGY PROGRAM

The Purpose of Evaluation

Frequent evaluation is the key to any system's on-going success. Sometimes we hear programs being praised purely because they happen to exist. How many times have we heard something like this:

"Last year, a sum in the amount of \$500,000 was spent on the purchase and installation of additional student computing facilities. We feel that this allows us to offer our children an educational experience that will prepare them for the technological age."

(Round of applause... Hear, hear! Jolly good show!)

Sound impressive? Well, yes, but what does it mean?

There is no mention of computing facilities for the teachers. There is no mention of any allocation of time for teachers so that they can learn how to use the new technology. In fact, there is no mention of *how* "additional student computing facilities" will make any difference at all!

This is what some school districts pass off as demonstrating their commitment to providing the best possible educational experience for their students. As Branscum (1992) observed, "for far too many, computers are ... used in tragically misguided ways."

Of course, making money available is important. Computer-based education is a lot more expensive than "chalk and talk." But, if the money invested is to yield an acceptable return, there must be accountability in terms of results clearly demonstrating improvements along criteria laid down by the managers at all levels of the educational process.

Accountability is possible only if there exists a clear set of criteria based on a school district's educational goals. Routine evaluation is the process that puts accountability under the magnifying glass by examining a system's success against established expectations.

Think of evaluation of a learning system, whether designed around computer technology or not, in the same way as you would think of service on your car or check ups on your health. The idea is to improve the performance, and ultimately extend the life, of the system under examination.

When Should a Program be Evaluated?

Evaluation that is done with care and sensitivity and that is approached from a positive perspective helps maintain the healthiest possible status for a system. Therefore, the best time to evaluate a program is when it appears to be working perfectly. In the same way, the best time to service a car is when it is running well, and the best time to check out the human body is when it is in a robust, healthy state. Evaluation of a learning system should also be routine, with the objective of checking to ensure that initially stated goals continue to be met.

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Evaluation also has the purpose of identifying opportunities which will lead to continuously improving upon the state of a system.

It is usually the case that new and often unexpected positive or negative aspects of a system are identified during the process of evaluation. Negative outcomes that are identified early can be circumvented and avoided for the future. Positive outcomes can be seized as opportunities for extending the potential of the system.

For example, a *Teaching and Learning With Technology* project described in Klenow, 1991 had several unexpected outcomes, among which were the following:

- Teachers discovered that "they no longer want to teach without technology," and that "they can be omnipresent without being controlling."
- Teachers and students discovered that "they have a greater tolerance for ambiguity and that both parties have ownership in the teaching/learning process."
- "The project forced [the teachers to engage in] conscious discussion of their roles as teachers causing them to take stock of themselves and their work."

Many other *Teaching and Learning with Technology* projects are described on the Web at <http://www.tlt.ab.ca/projects/projects.html>.

There is so much richness in experience, with the result that surprises like this are the norm, rather than the exception. The beauty of discovering unexpected outcomes is that, once discovered, they can be handled—enhanced if the outcomes are positive, corrected if they are negative.

This is why evaluation should be conducted when the system is in a healthy state, not when it is already on its last legs.

The Components of the Evaluation Process

Draw up evaluation instruments based on the objectives for the project stated in the proposal The first step in evaluating a technology program is to identify and spell out the objectives of the program. These objectives should be sufficiently specific as to be *measurable*. In the case of a technology program funded by a grant they will already have been spelled out, for the most part, in the grant proposal. These measurable objectives would then become part of the evaluation instruments, which are comprised of a series of check points and questions regarding predetermined aspects of the project. Questionnaires, pre and post tests, and portfolios of student work are examples of useful evaluation instruments. These evaluation instruments would be used during the regularly scheduled process of data collection about the project.

Reviewing the objectives spelled out in the proposal has the following benefits:

- The objectives will assume new importance prior to implementation of the grant. Implementers will approach the process of implementation more focused on the outcomes from their efforts. If you know where you are going, you are much more likely to arrive at the correct destination.

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- With the passage of time, it may well be that stated objectives need to be adjusted or augmented to reflect change in circumstances that have occurred since the grant proposal was originally drafted. New objectives may have become apparent. To the extent that they do not compromise the essential purpose of the grant, these additional objectives should be considered for inclusion alongside the original objectives to help guide implementation and evaluation.
- Some objectives will not be as important as others. Reviewing objectives will enable the implementing team to prioritize them, thus reducing the danger that important goals might become sidetracked by an unwarranted preoccupation with ones of lesser importance. For example, one objective of introducing new computer-based technology might be to *foster computer literacy* (familiarity with, and appreciation of the value of, computer technology) among the students involved in its use. Another objective might be to *improve students' writing skills* as measured against norms established by some specific, standardized assessment instrument.

These are both laudable objectives; the first, however, should not take priority over the second—and *should not be touted as a significant outcome from the project*—because, to a large extent, computer literacy will take care of itself in the world of today's child, where computers are, for the most part, taken for granted anyway. On the other hand, the second objective, improving students' writing skills, will always represent a crying need in schools.

Computer-based systems for developing writing skills have been shown to augment other methodologies in pursuit of this objective, and, therefore, fostering improved writing skills using computer-based systems is a goal worthy of diligent application. As Pillar (1992) observed, emphasis on computer literacy can too easily become a cop out when justifying computer use in schools. It covers up an all too common reality: money spent on computer technology has been wasted on poorly focused, poorly supported, poorly implemented systems.

Use the evaluation instruments to conduct the evaluation Each time data are collected, they should give a snapshot of the state of the environment. As Kinnaman (1992) explains, when it comes down to it, evaluation involves "stopping at both predetermined and random points on your journey to look around and answer the questions: *"Do the surroundings look the way we expected them to look at this point?"* and *How happy are we with our progress?"*

Kinnaman (1992) recommends that we look at more than student achievement on tests when conducting an evaluation. Pre and post tests, for example, are a useful barometer, but not a completely reliable one. Tests can be unconsciously biased or inappropriate. Other useful, though more time-consuming, measures involve:

- "performance assessment [which] focuses on what the student can *do*" (projects, portfolios of work accomplished);
- questionnaires and interviews to sound out "student attitudes ... motivation, effort, or enthusiasm";

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- and similar instruments to sound out "teacher attitudes and behaviors ... teacher motivation ... ways in which teachers interact with each other [or] with students."

Evaluation is an opportunity for improving the quality of a funded project. It should begin the moment the decision is made to prepare the grant proposal and should continue at regular intervals throughout the life of the project. The goal is the pursuit of excellence, which can be sustained only if we accept that it is by no means guaranteed. Educational technology-based projects that are evaluated in this way are far more likely to succeed. They are also more likely to provide a wealth of experience that will lead on to improvements in other areas of educational endeavor. As the English philosopher Aldous Huxley remarked: "Experience is not what happens to a man. It is what a man does with what happens to him."

LOOKING BACK

In recent years, education systems all over the world have come under scrutiny and been found wanting. In some countries, the systems are criticized as being too elitist, excluding too many of their youth from access to higher levels of education. In other countries, the systems are criticized for the declining quality of the graduates, at least as compared with 20 or 30 years ago. The United States, "a nation at risk," has also been found wanting. Education is at a crossroads. There is a sense that major change must occur if our schools are to meet the needs of future generations of children. But that change is expensive. In better economic times, schools can expect an adequate level of federal, state and local support. But, by all accounts, national and global economic constraints are going to hamper educational progress through the remainder of this century, unless we take matters into our own hands.

The Computer Learning Foundation is a nonprofit educational foundation serving the United States and Canada. Its primary focus is on developing computer competence among youth. It is officially endorsed by 54 U.S. and Canadian departments of education and 25 national nonprofit organizations. Funding for the foundation comes from U.S. and Canadian corporations, local businesses, and individuals. It is representative of many governmental and private philanthropic organizations in that it is dedicated to helping the deserving needy pull themselves up by their own bootstraps.

That is what grants and donations are designed to do. Ideally they are not given away arbitrarily. It is as if the sponsors are saying: "We have substantial amounts of money and equipment to help you. Show us that you understand the educational needs of children in a modern society, show us that you are likely to make the most of any help we give you, and we will provide you with the wherewithal to pursue excellence."

Sometimes we must grasp opportunities for change and make things happen.

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LOOKING FORWARD

It is now time to turn our attention to the impact the computer has had, is having, and will have on society in general, and on education in particular. To do this we will shift our focus from the computer as an entity in itself to the computer as a factor in social change.

Chapter 12 will examine a selection of the social impacts of advances in computing science. How has the computer extended human capabilities both as individuals and as social groups? How has the computer enabled us to effect significant change in our social institutions, including education? The accelerated pace of this change (Toffler, 1971) means that we cannot afford to wait on the sidelines. Non-participation will do a disservice not only to ourselves, but more importantly to the children with whose future we are entrusted.

Chapters 12 will go on to examine various ethical and legal issues that have arisen with the proliferation of computer-based technology. Privacy has become a luxury, while inequitable access to the benefits technology brings are creating a widening gap between the haves and have-nots. Computing technology is also spawning a new kind of criminal with the technical skills to carry out computer-assisted crime. Our students need to be aware of these problems.

As the saying goes, Knowledge is power. But here's another saying that is equally relevant: Forewarned is forearmed!