

Humanware

A Few “Humanware” Principles: The key to successful use is know-how. Too many people spend thousands of dollars on hardware and software and zero dollars on humanware. Teachers are rarely successfully trained on a consistent basis. The appeal of the quick fix causes many schools to buy new technology without providing the resources for professional development. Money must be budgeted for ongoing P.D. or the institution runs the risk of failed technology integration: not using the machines and thereby wasting money. The fact that technology become dramatically more powerful and cheaper every two to three years means that you don’t buy unless you have a concrete plan for the implementation of those uses. Our view in Summercore is that technologists generally tell you half of what you need to know. What they neglect might be best described in the following OTC guiding principles:

PRINCIPLE #1: Computers don’t save time; they consume it

Learning how to use apps and Web 2.0 sites effectively consumes time. And even upon mastering the techniques, the teacher will generally find that technology consumes time, because now there is access to tools which will improve the quality of their teaching. In fact, rather than thinking that you buy technology to save time, it is best to think that you are buying it to improve the quality of your output, whether printed or pedagogical. Maintaining an online glossary of poetic terms or creating a multimedia slideshow may actually be much more time-consuming than pre-Web 2.0 times, but the quality is likely to be superior. New technologies allow for a deeper, richer treatment of many subjects, not necessarily for a quicker means to process the material. Without question, technology can consume too much time, but if the quality can be improved, then obviously we need to examine when and how to use it.

PRINCIPLE #2: Computers resemble violins more than blenders

Buy yourself a blender, unbox it and you’re ready to use it. Get yourself a violin, and it’s most likely that you will need instruction. Without a good teacher, very few people can learn to play the violin. With one, most people can! And even if you don’t absolutely need technology instruction, you can save yourself considerable time and frustration. We believe that learning even the basic usages of technology will take time. And even though many applications can be looked at without instruction, hands-on instruction can save a first-time user hours of time. Yes, of course, some people require no instruction and of course, some people learn better by trying. But this group of users who are willing to read help screens carefully, view YouTube tutorials, and spend hours fiddling with the features is a small percentage of a school population. And let’s face it, most normal people greatly prefer reading novels to FAQs!

PRINCIPLE #3: The key to success is increasing overall proficiency

In the Dark Ages of the 80s when we started Summercore, schools and businesses might typically spend about \$10,000 to \$20,000 on hardware and allocate 10% for initial training. In the 21st century, the devices are more powerful and much cheaper, but the training needs have not vanished. While there are new devices and technology tools that are designed as consumer products where you can take it home or bring it to our classrooms, turn it on and instantly

become productive, true success will come with support and training. Time has shown us that if even we create a technology-rich environment, our schools will not necessarily improve. The lack of effective school-wide technology integration strategies is both startling and saddening. Why? Because there is not enough professional development provided and not enough teachers who are pushed to integrate technology into the classroom in a meaningful way. There are not enough English teachers who know how to use Google Docs to teach the art of writing and collaboration and not enough Art teachers who know how to use online graphic editing sites. Not enough Math teachers who know how to use Google Sketchup, Geometer's Sketchpad, or Scratch. Not enough. Not enough. Not enough. We've got hardware and software ad nauseam. We ain't got enough people!



Crazy Contrasts: Computers and Music

How is parenting like driving through tunnels? How do the Boston Celtics' ups and downs resemble yours? Sometimes you can gain insights when you try to find meaningful connections between two seemingly unrelated subjects. So let's try to list connections between the world of music with its long and rich tradition and the world of computers which is so volatile.



- The computer is more like a violin than a blender.
- Access to hardware is crucial.
- Access to hardware is not sufficient.
- There are many people who believe they cannot become even moderately skillful. Most of them — with proper instruction — can be proven wrong.
- The available resources make the hardware a lot more interesting.
- The copyright issues with all of their moral and legal implications is significant in both fields.
- Gaining proficiency in each field involves some degree of fine motor skill and physical dexterity.
- The time it takes to achieve proficiency is much longer than anticipated.
- The key to success is regular usage and regular practice.
- Children seem to be able to gain proficiency as well as, if not better and more quickly, than adults.
- Both subjects are taught in such token and inadequate fashion in most schools that the net result is ineffective.
- Some people can become proficient on their own, but most benefit tremendously by quality instruction.
- Teaching a large group of people — even 10 to 20 people — at once is incredibly challenging in these 2 subjects; small group and one-on-one hands-on instruction is invaluable.
- Each discipline is multi-faceted involving several of the established intelligences: logical, aesthetic, visual, auditory and motor skills.

Statement of Purpose: Mission not Impossible

The text below is from the Teaching Company's first workshop, conducted in March 1982 at Concord Academy for Independent School Teachers in Massachusetts. This speech has been presented to so many different teachers that perhaps even the jokes are growing stale.

In almost every fashion possible, the world is going crazy with computers — technology, applications, education, games, and businesses. Consider technology and this quote from Russ Walter:

The longer you wait to buy hardware, the lower the price will be; every year, computers get cheaper. A general rule of thumb is: If you wait two years, it will cost half as much. More precisely: suppose you do comparative shopping now, and buy the cheapest hardware that adequately handles your job; if you do the same comparative shopping two years later, you'll find that the cheapest adequate model then costs half as much as the cheapest model available today.

This price reduction is not some kind of wild idea of mine. Practically every year, since computers began in the 1940's, the total hardware price has been dropping 30% a year. If you take a dollar, and deduct 30% of it, you get 70 cents; if you then deduct 30% of 70 cents, you get 49 cents. So after two years, you're spending 49 cents instead of a dollar. And there's no sign of that trend stopping.

An interesting comparison with the airline industry serves as a wonderful illustration of this rate reduction. Both industries grew up in the late 40's-early 50's, and without question, airplane technology and service to the consumer in 1983 has advanced considerably since its infancy in 1950. However, if the airline industry had kept pace with the computer industry in the last thirty years, you would be able to travel today from New York to London on a plane with 10,000 other passengers, get there in one second, and it would cost you all of one cent.

Computers, memory, printers, disk drives — in the past ten years, the advancements have been incredible. Seven years ago, at Wooster School, we purchased a Wang computer system with 8K memory, 1 floppy disk drive, 1 terminal, and 1 matrix printer — all costing \$14,000. We developed software for the registrar, Development Office, Business Office; we even did the school's scheduling with 8k memory. We didn't even have word processing.

Just one year ago, my wife and I purchased an Apple for our home. For \$2400 we got a system that easily surpasses the "coal burning" Wang that we purchased for the school. And now, just one year later, our own system has been replaced by a more efficient, more powerful Apple 2e. The technology is simply going crazy. It serves as the best illustration of exponential growth. Consider memory storage — the device that holds your information, whether it is a file on your alumni, a computer program or a letter you are composing on your word processing software: Twenty to thirty years ago, a computer needed equipment the size of this room to store the equivalent of one short letter. Today, a Wang computer can store about 150 pages of double spaced text in its memory — which, by the way, is the size of a fingernail. Scientists are now developing a "bio-chip" — a mini computer made of organic molecules rather than silicon. It turns out that the circuitry in such a chip is unimaginably minute — much smaller than in today's

most advanced microprocessors. “One such chip, perhaps activated by microlasers, could hold all of the information ever recorded by mankind in a cube one two hundredths of an inch across — the width of two human hairs.” The only problem—as my wife reminds me frequently—is who’s going to type all that stuff in?

Implications of these rapid advancements are phenomenal. Consider these thoughts of some technology experts:

Anyone who insists on ignoring computers in this day and age does so at his or her own peril.

—Joseph Dakin, *The Electronic Cottage*

More and more companies can be described...as people huddled around a computer. Put the computer in people’s homes and they no longer need to huddle.... It is worth recognizing that if as few as 10 to 20 percent of the workforce...were to make this historic transfer over the next 20 or 30 years, our entire economy, our cities, our ecology, our family structure, our values, and even our politics would be altered almost beyond recognition. It is a possibility, a plausibility, perhaps — to be pondered.

—Alvin Toffler, *The Third Wave*

By 1990, this automation will have grown to where 50 percent of the labor force will be required to have some degree of knowledge about computer usage. This is up about 10 percent from today’s figures. Much of that growth will be in the under \$5,000 computer system which, I estimate, will top \$5 billion by 1985.

—Jean Yates, Senior Analyst for Gnostic Concepts

The development of the electronic computer has profoundly and irrevocably changed the scientific world. In so doing it has simultaneously created numerous opportunities for the application of mathematical ideas and methods to the solution of traditional scientific problems and made possible the exploration of research areas in mathematics and science either previously unattainable or undreamed of. We are, in consequence, living in one of the great times of intellectual history.

—Bellman, Cooke, & Lockett, *Algorithms, Graphs & Computers* (1970)

And on and on we could go: laser technology, teleconferences, controlling all the appliances in your house with a micro, chips inserted in the human eye to enable blind people to see, farmers using computers to control their irrigation systems, computers that allow severely handicapped people to communicate for the first time, computers that may well make quadriplegia a thing of the past.

Okay, enough, so what? How does all of this connect to education and the independent school world?

Well, if 50% of the labor force in 1990 will need to know about computers, who's going to teach them? How do they learn? What do they learn? Who are their examples and role models? And most importantly, what kinds of attitudes, stereotypes and associations will they pick up in their computer education?

Will computers be presented as a narrow, technical subject, full of excess vocabulary and technical details, in the way that mathematics at its worst is sometimes taught. Or will it be presented in the broad context of artistic, aesthetic, and intellectual achievement?

Or perhaps computer programming will become the exclusive domain of short boys wearing glasses, to quote a favorite phrase coined by a former high school student. Will it turn out that most boys learn how to program while most girls learn how to use the word processor?

Or perhaps the computer will become the glorified secretarial tool and the administrators will make no attempt to understand how the thing works, but will expect — unreasonably — that the staff people will be able to get a report on any information in any format — all within two minutes? “What do you mean we can't just type in a name and get the alum's record. What? We have to enter an ID number? You mean we just spent \$80,000 and this is all it can do?”

And what about the obvious militarism that is so pervasive in video games or even in some of the computer language — killing files and having system bombs, for example.

And what about computerized instruction...will it be as dull, dry and tedious as so many math and science textbooks. Or will it be just glorified — and expensive — flashcards? In ten years will we be able to turn off students to intellectual endeavors via our computers as well as through our presentations?

Or will computer education become a class issue? One frequently mentioned problem: middle and upper class kids in the suburbs learn how to program at school and have their own home computer systems, while inner city kids interact with the computer only at school and only with remedial software that drills them on basic math facts and diagraming sentences.

Well, I hope the answer is clear, but if not, then to prepare for the quiz in a few minutes, let me give it to you. It must be the goal, the mission, perhaps even the essential concern of the educational world over the next ten years to address these questions, to devise appropriate curricula, to define and formulate computer literacy, and to present computers in the broadest context of civilization and its intellectual growth, to inculcate positive attitudes in all students, tackling the issues of sexism, elitism, and classism that might well plague the computer curriculum. And to the extent that you believe the independent school world has a special leadership role in education, then it is even more incumbent on all of you to proceed in the 80's, to get involved, to lead, to do it right and to do it well.

Computers in our Schools: Who's Pushing The Buttons?

The text below is from a speech given by Steve Bergen to Independent School Heads at an NAIS Workshop in Rensselaersville in the summer of 1984. It has since appeared in publication in Classroom Computer Learning and the book RUN: Computer Education, Second Edition edited by Dennis Harper and James Stewart, 1986.



I would like to conclude this afternoon's session by raising what I believe is one of the most important issues in computer education today — who's pushing the buttons? Specifically, I'm referring to control, pressure, and coercion among institutions and within our society. The height of computer craziness in our society — even more so than decreasing hardware prices and proliferating software — is that schools and institutions are now making major decisions and expenditures to computerize not always out of strength and educational vision, but because computers seem to be the thing to do. Newspapers, magazines, television commercials, parents, publishers are all shouting computers — and everybody's jumping.

This whole issue of control is no simple matter — it pervades every aspect of computer education. In designing Logo, Papert made it clear that he wanted a language that would allow kids to control the machines, as opposed to traditional educational software which too frequently controls the kids. This image of human vs. computer serves in microcosm for what I see as the most important need for teachers today: learning enough about all aspects of computer education so that you are in control and that You are pushing the buttons.

This is not to say that schools should not be rushing to computerize; it's just that they should be doing so out of their own educational vision, not just to get on the bandwagon. And just maybe they should be walking, not running to do it. So let's take another look at some of those important buttons in computer education today.

The first two buttons, P and L, deal with the two relatively new languages, Pascal and Logo. Pascal advocates and Logo advocates abound these days, each making it clear that "their language is the gospel," with considerable technological self-righteousness. The College Board in Princeton has spelled out its reasons for opting for Pascal over BASIC, and in so doing it has made scores of schools spend considerable money to acquire Pascal and considerable energy on instituting Pascal. One school, in fact, has reacted by immediately replacing all of its hardware and instituting a required Pascal course for all tenth graders. The intellectual snobbery that exists in this BASIC vs. Pascal issue is mind-boggling. Consider the statement of one Harvard professor:

Anyone who first learns BASIC before Pascal will never ever be able to learn to program correctly.

In some ways, the BASIC vs. Pascal issue reminds me of the new math controversy of the sixties, when it was argued that axiomatic methodology had to pervade every aspect of the mathematics curriculum. Yes, the new math approach is wonderfully exciting for the 1% of your students that go on to be mathematicians, just as Pascal is a wonderful enrichment for the 1% of students that might go on to be programmers. But, for everybody? My fundamental fear of this Pascal button is that too many schools will push it for too many students, turning computer usage into an elitist, highly technical subject. John Kemeny of Dartmouth invented BASIC to make programming accessible to everyone, but pushing the Pascal button can easily serve to create hoards of computer-anxious students.

The second button, L for Logo, also has the potential to be abused. For one, publishers, textbooks writers, and some teachers are now coming up with a prescribed Logo curriculum for each grade. This imposed order is totally contrary to Papert's vision of heuristic learning and discovery — I urge you to read *Mindstorms*, if you haven't already, to get a wonderful perspective on the teaching and learning philosophy of Logo. The notion of prescribed Logo skills would certainly make Papert turn over in his grave, even though he is still alive and well and back once again at M.I.T.

Others are making the mistake of slotting Logo into grades K-6, missing out on the fact that Logo is a tremendously exciting medium for exploring informal geometry in the middle school and deductive geometry in the high school.

And then there is the contest to teach Logo to younger and younger students — first graders, kindergartners, pre-schoolers. Are people really asking WHY instead of just jumping on the bandwagon? Several friends keep urging me to start my four year old on early Logo skills. No way, I respond. Let her play with blocks, crayons, run outside. I urge you to take a look at that LEGO vs. Logo article in *The Computing Teacher* (May 1983). In it, the authors talk about the learning path of children in Piagetian terms, from the preoperational thinking stage, ages 3-7, to that of the concrete operations of the older child. The thesis of the article is that computers do not provide for the mobility and active play so essential to young children and do not provide enough “real life situations,” and “open-ended opportunities for experimentation.” The author concludes:

Computers provide children with unambiguous feedback and little opportunity to read significance into direct but critical communications from others.

Communications received by children at a microcomputer keyboard are direct messages circumscribed by the purposes of the programmer. Understanding these messages often requires a level of abstraction only available to a child who has arrived at the stage of concrete operations when he or she can deal with more than one factor simultaneously.

Finally, there are still others who advocate that Logo replace BASIC because it is a more sophisticated, cleaner language. Once again, programming is seen as an end in itself, in contrast to a means towards computer literacy and computer awareness. In other words, if programming is important because it is a valuable professional skill in and of itself, then of course it is important that we choose the best language, the most useful language and the one that matches the professional software world the best.

My particular bias is in opposition to that point of view. Instead, I believe that learning to program is important because it is the best way to get in touch with how the idiot machine works. Additionally, learning to program in any language involves considerable logical, intellectual and aesthetic skills — certainly the domain of education. Only for the 1% of the student population that goes on to be programmers is it important what language they learn. Yes, those kids should learn more sophisticated languages than BASIC, just as they should take Advanced Placement Courses in English, Calculus and Physics.

It has been interesting as of late to see Logo advocates slowly realize that after turtle graphics, the more sophisticated techniques of Logo, just like the corresponding parts of BASIC, can be tough going. In a recent issue of Hands-On, Bob Tinker of TERC has made some very significant points about why Logo should not replace BASIC. In the article, Tinker states,

Once the beginning programmer is familiarized with procedures and graphics, Logo suddenly becomes much more difficult to learn. Student progress is blocked by difficulties with three important properties of the language: its use of lists, the assignment statement, and the absence of an index looping construct.

Tinker goes on to criticize these three Logo structures in fairly technical terms; the point is that Logo, like BASIC, is not the panacea.

And finally, as one last comment on this Logo, BASIC, Pascal issue, I wonder what makes people think that we have to have one or the other? Why can't we offer both Logo and BASIC as introductory programming courses, Logo for its graphics, geometry and artistic applications and BASIC for its applications with numbers and words. Do we have just one foreign language in our curriculum? Think of how difficult it would be to choose between French and Spanish as the one and only introduction to a foreign language.

And then we have button number three, the E button, for educational software. As with so many aspects of computer education, things are changing faster than you can keep up with them. In fact, the first step in discussing educational software today is discarding those clichés that used to be true. In other words, it used to be said that most educational software existed only for math and science, that it was simply electronic flashcards, and that it was — for the most part — rather poor quality stuff. To continue making these statements in 1983 reflects considerable naiveté about the lifetime of progress that has been made in just the past 12 months.

So much new educational software has come out in the past year that the clichés themselves have changed. The new catch phrases are now how to find it, how to select it, and how to review it. There are now quite a number of high quality products in all academic areas — simulations in History and Science, “microworlds” for exploring composition in music and art, as well as first rate drill and practice software in English, Math and Foreign Languages. In fact, the most widespread lament of teachers as they get involved in educational software is the biggest HOW TO question of all — how to find the time to keep up with all of it.

Because the quality of educational software has improved dramatically in the past two years, there are now many educators who are beginning to advocate educational software for teaching and instructional use, not just drill and practice. Alfred Bork, a well-known computer education expert, predicts that within a few years, the math/science teacher shortage will be so severe that computers will by necessity have to be used to teach high school math courses. Bork states:

Learning is not an interactive process for the vast majority of students in schools today. There are just too many students, too few teachers, and too few resources; and I cannot see that the country is going to put additional financial resources into education. Half our high schools no longer offer more than a year of mathematics and science. Interaction is only possible in very limited form with the present dominant technologies; with computers, it becomes practical. Working with computer based learning models is the only way today's mass education can make learning an active process for millions of students.

— Classroom Computer News, March 83, p .17

Quite a few others predict that by the year 2000, two-thirds of our teaching will be done by machine. In discussing CAI, Computer Assisted Instruction, John Herriot goes so far as to state,

There is a very strong possibility that before the end of the century, students will be receiving all of their instruction from computers, with no contact with live teachers whatsoever. It can be done, and very well.

— Creative Computing, April '82

Scientific research seems to support computer based learning. In reviewing the findings of 51 studies, Dr. James Kulik at the Center for Research on Learning and Teaching at the University of Michigan summarizes his results,

Our analysis showed that computer-based teaching raised final examination scores — from the 50th to the 63rd percentile ... Any use of a computer to teach or grade material may force people to plan more carefully when they design the learning modules and to develop the instruction better, in a way that ordinary classroom teaching doesn't.— Personal Computing, June 1983, p. 123

In a major report published by the Office of Technology Assessment in 1982, similar conclusions are reached,

There is a substantial amount of agreement that, for many educational applications, information technology can be an effective and economical tool for instruction. Research exists, some of it dating back years, to suggest that students do learn as well or better from educational technology than from conventional means. Little evidence exists to the contrary.

— Personal Computing, June 1983, p. 123

My intention in sharing all of these statistics and quotes with you is really not to convince you as much as to make you aware that quite a lot is at stake when we push the E button — perhaps even our educational system as we know it.

And if you think that this educational software issue is going to just fade away, like language labs and other fads, you may be surprised. Publishing companies and software firms are

gearing up now for what may be a multi-million dollar industry by 1987. One of the reasons that educational software has improved considerably is that a lot of capital funding is going into producing the new software. In a recent N.Y. Times article, it was said that

between 4 and 5 million Americans now have desktop computers, 26 million will own them by 1986, and each owner is likely to purchase 8-10 books about these machines. Moreover, in the first year he or she owns a computer, the average buyer shells out approximately \$1000 for software to use with it.

— N.Y. Times Book Review Section, 6/5/83, page. 39

Accordingly, it is no wonder that in terms of the home market, even more so than to schools, slick brochures and fancy ads are promoting software products that can reinforce, instruct and perhaps even teach.

And it is this new breed of educational software, software that goes beyond enrichment or drill and practice, but purports to teach that, I think, needs to be an issue of “control.” Educators and administrators — not publishers and parents — should be pushing these buttons.

My own personal reaction to this new breed of educational software — and I emphasize that many would disagree with me — is astonishment and dismay. Having taught for 8 years before doing computer work, I have tremendous respect for the teaching profession — for those human beings who can motivate, excite, inform, explain, coerce and even throw erasers at kids at appropriate moments. And having done considerable computer software in the last few years, I feel reasonably comfortable with making judgments about current and future capabilities of the machine. Yes, software programs that instruct and teach will proliferate in the next 20 years. But they will never match the good teacher. More to the point, though, even if they do, I don’t want education being taught that way. It’s one of those areas that Joseph Weizenbaum, author of *Eliza* and professor at M.I.T. has in mind when he says,

There are certain tasks which computers OUGHT not be made to do, independent of whether computers CAN be made to do them.”

Computer Power and Human Reason, page x, preface

Furthermore, I see too much software, even the fancy stuff, as being soft education, rather than educational software. *Snooper Troops* is a work of art, an incredibly sophisticated software game, which like the game of *Clue* offers considerable logic and problem-solving possibilities. But it is being promoted as much more than just a game. In a recent issue of *Classroom Computer News*, an eighth grade English teacher discusses a lesson plan and teaching strategies for using *Snooper Troops*, which he says “can provide students with valuable practice in reading and logic skills.” — *Classroom Computer News*, March ’83, p. 62

I’m sorry. I just can’t buy it. Just as I wouldn’t want my child playing *Clue* at school, I wouldn’t want her eighth grade English curriculum to include *Snooper Troops*.

To me, the challenge of teaching has always been to make genuine academic learning appealing, motivating and exciting for students, not to water down the curriculum. The fact is that *Snooper Troops* is being promoted as an educational package designed to “help children learn to take notes, draw maps, classify and organize information, and help develop vocabulary and reasoning skills.” — back of package

That is what scares me. Too many students, teachers, and parents are believing this hype from the software publishers, and it's only going to get worse over the next 20 years. As publishers rush to convert more and more curriculum to software, I'm scared that the curriculum will get softer and softer, in keeping with Weizenbaum's nightmare:

abraham maslow once said that to him who has only a hammer, the whole world looks like a nail.
to him who has only a computer, the whole world looks like a computable domain. you introduce a new symbolic system, and one begins to interpret the world in such terms. the danger is that we will end up thinking like a computer and that the only things we will recognize as legitimate problems are those where quantification and calculation play a big role.

Of all the buttons that are involved in computer education, it is this E button, for Educational Software, that has the potential to fulfill Weizenbaum's dismal prophecy for the next 20 years. Neither pushing it blindly or refusing to do so is going to be a viable approach; accordingly, educators must get involved with learning about it, exploring it, experimenting with, and evaluating it — once again, out of strength and their own educational vision.

And then there is the \$ button, the most important one of all these days. It is interesting to note that if you look at a typewriter, the \$ button works only when the shift button is pressed, a metaphor suggesting that perhaps we need to shift the way we are spending our money. For years, some people were oblivious to the fact that software required as much attention and consideration as hardware. When I worked for The Williamson Group, I remember hearing about one school's decision to computerize their development office — they did an extensive comparison of hardware, and finally chose IBM because of its reputation, service and reliability. Announcing proudly that they were purchasing this fancy IBM system for \$40,000, the headmaster was asked about development office software. His response: that was the very next item on his agenda — they would now begin their software search. Two months later, they were shocked to find out that no development office software existed for the large IBM machine they had just purchased ... \$40,000 down the drain.

Well, people have gotten wiser over the last five years and now it has almost become a cliché that you need to spend as much money on software as on hardware and to research both at the same time, with equal priority. Unfortunately, the next lesson being learned the hard way involves not hardware or software, but what I have started calling "humanware." It is absolutely the most important thing to keep in mind as you push the \$ button. While some people talk about 1/3 for hardware, 1/3 for software, 1/3 for humanware, others have gone so far as to say 1/4 for hardware, 1/4 for software, and 1/2 of your computer budget for humanware.

Because no matter what hardware and software you have, the success of your computer education program will be based on people — your teachers and your staff. It takes time to learn BASIC, LOGO, PASCAL well enough to teach them. And if you rely on just one computer person, watch out when he goes off to California to get a high-tech job. And for people who teach computer literacy topics, there is a lot of information to synthesize — even learning to use a word processor or to do database management takes time, let alone choosing and reviewing software effectively or keeping up with the unrelenting changes in hardware. Everybody thinks that computers save time ... that's ridiculous. Way before they start saving time, they consume time — hours and hours of time learning how each feature works and how to get over each new frustrating — and inevitable — hurdle.

And guess what — time costs money. Even if you have 5-10 teachers on your staff who are willing to spend extra hours learning about computers, reviewing software, researching educational topics, if want to get the job done well, you won't be able to keep going on good

faith alone. Lately, I've been suggesting 2 strategies to schools — one is to have 5 or 6 teachers reduce their teaching load by one course and form a committee for the academic year to become resident computer education experts. The committee would be charged with learning all the topics of computer literacy, usage and programming, spending 6-10 hours a week for 40 weeks. The second strategy has been to simply award a financial stipend to the 5-6 teachers instead of reducing their teaching load.

Regardless of strategy, the idea is the same and as shocking as it may sound to many administrators, most computer education people agree on this advice. If a school had \$10,000 budgeted for computers, they would do far better buying one Apple for \$2,500 and having this committee of 5 people become resident computer experts in one year, rather than spend all of it on machines. And while parents might balk about not having enough computers in the school, the administration would undoubtedly achieve in one year what very few institutions have yet to do — with a team of 5-6 computer usage experts, knowledgeable about computers, the school would then be able to make rational computer decisions based not on the hard-sell of advertisements, but on their own educational vision and needs.

Which brings us to our next button — T for Time. Just how urgent is it for schools to jump onto the computer education bandwagon? Well, from a society and parent perspective, the answer is clear. Too many parents today feel that if their 6 year olds aren't sitting in front of a computer an hour a day, they will have fallen behind in this crazy race for technological literacy and will never get into graduate school. So, as far as parents go, yes, today, immediately, in fact maybe yesterday. But educationally, is that the best way to proceed? No absolutely not, say most people knowledgeable in computers. Yes, get involved in the computer education issues today, start learning as much as you can, but you don't need to launch the whole K-12 master plan during this academic year. The best advice I've heard on this comes from Tom Smith, author of *Kidstuff* and former teacher at The Park School in Brookline. In talking about their computer education program there, he said they decided to start with just the 4th grade, spending their money and limited energy that first year on teaching the students and teachers in that one grade only. Then, the next year, they expanded it to grades 3 & 5, and so on, one year at a time, out of strength, not out of panic.

And so, once again the theme of humanware emerges, even in terms of talking about time and urgency. Faculty learning must precede classroom implementation, or else you're going to have a mediocre program. Create a computer committee of 5 to 6 faculty members, charge them with becoming resident computer experts in one academic year, and then proceed.

And finally, the last button of all, and the most important, is the C button — computers themselves — to be or not to be, that is the question.

No, I guess that's not the question, for they are here and we just don't seem to have a choice anymore, for better or for worse, in sickness and health, till death do us part, or should I say till terminal illness do us part? But we do have a choice to do it sanely, cautiously and with constant examination and review of how things are evolving — in fact in the true spirit of scientific inquiry and the scientific method.

Yes, word processing is wonderful, but will students over the next ten years become less capable at writing on paper, just as calculators have allowed people to be less facile with mental and written calculations. I mean, doesn't it annoy you when you hand the clerk ten dollars to pay a bill of \$9.56, and the clerk then starts searching for the calculator all over the store, rather than using his mind or a piece of paper. Is it remotely possible that as word processing proliferates

through our schools to younger and younger kids that the skills of penmanship and writing on paper will be a lost art in the year 2001?

Yes, educational software can be of value, but will it undermine education itself? Will the fancy graphics and immediate feedback of software cause our students to have an even shorter attention span in our classes, in the way that television has invariably done?

And yes, programming the idiot machine is very exciting, whether it be in BASIC, LOGO, or PASCAL, but should it be seen as more important than other academic areas? Too many schools are cutting down on English, Music and Art while putting more money into computers. Is it really more important to buy 10 more computers this year or to give all the teachers a 20% across the board raise? The ultimate irony of all this computer craziness would be if in the year 2000, we have a tremendous shortage of English teachers and have to pay THEM higher salaries to keep them in the teaching profession.

Yes, computers are here to stay, but it is important that we use them on our own educational terms. Too much is at stake and there are too many buttons to push to simply have one person in the math department decide the future of your computer education program. Educators of all disciplines must learn as much as they can so they are in control. Administrators may not need to know how to program — although it might be argued that everyone should — but most DO need to know much more about the breadth of computer education issues than they currently do. Otherwise, the software publishers, the hardware manufacturers, the college professors and the neurotic parents will be banging on the door to push the buttons. Each group has its vested interest and each group would love to steer the direction of computer education.

And though I don't like ending talks like this one on the down side, the current state of affairs in computer education is full of too much craziness to do otherwise. And so we turn once again to Weizenbaum, who expresses best the ultimate reservation of the C button, portraying in rather devastating terms one view of the present and the future:

Wherever computer centers have become established, that is to say, in countless places in the united states, as well as in virtually all other industrial regions of the world, bright young men <and women> of disheveled appearance, often with sunken glowing eyes, can be seen sitting at computer consoles, their arms tensed and waiting to fire their fingers, already poised to strike, at the buttons and keys on which their attention seems to be as riveted as a gambler's on the rolling dice. when not so transfixed, they often sit at tables strewn with computer printouts over which they pore like possessed students of a cabalistic text. they work until they nearly drop, twenty, thirty hours at a time. their food, if they arrange it, is brought to them: coffee, cokes, sandwiches. if possible, they sleep on cots near the computer. but only for a few hours — then back to the console or the printouts. their rumpled clothes, their unwashed and unshaven face, and their uncombed hair all testify that they are oblivious to their bodies and to the world in which they move. they exist, at least when so engaged, only through and for the computers. these are computer bums, compulsive programmers. they are an international phenomenon.

The Battle of Lexington (from a speech in 1986)

Most of the comments so far apply only for the next 10 years. By 1995, or surely by the year 2000, half of our teachers will be people who are now in grades K-12 in our schools. By virtue of the computer-rich worlds that most of them grow up in, most of these future teachers will have completely different attitudes towards the computer. To me, 1985-1995 is the transition that might be called the computer evolution. It is happening so slowly. Back in 1982 when TIME magazine chose the computer as Man of The Year, everybody started talking about the “computer revolution” in schools. Now we realize this was hyperbole. The computer Revolution has become the computer Evolution for one obvious reason: Revolutions are dependent on people; and people change slowly.

I’ve been doing some research in the Lexington archives about the famous Lexington Green and the Shot heard around the world:

Apparently, in 1773, there were several Lexington and Concord residents who were ready to fight the British. They came to the famous Green only to realize that they had no weapons. Realizing that the first ingredient for a revolution is hardware, they returned to their homes disappointed.

Next year, in 1774, these same residents came back with piles of guns. They had developed the necessary hardware and were ready to fight. At the last moment, they realized they lacked sufficient bullets and ammunition; even the ammunition they had was poor quality with frequent misfires and limitations. Realizing that hardware wasn’t enough— they needed good quality software — they returned to their homes again disappointed.

Next year, in 1775, these same residents came back to the Green. They had worked all year on developing high quality, reliable ammunition. Their bullets were now compatible with most guns and well tested. Finally, they had the software! Excited, they came out on July 4, 1775 with trucks of guns and ammunition. As they started to unload the stuff, they realized that there were only a dozen or so people, not nearly enough to successfully fight the British. Realizing that even hardware and software together weren’t enough — they needed the necessary humanware — they returned to their homes again disappointed.

Finally, in July 1776, having invested in the necessary training, these same residents returned to the Lexington Green, complete with hardware, software and humanware.

The rest — as they say in the textbooks — will be history.

Postulates and Theorems: We Hold These Truths to be ...

Developing a Philosophical Framework Towards Computer Education

pos•tu•late (n. pos´chð lit) 1. something taken as self evident or assumed without proof as a basis for reasoning 2. a proposition that requires no proof, being self-evident 3. a fundamental principle

the•o•rem (n. the´ð rðm) 1. a theoretical proposition, statement or formula embodying something to be proved from other propositions or formulas 2. a rule or law, especially one expressed by an equation or formula 3. a proposition deduced from other premises or assumptions

Postulates

P1: The computer and all forms of technology represent a qualitatively new learning medium, akin to the printing press and the widespread use of paper and pencil.

P2: Independent Schools have the professionalism, intellectual commitment as well as the financial and administrative flexibility to do it right and deal with the challenges of computer education.

P3: Gaining mastery over content creation is more important than programming skills.

P4: Teachers are professionals; teaching is a wonderful, invaluable position.

P5: Alienation from technology is a handicap similar to other forms of alienation.

Theorems

T1: Technology is forever becoming more sophisticated and cheaper in dramatic ways.

T2: Tuition is forever increasing.

T3: There is enough high quality software and websites in almost all areas of the K-12 curriculum to begin putting pieces of the puzzle into place.

T4: The humanware factor is the most important component.

T5: Almost every aspect of learning about and working with technology— hardware, software, websites — consumes time.

T6: Formalism, structure, curriculum is the best way to reach everyone.

Gaining Perspective on Changes in Technology

A presentation for (1) Nobles Trustee Retreat 1/28/94 (2) the St. Sebastian's Trustees 2/98 (3) AISNE Business Managers and Tech Coordinators 10/31/00 (website: summercore.com/buttons/difficult.html) and (4) Technology Committee at Governor Dummury Academy 3/2002

First, Some Essential Vocabulary to “let your feet reach the ground” as Mark Twain once responded when asked what is the proper height for a person

- byte, kbyte, meg, gig, CD ROM, Laser Disc, analog vs digital, bit, modem, baud rate

Second, A Fill-in-the-Blank Worksheet on Recent Technology Changes

(H)= heard about that tool that year (F) = first used that tool that year

(O) = occasional user of that tool that year (R) = regular user of that tool that year

(S)= skeptical (E) = enthusiastic (D) = dependent on that tool's importance that year

Tool or Topic	pre80	80	82	84	86	88	90	92	94	96	98	00
Answering Machine	-	-	F	R	-	-	-	-	-	-	-	-
ATM BankCards	-	-	-	H	4	D	-	-	-	-	-	-
Calculator	R	-	-	-	-	-	-	-	-	-	-	-
CD ROM	-	-	-	-	-	H	F	R	-	-	-	-
Cellular Phone	-	-	-	-	-	-	-	H	-	F	O	-
Celtics Win #17	-	-	-	-	E	-	S	-	-	-	-	-
Desktop Publishing	-	-	-	-	1	2	3-	4	-	-	-	-
Dishwasher	S	2-	D-	-	-	-	-	-	-	-	-	-
Distance Learning	-	-	-	-	-	-	-	-	1	2	-	-
E-Mail	-	-	-	-	-	-	1	2	E	D	-	-
Educ Software	-	-	-	-	-	-	-	-	-	-	-	-
Fax Machine	-	-	-	-	-	1S	-	-	-	-	-	-
Hard Disk Drive	-	-	-	-	-	-	-	-	-	-	-	-
Internet	-	-	-	-	-	-	-	-	-	-	-	-
Laser Printer	-	-	-	-	-	-	-	-	-	-	-	-
Laptop Computer	-	-	-	-	-	-	-	-	-	-	-	-
Logo	-	-	-	-	-	-	-	-	-	-	-	-
Microwave	-	-	-	-	-	-	-	-	-	-	-	-
MODEM	-	-	-	-	-	-	-	-	-	-	-	-
Mouse	-	-	-	-	-	-	-	-	-	-	-	-
Music CD Player	-	-	-	-	-	-	-	-	-	-	-	-
Networking	-	-	-	-	-	-	-	-	-	-	-	-
Personal Computer	-	-	-	-	-	-	-	-	-	-	-	-
Scanner	-	-	-	-	-	-	-	-	-	-	-	-
Spell-checker	-	-	-	-	-	-	-	-	-	-	-	-
Spreadsheets	-	-	-	-	-	-	-	-	-	-	-	-
VCR	-	-	-	-	-	-	-	-	-	-	-	-
Video Conferencing	-	-	-	-	-	-	-	-	-	-	-	-
Voice Mail	-	-	-	-	-	-	-	-	-	-	-	-
Word Processing	-	-	-	-	-	-	-	-	-	-	-	-



Q: What is the proper height for the average person?
A: Long enough so that your feet can reach the ground!

Q: How much computer literacy does the average person need?
A: Same answer!

Third, Let's Analyze & Seek Some Meaningful Generalizations

- #1 For how many items did your skepticism turn into enthusiasm within a few years?
- #2 How often did you go from first hearing about (H) to regular usage (R) within a few years?
- #3 In what year did you experience the most skepticism?
- #4 For each tool that you have reached level D or level R, what is the personal or intellectual “downside” in terms of what you have given up? has this translated into an actual savings of time or an improvement of quality?
- #5 Which one technology tool thus far has had the biggest impact on education? Stuart Chase from Eaglebrook School gets credit for pointing out the amazing irony of the answer!
- #6 Which tool(s) present the most significant ethical and moral challenges?

A Collection of Humanware Quotations

#1

“But overall, reports Joan McCord, a sociologist, ‘the impact on morale has been tremendous.’ McCord is conducting a five-year study of the effects of Drexel’s computerization by measuring such intangibles as self-confidence and optimism about the future. Her samples show sharp increases for both students and faculty. ‘We’re trying to be cool-headed about this,’ says Banu Onaral. ‘But in the hands of a professor who really believes, it seems the computer can do miracles.’”

Time Magazine, October 21, 1985, (p 71) in an article on how 8,000 computers transformed the campus of Drexel University

#2

“Cool, Mom, you are learning—that’s amazing!”

*Emilie, upon her mother’s successful changing of a computer ribbon.
(Summercore 88 on-site at Greenwich Academy)*

#3

“I think that the simulation captures the manner that Columbus sailed better than any book for sixth graders. I’m absolutely in love with it as a simulation.”

Walter Birge (Headmaster, The Fenn School)

#4

“In the end, therefore, with all the exaggerated claims and the media hype, we can still look upon the new technology with cautious enthusiasm. At the very least, universities should manage to use technology to engage students in a more active process of thinking and problem solving that will help them learn more effectively. At best, the new machines may also be a catalyst to hasten the development of new insights into human cognition and new ways of helping students learn.”

Derek Bok, Harvard Magazine, June 1985

#5

“It no longer bothers me when I meet someone who is cynical of word processing; I just smile and walk away. I know that within a few years that person will be begging me for help on how to format disks, make backups, center text and move paragraphs. The world is full of reformed smokers and reformed non-computer users. It just takes time.”

Bob Gula (former English teacher & Director of Studies at Groton School)

#6

“Today, I wouldn’t teach without a computer on my desk. I would not use [the computer] to teach students. We don’t know whether computers teach students. We know that teachers teach students.”

Tom Snyder (Software Publisher, One Computer in the Classroom)

#7

“The world is full of computer utopians who say, ‘Wow, this will solve all our problems and computer pessimists who say ‘It’s awful.’ But I think they’re both equally irresponsible and equally irrelevant. The important thing isn’t to sit on the sidelines predicting whether it’s going to be good or bad but to jump in there and make it come out the way you want to.”

Seymour Papert (creator of Logo and author of Mindstorms, 1987)

#8

“To be alienated from the computer is to be disenfranchised in our society. People should learn whatever they have to learn to feel that this thing belongs to them. The most important thing that computer literacy programs can do for people is to give them the sense that they can be empowered by the machine.”

Sherry Turkle, The Second Self: Computers and the Human Spirit

#9

“Secondly, if introducing children to computers is important (and if it’s not, we should quit talking about it and get on with whatever is important) then it must be important that teachers and administrators know what they’re doing with respect to computers. Unfortunately, the body of teachers who have adequate training in this area is very small.”

Joseph Weizenbaum (creator of Eliza & Computer Power & Human Reason, 1987)

#10

“We have new technologies for learning, but will the layout of schooling resist them? ... The thing we have to think about is what produces engagement, what produces involvement. It’s much more related to love than to logic. It’s much more related to how you see yourself fitting into the social and cultural fabric. Even television... is it something being done to you or something you want to appropriate. Education has very little to do with explanation. It has to do with engagement ... with falling in love with the subject.”

Seymour Papert (creator of Logo and author of Mindstorms)

#11

“What is important is that computers be used in the context of what they can do to, with and for people — how they can help you as a human being to be better — not that computers be seen as wonderful in and of themselves. You can play with lots of [creative software] and begin to feel that you can use your mind with an instrument that makes it more powerful. Here we have a new way to make people remember that kids are wonderful, that learning is open-ended and that creativity is the gift that everybody deserves...At their best, they empower the user.”

Herbert Kohl, Classroom Computer Learning, September 1983

Computers in our Schools: Why the Right Buttons are So Difficult to Push

AISNE Conference on Tuesday 10/31/2000

- * 1984: Who is Pushing the Buttons
- * 1986: Who is NOT Pushing the Buttons
- * 2001: Why the Right Buttons are so Difficult to Push

In 1984, I delivered a talk to NAIS Administrators at Rensselaersville NY titled Who's Pushing the Buttons. In this talk I wanted to excite heads of school about the potential of computers. The tone of the talk was optimistic and I truly believed that a revolution in education lay ahead of us.

A few sobering years later, as it became clearer that this revolution would be instead an evolution, I published an article in Classroom Computer Learning titled Who's Not Pushing the Buttons. The tone of the article was skeptical. I would like to revisit these global issues this morning with you, so I have chosen the catch phrase "Why the Right buttons are so Difficult to Push" to encapsulate my thoughts this morning. If I had to pick a word to describe my reflections in this post Y2K computer world, it would be realistic.

And now I would like to be specific about why the right buttons are so difficult to push.

First difficult button to push: for money

First of all, money. We are not spending the kind of dollars on hardware, software and humanware that would allow us to see significant changes. I have offered this statement for years and years. Back in 1989, a head of school, former computer and math teacher, came to Summercore, was stunned by the radical changes in technology. He raised the philosophical question, "Are we totally underestimating the potential and breadth of technology in our schools?"

The best discussions of school budgeting comes from Dave Moursund, (Professor, College of Education, University of Oregon, Executive Officer for Research and Development, ISTE, International Society for Technology in Education darkwing.uoregon.edu/~moursund/PercentSolutions/). Moursund has published a book called The Future of Information Technology and several articles on budgeting. One of the most respected writers and leaders in computer education over the past decade, Moursund has given me permission to quote his words in this morning's talk:

In his articles and books, Moursund advocates the 15% solution in terms of annual budgeting for technology. Moursund lists the expectations that a school should have:

1. Providing every student and teacher with a powerful portable computer and a full range of computer productivity tools.
2. Providing every classroom with technology infrastructure that includes scanners, printers, camcorders, desktop presentation, and network connections.
3. Providing every student and teacher Internet and email access, as well as access to the full range of distance learning and computer-assisted learning facilities both in and outside of school.

4. Providing adequate maintenance and repair staff, as well as other technical support.
5. Providing continuing inservice education and support for teachers.
6. Providing ongoing curriculum revision and curriculum development to keep pace with the continued change in the technology.

Moursund predicts "fifteen years from now there will be a significant number of schools that have implemented the 15-percent solution. To a great extent, the needed resources will come from restructuring of staffing. Schools that have the most flexibility in staffing (such as Charter Schools, magnet schools, and private schools) are likely to take the lead in these types of educational change."

One of the reasons that the money button is difficult to push involves the fact that we still do not have agreement on the value of computers in education. Consider these divergent opinions on the recent heated discussions on the ISED listserv.

"For the past four years, I've been harboring a nagging feeling that our default position of "needing" computers within the learning environment may have been reached a bit too hastily. I've decided to draft a letter to our headmaster trying to make the case for the removal or limitation of computers in our school. I am trying to do this with as open a mind as I can muster, with the idea that if we should indeed continue to invest in technology, then the rightness of that decision will stand up to the best argument against it."

"As a school where each student has a laptop and we attempt to integrate technology as much as possible into all of our classroom curriculum, I can see absolutely no arguments for not having technology in the school.

"The argument that you need computers at school so that students will learn how to use computers is flawed. Learning does happen elsewhere, and at other times."

"Technology if used appropriately in the middle and upper school, in addition to being taught as a "subject", can augment almost everything you do. It is an incredible information tool, can supplant much of what is found in the up-to-date library, can teach students to be truly discerning about the information they choose to accept and use, and if used PURPOSEFULLY can only enhance their education."

I find the diversity of these opinions fascinating. To some extent, the money button is difficult to push because it competes with many other priorities in schools. But the fact that we as educators are not convinced of the value of computers in our schools underscores another reason for the difficulty of the money button. In other words, our lack of philosophy in terms of technology affects the money button.

The postulates I shared with you previously lead me to a personal position that computers -- like virtually every other aspect of education -- are neither good nor bad for children but that they are critically important and good for teachers. Computers provide teachers with connectivity, with tools, and with the stimulus to rethink and reshape their curriculum. We must push in Moursund's direction because computers are good for teachers and for the teaching profession. I offer you a

thought from an art teacher colleague shared via e-mail a few days ago: "Thanks for all of your help. The digital work I have been doing has been educational and fun but more importantly it has helped me to conquer some personal issues about being a part of a changing world."

Furthermore, we must push in Moursund's direction to address the issues of the digital divide -- the inequities in access for students in our schools and in our country are horrendous. Additionally, inequities based on experience, family usage, previous schooling or gender need to be addressed. When I started the Teaching Company back in 1982, I stated that "it must be the mission of schools to implement computers in the broadest context of civilization and its intellectual growth, to inculcate positive attitudes in all students, tackling the issues of sexism, elitism and classism that might well plague the computer curriculum."

I believe that this perspective is just as important in 2001 as it was 1982 and can be addressed only by pushing the M button in the Moursund direction.

Second difficult button to push: for humanware

The vast majority of money spent is for hardware and labs and computers. But if you believe in my postulates, the key is the faculty and the need to provide them with appropriate environments. We own 10 LCD projectors and they are hot items. The teachers who use them love them and there are a number of teachers who exhibit projector envy. But there are also teachers who have no interest in using this tool. How do we move our faculty along? That needs to be the central focus question in all schools. Spending money on labs is relatively easy. Trustees become obsessed with building beautiful computer labs. As one Summercore participant said, "it is easy to fund a memorial room, but no one wants to fund a memorial broom." To some extent, a quality computer per teacher and a projector in the classroom is a memorial broom, important but less sexy and less of a showpiece in the school. And if that is not a broom, then more often than not, the humanware efforts of training and exciting the faculty are often considered secondary, the proverbial broom.

The need to provide quality faculty training in both group and individual format for teachers cannot be overestimated. Even Joseph Weizenbaum himself -- the computer scrooge of 70s and 80s -- proclaimed, "if introducing computers to children is important (and if it is not, we should quit talking about it and get on with whatever is important), then it must be important that teachers and administrators know what they're doing with respect to computers. Unfortunately -- writes Weizenbaum -- the body of teachers who have adequate training in this area is very small."

This is a big item. It cannot be wrapped up in one professional growth day or even one 5 day workshop. It must be ongoing and it must be a priority. All of this training of course adds up to significant money. When I started at Nobles in 1994, I was, for the most part, the one computer person (one FTE) and about 1/3 of my job was faculty training. Now 7 years later, we have about 5-6 computer people and perhaps about the equivalent of 1 FTE is focused just on faculty training. It still is not enough.

This year, we initiated a personal trainer program so that 30 designated faculty members receive one on one computer instruction once a week. But if you believe in the analogies between computer usage and musical instruments, then even this program is not sufficient. I would like to see our school or any school institute a policy that requires weekly one-on-one computer training for each faculty and staff member. Estimated cost might be 2-3 FTEs. Estimated value to parody American Express: significant.

To emphasize the need to push this button, I would like to share an example from Nobles in terms of our DLC (digital language center). We built this facility at Nobles about four years ago as a computerized language lab . It cost us about \$80,000 but only recently have we instituted the necessary staffing (i.e. humanware). The head of the Modern Language Dept recently shared his thoughts with me:

A dedicated tech person working the DLC gives the foreign language teachers peace of mind. Our classes are much smoother because we know that if plan A fails, we can go to plan B while the tech person works on plan A. It is like having a point guard who not only oversees the team, but who is also there in case we start to lose control of the activity due to screen freezes, files not opening, plug-ins needed. It has made our year so much easier and anybody who thinks that non-tech trained educators can also run a digital lab are in for a big surprise. We tried and it did not work.

Third difficult buttons to push: **S** for skills and **T** for time

Becoming skillful with computers is much harder than anyone ever imagined!

I have been conducting workshops for teachers for about 20 years. Lynne Schalman and I have conducted Summercore on site for about 35 different schools and almost 2000 individual teachers. As computer coordinator for two different schools over the last 20 years, I have worked first hand with dozens of teachers. The statements I am about to make are not theoretical but based on interacting with a vast array of people.

Becoming skillful with computers is far more difficult than anyone ever imagined back in the 1980s. Everyone learns a few skills, and is happy with those tricks and techniques, but the number of gaps in people's knowledge is incredible. Most tech people just do not realize the extent of the learning curve. The vast majority of teachers -- whoops, I mean the vast majority of people --operate computers at a very basic level. And furthermore, the vast majority of people think that everyone else is far more advanced. The reality is that "becoming skillful with computers is much harder than anyone ever imagined."

The Web is such a vast collection of resources for teachers that the issues of time have never more stressful for teachers. I sometimes wish that we would choose periods of the day and days of the week to turn off e-mail and turn off the Web on an institutional or national level. The guilt that most of us would feel 20 years ago by not reading one more article about today's lesson has now been compounded by a factor of a googol for the important Web references and websites

related to today's lesson that we have not had time to access. Our new buzz word for the 21st century is perhaps e-guilt. And yes, this does affect skills, because lack of time makes people less willing to learn skills than they were twenty years ago!

Next Difficult button to Push: for Leadership

Fourth RIGHT button involves human development, analysis, contemplation of what it really means and takes to be a computer teacher, something I will lump together as our IP problem, IP for inter-personal skills.

Computer skills are not easy. Computer teachers for the most part do not get it. The arrogance displayed on Saturday Night Live during those funny tech skits unfortunately reflects the attitudes of many computer people in our schools and in our world. Lynne Schalmán and I constantly hear stories at our Summercore workshops about the computer folks at their schools and the attitudes displayed towards the rest of the faculty. Too often, there is the "territorial problem" where the computer folks have carved out a tech center and act as if it is their living room. Then there is the "gender problem" where often the males running the computer center act as if it is a locker room making others feel like outsiders.

A few years ago, one computer teacher who happened to be female shared several of these complaints with us at Summercore

- 1) buying or installing any software at her school was incredibly complicated
- 2) the computer tech people at her school made it so difficult to do anything on the computers, running the place as if it were a bank network
- 3) the attitudes of the 3 men who ran the computer show at her school made her as a computer teacher feel like a total outsider in her own department, and they intimidated most of the faculty

She ended her mini-talk by referring to them as 3 despicable men. I won't destroy your enjoyment of music by singing it now, but I went home that night and wrote a song called 3DM.

Three D M, Three D M, see how they run the school
They tell you installing other software is way too much work
And if you ask questions you feel like a jerk
They make the whole place feel like a bank network, Three D M

and I do believe that that this is a button that we in our schools are not pushing very well. Let me give you an example.

Just last week, two administrators from a California school toured Nobles and asked the usual 33 questions about what we were doing with computers, faculty training and curriculum at our school. Afterwards, they shared with me that they have a computer person who is good technically but has no interest in working with the faculty. I smiled and said goodbye but did not say what I thought.

Like most things, "the fish rots from the head" to paraphrase Michael Dukakis. It must be the responsibility of the head of school to hire technology people whose focus is on helping teachers by creating a healthy open environment for teachers, not an environment where teachers feel intimidated. Every computer person in a school must see himself/herself as part time nurse, part time police officer, part time maintenance person, part time counselor, part time psychologist and full time teacher. Although this is not an easy button to push, studies suggest that the progress of schools with technology is frequently directly correlated with the personnel.

Next Difficult Buttons to Push:

Time continues to drive people crazy people. Remember theorem 5 which stated that "Almost every aspect of learning about and working with computers— hardware, software, reading — consumes time." People who don't teach just don't understand. Forget about the triple threat philosophy in boarding schools of teaching, coaching and dorm duty. Teaching itself is a triple threat: preparing for classes, grading, and providing individual help. Every dedicated teacher feels guilty about all three of those aspects of his/her profession. We all begin the fall year with great expectations and by October or November reality sets in. The rest of the year is spent in reaction mode which is so unhealthy.

Throw computers in the mix and they just add to stress.

Some of you know about the book Seven Habits by Stephen Covey. In this book, the author constructs an organizational chart of four quadrants and divides life's tasks into these four categories. And though this organizational scheme was not created with computers in mind, I would like to share some observations and point out that there is a message for all of who deal with computer issues.

A computer coordinator's interpretation of Stephen Covey's four quadrants from "Seven Habits"	
QUADRANT 1: important and urgent • s and m (support and maintenance) of e-mail system, servers	QUADRANT 2: important but not urgent • wireless laptops • video conferencing • distance learning • faculty training
QUADRANT 3: urgent and not important • someone has a faulty disk with files • someone can't access attached file	QUADRANT 4: not important and not urgent • cleaning my office • throwing away old manuals

Well, this organizational chart has significant impact on the computer progress at your school. If your computer tech people are always in reactive mode regarding time, i.e. quadrant I, then they do not have enough time to help your school learn and explore new growth areas with technology, i.e. quadrant II

Because change in technology is so much more rapid than any other field, I would argue that emphasis on quadrant II is an important priority for our schools. This is a very difficult button to push. I feel blessed that I have been for the past six years in an environment where the academic director values my quadrant II activities. Let me give you examples

Example 1: Video Conferencing is for real. Last year I spoke at NAIS Baltimore and shared all of the experiences we have had at Nobles with video conferencing. It is not that expensive, the technology is quite reliable and there are literally thousands of places around the country wanting to video conference with others. Two years ago, we ran a course in C++ programming that was taught by a teacher from another school. The technology works and the enhancement to our classrooms and schools is obvious. We have had many successful video conferences now with other schools. So what's holding this back in our schools? Time, personnel and to some extent money.

Example 2: Laptop and wireless technology is for real. This year, we are experimenting with a ninth grade English and History classes that uses wireless eBooks every day as part of their normal classroom. Reaction from most of the teachers, students and parents is positive. Will we build on this in the next few years? Is this a model for the future for all classes? Perhaps. Will it demand we move towards the 15% Moursund strategy? Absolutely. About 1/5 of my job this fall has been spent supporting and dealing with this English/History program. A second person meets regularly with the two teachers to provide them with ideas and curriculum plans. Do computers save time? How could we have been so naive as to ever think that?

Example 3: Distance Learning is THE quadrant II activity that we all need to be thinking about. There are some people out there who believe that distance learning will have an unbelievable effect on most of our schools in the next 20 years. Look back at the Mark Twain page before you laugh. Yes, most of us will agree with the Neil Rudenstein quote that "in person teaching is still the most powerful mode of education" but that does not take into account the big picture. As a quadrant II exercise and as one of his last administrative decisions, Dick charged me with creating and teaching an online course in C++ this year. The course begins tomorrow, November 1st and I have 9 people signed up from 5 schools across the country -- Colorado Academy , Shorecrest Preparatory School in Florida, University High School in San Francisco, Convent of the Sacred Heart in Connecticut and Bryn Mawr School in Baltimore. With minimal promotion, we had more signups than we could handle and ended up turning down some people. Some of the participants are teachers and some are high school students. All of them probably believe the Neil Rudenstein quote, but nonetheless are choosing to take a C++ course online. Is Dick Baker correct in predicting the demise of schools like Nobles in 20 years? I don't share Dick's sense of pessimism and gloom but firmly believe in the Rudenstein quote. My goal in teaching this course is to prove that students can learn effectively and thoroughly via distance learning and that I can establish relationships via e-mail, Web and phone interaction that are not that dissimilar from the relationships of face to face teaching that have been the life blood of my career over the past 28 years.

Another way to gain this same perspective comes from my brother in law Donald Fischer who runs an insurance company. He has passed on to me the aphorism that in order to IOE, you need

to D. When I asked him what I,O,E and D stood for, he was stunned. I am sure you all know. I is for innovate, O is for organize, E is for expedite and D is for delegate. Because computers are such a rapidly changing environment, there is a tremendous need for I, O and E: innovate, organize and expedite. Once again, it is the focus of the leadership at the school and a function of Moursund's money allocations that allows I, O and E to occur. In my own situation at Nobles, I have had tremendous administrative support in allowing me to add several people to the computer department over my six years tenure. Without having people to D (D for delegate), there is no way that I could be doing the I, O and E.

I urge you to hold onto these BUTTON suggestions:

- a) provide every faculty member with a computer so that he/she can have a reliable productive tool (the H button)
- b) provide every faculty member with an ongoing once a week trainer (the S button)
- c) move towards Dave Moursund's 15 per cent solution in terms of technology budgeting (the M button)
- d) administrative leadership at the school must see to it in terms of hiring and overseeing that quality faculty training, IOE and quadrant II endeavors are a priority for the technology department at the school (the L button)



from kleinbottle.com with permission from Clifford Stoll (author of [High Tech Heretic](#))

I will conclude with the image of the Klein bottle, a wonderfully symbolic mathematical object that has one side. Like our buttons of today, it is a difficult object to create and even in mathematical terms, a difficult object to think about. And yet, despite its difficult qualities and appearance of inside and outside, there is just one side to this object!

One computer coordinator once said to me "we are all sailors on the same ship." I have held onto that quote for a long time. We are all in education to help students and to catch the kids falling off the cliffs. Technology is here, for better and for worse, and we must help to push our schools forward to do it right and to do it well. We need to be together in this, since we can accomplish more via teamwork. There are NOT two sides to this discussion. We should not be arguing whether to have computers or not. We should be focusing on how to use technology well. There is just one side. We are indeed sailors on the same ship. Our mission is to improve the role of technology in education -- for teachers and for those students who would otherwise be on the other side. There is no other side. We are all on the same one sided surface. Our mission -- sad but true -- is still underway. Mission not impossible but mission difficult.

Trying to Define Humanware

We started using the phrase “humanware” when we began the Original Teaching Company back in 1982. Over the last two decades, we have used it numerous times to refer to the “human” aspects of computing. Recently, we were asked by the Director of Publications at Nobles for a definition of this word. The humanware at any school might be defined as the sum of all the computer support help both explicit and implicit within a school. Taking inventory of hardware is fairly well defined, even though an increasing number of schools have inventory lists that are well past three digits and approaching four! Taking inventory of software is more difficult, since it involves inspection of every computer, some of which are not on a network; taking inventory of software can also result in copyright realizations about honesty and licenses.

But taking inventory of humanware is the hardest of all. It begins by adding up the FTE components of all the people at your school who formally wear the hat of computer s&m (support and maintenance). But that is only the explicit humanware component. If you have students and faculty who actively help out with the ongoing computer problems that others encounter, then of course, they add to your humanware count. And computer-using faculty are also part of the count! We have a slogan at Nobles that says “when you have a computer problem, find someone younger than you to ask.” Note that the slogan does not say IF you have a problem, but WHEN you have a problem. Computer are forever causing us frustrations because they are much more like violins than blenders.

Even though, it is difficult to put a number on the humanware component at your school, defining it and discussing it is easy. Too many administrators and too many trustees spend too much time on the hardware and software components of computing. Macs vs PC? First Class vs Outlook Express? Laptops vs Desktops? Microsoft Office vs AppleWorks? Over the past five years, we have tried to emphasize the humanware component, although obviously we do not ignore hardware and software. Ongoing faculty training, overnight loaners and extended loaners for faculty and students with financial need, software loaners for faculty, the N/G license program, modem loaners for faculty and the student staff have all been important humanware components of our program. In fact, we do believe that standardization of hardware and software itself is a humanware theme, since it creates a community where more people can help each other solve problems!

Two of our most recent technology programs — the Pioneer Program and the Digital Learning Center — fit into this humanware philosophy. The Pioneer Program puts laptops into faculty hands if they are willing to be leaders, risk-takers, pioneers and if they are willing to support each other. The DLC is a consequence of the maturity of a school. The willingness and ability of the modern language department to take ownership of its own computer lab is a result of the increase of humanware within that department.

The bottom line is that humanware costs money. Too many schools throw money at hardware and software and allow the humanware component to fend for itself. This perspective is extremely problematic, since humanware is the most critical component. The analogy with the violin has been with me every since we first started using the word humanware. Years ago, we

wanted our daughter to play the violin. We bought the hardware for \$1000, but she did not play. We bought the software (sheet music) for a few hundred dollars, but she did not play. We hired a violin teacher for once a week lessons and eventually she played wonderfully. By the end of seven years, the humanware component proved to be the critical one and the most costly.

FORD FOUNDATION GRANT, Spring 1998

Hardware, Software, Humanware

With a try before we buy approach to technology, Nobles takes special care to keep the focus on the humanware.

At Nobles we believe that technology has the potential to revolutionize education, yet we have moved forward with caution, regarding technological tools as experimental until their success is proven. We believe this approach has allowed us to strike a balance that has placed us at the forefront of technology-using secondary schools.

On one end of the spectrum are schools that will jump right in and spend money to get the newest and the best technology, often at the expense of anyone actually knowing how to use the technology to its full advantage. At the other end are the conservative schools that choose to wait and play it safe, letting others make the mistakes first before they commit to any form of technology. But why, in many cases, have these schools come up short? And why has Nobles been able to forge ahead of so many of its peer institutions? The answers lie in our simple, two-fold approach to technology.

First we have discovered that the key to technology is to keep the focus on the *humanware*, or the human aspects of computing. What use is fancy, expensive equipment if no one has taken the time to learn how to use it? Our philosophy for purchasing new hardware and software and for incorporating them into the curriculum has always assumed that *humanware* comes before hardware, that teachers skills with computers and technology are a prerequisite to the purchase of new technology.

Secondly, our success has come when faculty members (humanware), and in some cases students (also humanware), have had ideas that they have been willing to push and test experimentally at first, not adopting them schoolwide until we become convinced that they show significant potential to support teaching and learning. The results of this careful approach, one we have loosely termed try before we buy, ensure that the centrality of faculty/student interactions and a sound curriculum remain at the heart of the Nobles experience, while at the same time avoiding stasis in education.

Nobles approach began to take shape in 1995 when a campuswide computer network called Noblesnet, conceived and installed by a student, revolutionized communications among teachers and students, and connected the School to the Internet and the World Wide Web. Since then, huge strides have been made in incorporating computers into our educational program: we've networked our entire campus; added a fractional T1 internet connection line; automated our

library services; created a campus e-mail and bulletin board system for all students, faculty, and staff with components for parents, trustees, prospective students, and outside visitors; and provided on-going computer training and support for faculty.

Powerbook Pioneers

- *Ten pioneering faculty explore new ways of adopting computer technology into their classrooms to enhance teaching and learning*
- *The Pioneer program provides the teacher with an electronic blackboard that is a window into the entire world of data, graphics, video and information.*
- *While the results of the pioneer work to date are more anecdotal than statistical, they are unanimous in their sentiment: students in a pioneer classroom are more excited and involved in the learning process.*
- *The objective of the Pioneer program is exploration, the exploration of ways in which teachers can adopt computer technology into their classroom to enhance teaching and learning.*

Down in room number 008 in the basement of the Shattuck Schoolhouse, Sandi MacQuinn's freshman English class convenes daily over a powerbook computer, an LCD (Liquid Crystal Display) projector, a wobbly cart, cords akimbo, and a darkened room. All this so her students can present AppleWorks slide shows, HyperStudio stacks, interesting websites, and other assorted software designed presentations on ancient Greece or a Native American tribe and their contact with Europeans.

Some days MacQuinn says it's a disaster, with frantic pleas to Nobles Computer and Technology Coordinator Steve Bergen who runs down and crawls around on his hands and knees fixing cords and computer settings until he gets them to work - or doesn't.

But most days, MacQuinn is in awe of the learning environment in her classroom. "Most of the time I sit there scribbling notes, learning amazing details about things I didn't know, and the student is in control of the classroom for almost an hour, sharing information, answering questions, showing slides, manipulating maps, and using musical backgrounds to add drama and life to their stellar presentations," said MacQuinn, who admittedly has a love/hate relationship with the schools Pioneer Powerbook program that she and nine other faculty members are currently a part of.

"I take my cue from Steve Bergen who tells me we are attempting some very sophisticated stuff," said MacQuinn who joined the Nobles faculty this year. "It can be exhausting at times, because I am used to being able to totally control the environment and I cannot always do that with technology. But it's also very exciting. I'm learning and so are the kids. Its worthwhile and I'm sticking to it."

MacQuinn isn't alone in her mixed feelings about the technology. Many of the other Pioneer Powerbook faculty have also experienced similar frustrations spurred on by problems with the hardware and software. But like MacQuinn, they're staying with the program and using the powerbook in class as much as possible, whether it's used to supplement their lectures or as a medium for their students presentations. But why? What is so revolutionary about this program

that keeps these faculty members, and their students, clamoring for more? Perhaps the answers lie in the underlying philosophies of the Pioneer Powerbook program.

The image of pioneers was chosen for this project to connote the forward edge of educational innovation. Over the last year, Nobles has launched the first phases of its Pioneer Powerbook program in which ten teachers, representing different academic departments, have been supplied with basic pioneering equipment: a networked laptop powerbook computer, a modem, an internet connection line, a traveling case and special software applications that they have been required to use regularly in their classrooms.

In each generation, teachers have adapted to new educational tools that enable them to teach more effectively. The blackboard, although still valid as a teaching tool, is limited to a teachers writing and drawing skills. The overhead projector is limited, as well, in that each projection is simply an image that is static in nature.

In our Pioneer program, however, the laptop computer, in tandem with an LCD projector, literally puts the computer screen on the wall and becomes an interactive teaching tool with unlimited capabilities for such things as accessing resource materials from the World Wide Web, presenting CD-ROMs, showcasing and editing student writing, and taking notes during class that can be e-mailed directly to all class members over Noblesnet - all in an intimate, fast and engaging manner.

The objective of the Pioneer program is exploration, the exploration of ways in which teachers can adopt computer technology to enhance teaching and learning. While at times the effort to get the powerbooks wired for class has been frustrating, the benefits to both teachers and students have clearly outweighed the programs inevitable growing pains and sporadic technological mishaps, making the Pioneer Powerbook program a powerful teaching tool, for the ten teachers, or pioneers if you will, who have been using them in their classrooms.

“The Pioneer Powerbook program makes the classroom a richer daily experience for the students,” said Steve Bergen who created and has led the charge for the program. “It provides the teacher with an electronic blackboard that is a window into the entire world of data, graphics, video and information.”

At Nobles, we do not believe that computer technology in a classroom replaces teachers, or that students cannot learn effectively if their teachers are not using Pioneer program applications. But the School does believe that the Pioneer program has the capability to enhance more in-depth and interactive classroom learning experiences. “Technology today is a great advantage in the classroom,” began freshman Alexandra Briggs of Weymouth when asked to reflect on the use of the powerbook in class. “Information is more fun and interesting when presented in a multimedia presentation. I used HyperStudio, a multimedia program, for my English project. It raised my interest in the project and my friends were more attentive during my presentation. It was easy and hands-on, and adding graphics and sound made it look great.”

Bergen believes it's too simplistic to say that the program creates value only for students; he thinks the impact on faculty is enormous in that it creates a level of excitement for teachers that can sometimes be lost. "Teaching can be a burnout profession," he began, "but the Pioneer program creates a level of being on the cutting edge, of trying new things, a feeling of renewal. Our pioneers have been challenged to find new ways of presenting material, and that can be very energizing."

According to pioneer and English teacher Rosie Driscoll, her first day of pioneering yielded unbelievable and immediate results. "My goal was to get my sophomores to focus on their use of language in their *Macbeth* essays," she began. "I used the powerbook to project selected sentences from their drafts onto the screen and had the class work together to suggest solutions. I couldn't believe how well the exercise worked because the students were so engaged. I've certainly never managed to get them excited in a 40-minute discussion of grammar and syntax before!"

Bill Gilbert, who teaches Spanish, is one of the few teachers who has been able to embrace the full spectrum of the Pioneer program. As a modern language faculty member, he uses the School's Digital Learning Center with each of his classes one period a week. But, by also being one of the School's ten pioneers, he is able to use his powerbook in classes held outside of the DLC. "This equipment has been a wonderful help in my teaching," he said. "I use it to make periodic forays through websites in Spanish. It's neat to have the entire class read today's comics section in San Jose or an editorial on anti-terrorism from today's paper in Buenos Aires."

Whether a Nobles Pioneer is using the powerbooks for on-screen essay revisions or if they're exploring on-line websites, they have incredible access to the most current world of information from museums, universities, books, magazines, videos, foreign newspapers and more. And teachers are redesigning their lesson plans based on these new methods of curriculum innovation by creating quizzes or discussions after accessing in class such things as historical time lines, live CNN broadcasts related to physics lessons, graphics of ancient Roman and Greek artifacts from around the world, or websites related to upcoming field trips.

In the short time the Pioneer program has been tested, it has become clear that the tools of the program are providing teachers with the unique opportunity to think about new ways of presenting materials that illustrate their curriculum and excite and engage their students. It has also fostered a climate of interdepartmental sharing. "The Pioneer program has created an interesting interpersonal theme at Nobles," observed one teacher. "Teachers in unrelated disciplines are learning from each other: the Latin teacher, the physics teacher and the English teacher are all sharing their successes and failures and giving helpful hints to each other; technology is the catalyst here."

The notion that teachers are stimulated and revived by the challenge of finding new ways to present their material supports the core of the Schools belief that stasis in education must be avoided. Nobles must continually move forward and deploy prospective new tools experimentally at first and then adopt them should they prove to offer real benefits. While the results of the pioneer work to date are more anecdotal than statistical, they are unanimous in their

sentiment: students in a pioneer classroom are more excited and involved in the learning process and participate more frequently in class, thus creating a more interactive classroom.

Most importantly, students see their teachers not simply as harbingers of information, but as active and engaged learners themselves; this conveys a powerful message about lifelong learning to faculty and students alike.

Institutional strategies for Moving Forward: Immediate Impact

- Use Division Meetings to move forward: Demonstrations sharing both skills and pedagogy could be held at the beginning of each meeting; teacher presentations should transcend “show and tell” to include classroom issues and management strategies. Schedule “Dart and Dash” technology moments allowing faculty to contribute quick shares of tips, techniques, or integration strategies at the opening of each meeting, or open with a short spotlight on one “cool website.” Set aside time to view informative YouTube videos or TED talks about pedagogy and technology. Teachers could run a mock classroom, modeling IWBs and/or technology integration strategies and management techniques. All faculty members could bring laptops to experience note taking within a classroom environment. Video viewing could be assigned and then discussed during the meeting, creating a model of the Flipped Classroom. Pedagogical discussions throughout the divisions and departments could be arranged. “Learning buddies” across departments or divisions could convene. Departments could take over meetings once per month to demonstrate “Best Practices” in their curriculum.
- Carve out the time for Moodle Mondays or Tech Tuesdays afternoons to include skills and pedagogy discussions.
- Require technology sessions for new faculty: These technology sessions should be spaced throughout the year and not designated for only a day or two. The teachers could be held accountable for appropriate classroom integration by demonstrating at least one new technology implementation to the department.
- Provide workshops prior to school opening on a variety of smaller topics: Digital Storytelling, The Blended Classroom, Google Earth and its Applications, Flipping the Classroom, Podcasting, Writing and Revising with Google Docs, Collaborating with Social Media, Managing the 1:1 classroom, Creating a Personal Learning Network with Twitter, Alternate Assessments with Technology, Technology and Learning Styles, Video Editing, Teaching with Interactive White Boards, and Web 2.0 tools. These workshops should be repeated during the year as individual offerings or during a Professional Development Day. Another option is to design discussions/workshops around a pedagogical principle --risk-taking, collaboration, digital literacy, etc.-- and the ways technology addresses these principles/issues; existing study groups could be charged with assessing technology use in their area of study based on these discussions
- Establish specific times for faculty development by instituting annual Professional Development Days focusing on technology implementation: One such day could be a Technology Carnival; faculty become “carnie operators” by setting up “booths” to demonstrate their technology project and to teach the necessary skills to other faculty members who are the “carnie visitors.” Another option is to provide opportunities to connect with success by setting aside time for teachers to visit or tech-connect with schools integrating technologies effectively. These days could be divided by

department, division or across the divisions; they could be teacher-led, student-led, or Academic Team-led.

- Leadership Seminars: Faculty highlight technology projects and initiatives to the Administrative Team several times throughout the year; these seminars can also be used for discussions of technology initiatives and skill-building.
- Develop a Technology Institute with regularly scheduled meetings; this group of pioneering faculty would participate in a seminar focusing on technology pedagogy, management issues, and skill-building. Providing a stipend or some other incentive should be considered.
- Focus on a “Department of the Year” as an integration strategy or provide discipline-specific training. Develop workshops based on department-driven projects with both hands-on work and curriculum discussions.
- Designate a team of experts to provide follow-up support to workshop training sessions. Select technology innovators from each department to spearhead technology use.
- Form an Innovations Team charged with the task of exploring, evaluating, and piloting the use of new and emerging technologies and initiatives

Institutional Changes for Moving Forward: Big Picture Initiatives

- Become a Google Apps School to further collaborative activities and 21st Century skills; the world is increasingly collaborative, giving rise to reflection about the way student projects are structured.
- Initiate an opt-in program: A pioneering group of faculty members would select three areas each is most interested in developing for his/her curriculum and then commit to professional development for an extended time to acquire the necessary skills and pedagogy. All opt-in participants must demonstrate their use of these initiatives to Department/Division Heads. Eventually, the opt-in program could become required for all faculty members.
- Construct rubrics for faculty or a base knowledge requirement: Create a list of goals, learning objectives, and the necessary skills a faculty member must demonstrate.
- Introduce media literacy and digital citizenship in all courses; digital media literacy continues its rise in importance as a key skill in every discipline and profession. Include discussions of plagiarism, copyright and fair use, and search strategies as appropriate to each course.
- Institute electronic portfolios for all students

Specific Recommendations and Divisional Options:

- Explore the iPad for curriculum use in all divisions: provide one iPad per faculty member to initiate exploration and discussion.
- Survey the faculty regarding Professional Advancement and Development: what areas do they want addressed; what do they need to learn; what do they want to learn; what works and what has not worked.
- Celebrate successes with parents: Possibilities are a Technology Celebration Night run by faculty , a Moodle page designed to highlight projects and share information and resources, a Technology Project of the Month detailed on the school website, workshops for parents on Web 2.0, Moodle, and Digital Citizenship issues. Another Success Celebration could be centered on students sharing their electronic portfolios or their 1:1 laptop successes.
- Form a student staff to empower the students.
- Suggest that all teachers create a Personal Learning Network by taking advantage of Twitter, blogs, wikis, social networking sites, RSS feeds, and social bookmarking.
- Share a website of the month: faculty in one division or department incorporates the site and demonstrates their integration strategies.
- Purchase a digital camera for each faculty member to explore the educational applications of video; faculty could experiment with the Flipped Classroom concept by filming a lecture and assigning it for homework viewing.

Issues to consider in Successful Laptop Usage

- 1. Leadership:** The fish rots from the head, said former Presidential candidate Michael Dukakis. Head of School and trustees need commitment to the vision and financing of the program.
- 2. Curriculum:** Head of school, faculty leadership and Technology department need an understanding of the school's curriculum.
- 3. Teacher equipment:** Abide by the motto of “Teachers First;” teachers need access to professional development and laptops one year in advance of the start of any student program.
- 4. Teacher training:** Faculty needs both short term intensive training and on-going sessions.
- 5. Teacher Time:** Teachers need release time for training, sharing and curriculum development.
- 6. Technology Staff support:** No Elephants without Hay: there needs to be an adequate, fully staffed technology support team in place.
- 7. Outside Services:** Critical is a good working relationship with dealers and technicians.
- 8. Equity:** Schools must address this issue by providing student scholarships or laptop loaners.
- 9. Network Needs:** Financial commitment to support both traditional network and wireless.
- 10. Classroom Set-up:** Classrooms need to be provided with projectors. IWBs allow for maximum laptop use. Arrange classrooms to allow teachers to view laptops easily to ensure that students stay on-task.

Gender Equity: Females and Technology

A central humanware issue is women and computers, both students and faculty. A recent UCLA study revealed that female college freshman are far less confident in their computer abilities than their male counterparts. Time spent on the computer is not the issue because both males and females reported roughly equivalent time spent using computers; however, the male students were twice as likely to rate their skill level as above average. The study also revealed that male college freshman were five times more likely to pursue a career in computer programming. This gender gap is, in fact, the widest in the history of the UCLA survey.

After all these years, girls are certainly using computers. Walk into any lab and you will see girls eagerly chatting online, AOL messaging, and word processing all of their essays. Yearbook editors, traditionally female, must use computers and many technology coordinators-particularly in the lower school level-are female. So what is the problem? Agreeing with the above statement, Sherry Turkle, professor of sociology at MIT and co-chair of the commission, asserts "The commission makes it clear that girls are critical of the computer culture, not computer phobic. Instead of trying to make girls fit into the existing computer culture, the computer culture must become more inviting for girls."

The commission reported further troubling statistics:

- Girls represent 17 percent of the Computer Science AP test takers, and less than one in 10 of the higher level Computer Science AB test takers.
- Women are roughly 20 percent of IT professionals.
- Women receive less than 28 percent of the computer science bachelor's degrees, down from a high of 37 percent in 1984. Computer science is the only field in which women's participation has actually decreased over time.
- Women make up just 9 percent of the recipients of engineering-related bachelor's degrees.

The heart of the matter, it seems, is redefining the term computer literacy; girls using computers is not the issue. The issue is "Computer Fluency." According to the report, "Gender equity cannot be measured by how many girls send e-mail, use the Internet, or make Powerpoint presentations. Rather, gender equity means using technology proactively, being able to interpret the information that technology makes available, understanding design concepts, and being a lifelong learner of technology. The new benchmark for gender equity should emphasize computer fluency: girls' mastery of analytical skills, computer concepts, and their ability to imagine innovative uses for technology across a range of problems and subjects."

That all sounds great, but can these goals be accomplished. The study provides these guidelines:

- *Rethink educational apps:* Software designed specifically for girls tends to be problematic because the focus is usually on the stereotypical female issues of social concerns and looks. Software does not need to be specifically designated for girls or boys. Educational software and games have too often shown significant gender bias. Software should not only speak to girls' interests but it should encourage them to explore new skills and new areas of technology.
- *Provide time for teacher training:* Professional development for teachers needs to emphasize more than the use of the computer as a productivity tool. It must give teachers enough understanding of how computer technology works and its basic concepts so that they are

empowered users. The focus needs to be implementing technology in meaningful, real-world and innovative ways to engage female learners.

- *Educate girls to be designers, not just users:* A recent study by Tufts University recommended that engineering be taught at all grade levels. Educators and parents should help girls imagine themselves early in life as both active users and creators of new technology. Engage girls in "tinkering" activities that can stimulate deeper interest in technology; provide opportunities for girls to express their technological imaginations. Look into the MIT program, Scratch.
- *Attack Stereotypes:* For the most part, girls perceive computer professionals as living in a isolated, antisocial world, a world inhabited by short boys wearing glasses. Show them other role models.
- *Get parents involved:* Among other things, parents should be encouraged to place computers in accessible home spaces. Parents should be encouraged to send their daughters to computer camps and to enroll them in computer classes. Send a newsletter home to parents detailing the available computer courses and encouraging parents to do some friendly arm twisting.
- *Compute across the curriculum:* Integrate technology across the curriculum, particularly in the areas female students seem to excel such as art, music, and literature, as well as math and science; this integration invites more girls into technology through a range of subjects that already interest them.
- *Redefine computer literacy:* Computer literacy needs to be redefined to include the lifelong application of relevant concepts, skills, and problem-solving abilities. Students must be trained to be literate citizens in a culture increasingly dependent on computers. As Sherry Turkle has stated, "To be alienated from technology in our society is to be disenfranchised." Students—especially females—must be educated to move beyond Facebook to solve real-life problems with technology. Empowering girls to access technology for complex, innovative uses requires a mastery of these literacies and abilities.
- *Address gender equity issues in public forums:* Newsletters, parent meetings, faculty meetings, trustee meetings—all need to discuss this issue. Workshops for parents have several benefits but the relevant one for the gender equity issue is that these workshops can help alleviate parents'—particularly mothers'—fear of technology.
- *Create opportunities to explore technology:* Create computing clubs, student staff programs, and summer school classes for girls, mentoring programs, science fairs, and programs that encourage girls to see themselves as capable of careers in technology.
- *Laptop programs:* Because teachers of laptop classes feel obligated to use technology intensively, girls in those classes will by necessity become engaged in using technology aggressively. The focus can be moved to higher order thinking skills and applications.

Good to Great and the Collaboration Hypothesis

Top Ten Best Practices

1. The collaboration hypothesis occurs when a key technology leader works closely with an administrator on planning and phasing of technology initiatives.
2. Create a culture of innovation.
3. There needs to be data-driven accountability for each tech initiative. Link new hardware with professional development; training should always be tied to receiving hardware and software.
4. Provide hardware with a clear, designed system. Technology initiatives should be staged and should be linked with your strategic plan in terms of time and resource priorities.
5. Publicize your technology initiatives to parents, faculty, and trustees
6. Think “outside the box” about faculty paradigms: faculty meeting presentations should focus on "sharing, not presenting" and teachers should create conversation starters.
7. Create a balance between technology committees, mandates, and small groups in the decision-making procedures for “moving forward.”
8. Key administrators need to be well versed in tech and need to be the cheerleaders.
9. The key technology person needs to be on the Administrative team. That person should be be savvy about both technology and curriculum, about both hardware and humanware.
10. The inch by inch, one step at a time paradigm, is crucial (wind sprints in what is going to be a marathon).