

**TECHNOLOGY IN CONTEXT: A Critical Examination of Technology in Education**  
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**Creating the Just-In-Time Learning System - Merging High Tech with High Touch**

**America will have a new type of life long, cost effective learning system in the 21st Century--The only question is what role, if any, public education will have in that system.**

My primary mentor, Kenneth Boulding, taught me that:

**As we move from centuries of Information Scarcity to a new century of Information Abundance--the Information Age--Knowledge ceases to be the acquisition of information, and becomes the skills to manage the orderly Loss of Information”**

Today’s school systems were based on the acquisition of information:

Tomorrow's schools will be on the use of information--critical thinking and application of knowledge skills.

Furthermore:

The chairman of the U.S. Chamber of Commerce, John Clendenin, CEO of BellSouth Corp. recently said:

**“The bottom line is, America’s fight for long term competition ultimately will be won or lost not in the halls of Congress...not in the boardrooms around the world... but in America’s classrooms”.**

Education has become too important to America’s success, even its economic survival, to be allowed to continue to wallow in mediocrity and backwardness. Every other industry in America has used technology to create dramatic improvements in productivity. The education industry is the largest monopoly left in America, now that the defense industry, telephone companies, and public utilities are downsized or placed in a competitive environment. Without the challenge of competition, within America or from foreign firms, education has been able to operate pretty much the same for over one hundred years.

**TODAY'S EDUCATION SYSTEM**  
faces:  
**INFORMATION AGE CHALLENGES**  
posed from a  
**GLOBAL ECONOMIC MARKETPLACE**  
in a  
**HIGH TECHNOLOGY AGE**  
with a  
**BUREAUCRATIC AGE CULTURE**  
and an  
**INDUSTRIAL AGE DELIVERY SYSTEM**  
governed by an  
**AGRICULTURAL AGE CALENDAR**  
toward a  
**FEUDAL AGE AGENDA**

I hope that the headings of the statement above are self-explanatory since I will not take space here to explain, but use this statement to further illustrate the mis-match between the education system we have, and the education system we need for the next century. I also hope the reader will understand that I am not attacking any group of individuals. The problem is a system's problem. The result of decades of individualized decisions of well-intentioned people operating on principles more relevant to a prior time, a different world than now exists. The only blame is ours collectively, for not more actively engaging in the change process with all of our cards--our sacred cows-- on the table for review and discarding.

**COMPONENTS OF NEW LEARNING SYSTEM:**

The first graphic shows the components of a new learning system. We will have a system designed on using the best of:

- **Standards Based Education** (High world class content standards leading to focused demonstrable performance skills);
- **Diagnostic/Prescriptive Individualized Curriculum;**
- **Just-in-Time-Learning;**
- **Value Added Measurement;**
- **High Touch/High Tech Delivery systems;**
- **Learner as Producer of Learning Materials;**
- **Total Learning Communities;** and a
- **Finance/Governance system** focused on funding and rewarding investment that leads to both student achievement improvement and system productivity gains.

A system focused on meeting the diverse learning styles and conditions of the learner with diverse learning methods. Equity will be judged by the fairness of outcomes, of student achievement, not by the sameness of teaching method and process. On the basis of student achievement we have a very unjust system, which will never become just until

student achievement is high for all learners, independent of geography, race, color, national origin, or wealth.

There is not space here to explain each component, rather let me focus on the role of technology in the new system. We have to re-frame our view of technology and learning. For decades the automobile industry in America believed that they could either build a low cost, or a high quality car. W. Edwards Deming tried to explain to American auto companies that they were wrong. The Japanese companies heard Dr. Deming and accepted his paradigm shift that High Quality = Low Cost. The world's auto industry changed, totally.

Likewise I argue that educators and policy makers currently see technology as a replacement for people. This is not true. Rather, as John Naisbett said we can and must have High Tech and High Touch at the same time. We can never afford to have one-on-one teacher student interactions all day. However, we can use technology as described below to have an actively engaged learner all of the time if we use technology and people differently. The real improvement for the learner is based on the degree of active involvement in their learning. Whether one-on-one with a teacher, para-professional, volunteer, or computer; or in very small groups, we must engage their mind in active learning activities. Being a passive participant in 30 plus classes has proven to engage less than 10% of the students at any point in time.

#### **NEW INDUSTRY BEING CREATED IN AMERICA:**

A new industry is being created in America. We are beginning to create massive Data Libraries. These contain all the books, drawings, videotapes, audiotapes, lesson plans, experiments, and other ways of storing information. Whereas five years ago it might have been a college or neighborhood library, now it is an electronic data source of limitless capability. No one place will contain the information. Rather all information sources are being made available in electronic form through the Internet. The Library of Congress, vast as it is, becomes but one small source of information. Private firms control vast data sources, including the collections of journals at Dialogue, the movies at Disney and TNT, the space information at NASA, etc.

The present learning system is primarily delivered through a teacher-expert at the front of a classroom to a group of learners. Today's technology is used primarily to deliver this talking head through videotape or broadcast TV to additional sites. Providing two way audio or even audio-visual merely perpetuates the primarily one-way and one to many nature of the communication process. It is actually amusing to me that educators have found such creative ways to force expensive technology to support the present classroom model. Today's technology has to be crippled to work this way, but that has also been done.

The Just-In-Time Learning System is one based on eliminating the classroom, as we know it--eliminating the teacher as expert, and teacher as boss. Most importantly it is

a system based on treating every learner as an individual with the capability to learn anything they want to learn acknowledging their limitless potential of learning and knowledge. To do this we must focus on the learner's needs, preferences, goals, and motivators.

### **Individualized Curriculum for Cost-Effective Education:**

Look at the graphic, step one is to Query the Learner as to what they want to learn. Then create a "learning nugget" which is our term for a sequence of experiences which allows the learner to learn whatever they want to learn, at their own pace, and focused on the methods and techniques best for that learner.

A learner will work with a teacher/coach. That human will represent a high-touch, caring, personalized tutor formerly only available to the wealthy who have had this type of individualized learning for centuries. With the ability to use technology to access information, guide learning activities, assess progress, and provide both individualized learning and assessment we **may** be able to provide personalized learning for every person. The new teacher will be a coach or learning facilitator, not a subject expert. Subject expertise will be delivered through telecommunications or from CD Roms' and other information sources. The teacher/coach will learn subject competencies alongside the learner.

I say **may**, because the policy issues are as important as the technical issues. Today's wealthy child already has access to multi-media computers at home, the Internet and all databases, and a private tutor to guide and direct the learners. Corporations can provide such resources to their employees, and do so at an increasing rate. However, the middle class and the impoverished classes have little or no access to this emerging learning system. Moreover, the power structures avoidance of real re-structuring using technology will further impoverish the un-powerful, and is increasing the gap between the have's and have not's.

Home schoolers' who have multi-media, Internet access, and parent/tutors are beginning to demonstrate tremendous rates of learning and levels of achievement. A recent Wall Street Journal front-page article demonstrated this to be the fastest growing segment of home schoolers. Last summer I spoke to members of State Boards of Education from over thirty states and used a cartoon showing a parent yelling at "Johnny" leaving for school. The parent pointed to a computer multi-media work center in the corner of the house living room, and said, "**Johnny, you cannot go to school today-- I want you to stay home and learn**".

Schools have focused so much on social skills that less than 10 % of the time is a student actively engaged in a learning activity (according to extensive research at the Mid-Continent Regional Education Laboratory in Colorado--McREL). Thus in a semester of about 2000 hours, a child is an active learner for less than 200 hours. They not only watch TV for more hours than that, they also play Nintendo, socialize, and party more hours per month than they are active learners in school in a year.

### **LEARNER AS PRODUCER:**

Affordability of such an individualized system will come about as every learner adds to the data banks of information, learning projects, and shares learning and teaching duties with each other. Already we have productive exchange of ideas between learners of very different ages, countries, and stature through the blindness of electronic conferencing. One of my projects has as a mission statement the following:

*“Our mission is to create a learning environment in which each student, guided and helped by his or her teacher, supported by technology, learns a subject using whatever resources are available--teachers, other student, parents, computers, multimedia, texts, video--well enough to then convey their knowledge to other learners. Learning by doing, demonstrating, teaching, and increasing the stock o available information and learning materials for learners of all ages. Making learning meaningful because each student is actively contributing to their own education and to the education of others”.*

In this system we will pay children to teach other children, adults to teach adults, and children to teach adults as well. A system of royalties will be created on information server networks, like America On-line, Prodigy, etc. As material is used, the provider earns money, and as they consume other’s ideas they pay out. An electronic economic marketplace for ideas and knowledge will be created. Schools may well begin this, or perhaps be replaced by it.

### **PRIVATE COMPETITION;**

Major corporations, especially newly merged Tele-communications/multi-media giants like Times/Warner, TCI, Disney, US West-Bell Atlantic, see a major new marketplace for the next century. With almost \$400 billion dollars being spent on education at all levels private industry sees the delivery of learning as the largest untapped, or under utilized market place in America. With fiber optic level broadband connectivity provided to every home, business, and school building in America they are beginning to produce the products for learning shown in my diagram as the Data Library. They are already buying textbook companies, curriculum producers, computer software development companies and other components of the new age of multi-media learning. They see no need to buy teachers--because 99 % of existing and newly graduating teachers are illiterate in these new technologies, and many seem ideologically opposed to using technology for learning.

### **SUMMARY:**

This is not yet a completed, cogent argument for where education is heading in the next century. Rather this short paper is a call to concern and hope. We have the tools and technology to create a new learning system based on the principles listed above, such as, Content Based Education, High Touch and High Tech delivery systems, learning integrated with the total community--not just in school buildings--and personalized learning based on the interests, and learning style preferences of the learner. We do not

yet have an accepted total vision of the new system, nor do we have public policies which will insure, or even consider, access to the poor and dis-enfranchised for using technology to learn.

We also have a new learning system being created by private entrepreneurs who will continue to advance vouchers and other means of funding competition with public schools. The issues of the next several years are both the means and methods of using technology to improve educational productivity. As important is the re-formation of public policy to insure access to everyone, whether rich or poor, urban or rural, technology comfortable or ignorant. Most public educators continue to shun this revolution, but they will be among the missing in the new learning system. Technology has a continuing downward cost curve, and people always cost more. People using technology will replace the overly expensive, information poor and isolated classrooms of today.

Public education has a choice. It will either actively embrace these new technology driven opportunities, or be replaced by private firms who will use them. The business marketplace already knows how to segment the marketplace by the characteristics of the consumer, how to differentiate the product for each segment, and thus how to better meet the needs of a real world of different people. If public education clings to the Marxist model that the same size fits all, then it will be as doomed to failure and replacement as was the former Soviet Union and its partners.