Chapter 2 - First Things First

First things first.

Platitudes may be time worn and overly simple, but they often capture an essential truth.

First things first.

“That’s obvious!” someone might grumble.

But it is startling to note how many districts fail to consider all of the key issues while neglecting, ignoring or underfunding the essential elements of a successful technology/literacy program.

It is also surprising to watch the order in which various issues may be considered or addressed (if at all). The metaphor of placing a cart before a horse aptly captures this failure to follow a logical sequence.

We should begin by asking what kinds of student learning we hope to promote. Those questions then logically lead to considerations of strategy and resources. Once we have a good sense of our purpose and the activities we plan to launch, we can begin to design a network that serves them well. Design should follow function.

In many cases, installation precedes discussions of purpose. Getting wired becomes the goal.

When we are planning networked schools, we should agree on a clear educational purpose. We might decide, for example, to create an "information literate school community." (McKenzie, 2000) This choice would then guide the design and development of our program.

First things first! First the purpose . . . then the design.

In all too many places, the network precedes the purpose and is distantly (if ever) related.

In all too many districts, the network is installed "cookie-cutter" fashion from school to school with little relationship to learning goals and process.

This gap between purpose and design is a recipe for failure and

waste.

When we begin with a clearly stated purpose, we can then focus our efforts. This focus produces momentum and results. Mish mash, on the other hand, leads to confusion, scatter and drift.

If we are constructing an "information literate school community," the "building blocks" fall into place.

- The shape of professional development
- The nature of classroom activities
- The placement of equipment
- The layout
- The time-line
- The assessment activities

The Key Elements

A few years back I was asked to write an article about planning for technology by a leading educational journal. When I submitted the article with a list of essential elements, they cut the article in half and deleted half of the integral parts of the system. In the article, I had explained how these components must be skillfully interwoven to reinforce each other in service to improving student learning.

These elements should meld as an integrated package. Remove one component and the effort is likely to fail or flounder. Each element is as important as a key stone. Pull out the keystone and watch the arch tumble to the ground.

If we hope to see an impressive return on our investment, we cannot eliminate, short change or underfund any of these elements.

The editors tried to pull three elements from the article . . . three of the stones from the arch I had constructed!

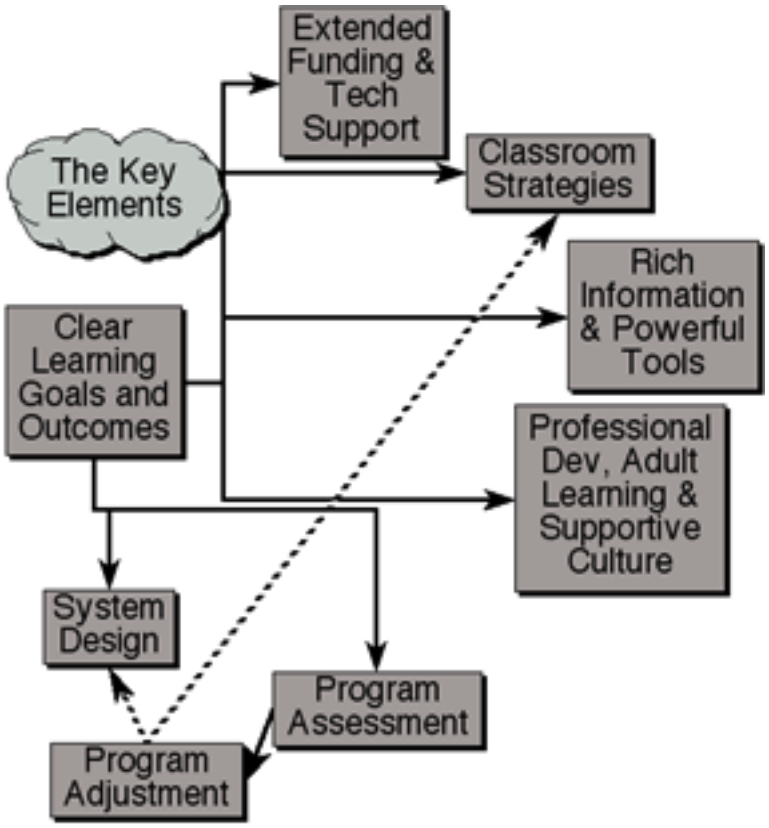
I pulled back my article and found a different publisher - one willing to print the article as submitted with all of the integral parts intact (see figure below). The article has been extensively modified for this edition based on recent experiences with technology planning challenges as well as new planning resources now available to teachers and administrators.

1. Make learning goals and outcomes very clear

The installation of networks should support learning activities that contribute discernibly to student performance.

This challenge should be about using new tools to help students

First Things First



master the key concepts and skills embedded in the science, social studies, art and other curriculum standards. It is not so much about powerpointing, spreadsheeting or word processing. The focus should be on teaching and learning strategies that actually make a difference in daily practice – on activities translating into stronger student performance. As a result of these practices and the use of these new tools, students should be able to . . .

- read, reason and write more powerfully.
- communicate productively with members of a global community.
- conduct thoughtful research into the important questions, choices and issues of their times.

- make sense of a confusing world and a swelling tide of information.
- perform well on the new, more demanding state tests requiring inferential reasoning, analysis, synthesis and interpretation.

The above list reflects the high expectations of most states as they define educational purpose for this new century. A quick glance at state standards from states as diverse as California, New York and Oklahoma show that these goals resonate from shore to shore as well as emerging from other countries.

In Western Australia, for example, the curriculum frameworks for English lists thirteen Overarching Learning Outcomes (see opposite page).

Long before the design and installation of a network, a committee of educators should be asking how teachers might best develop such capabilities. In an earlier book, (McKenzie, 1993), I advocated an approach to goal setting called "Future Perfect District Technology Planning." An updated version of this approach has been included in the next chapter.

Once the goals and the outcomes are clear, the planning groups turn to the task of identifying the most promising practices and strategies to foster such growth. Most educators recognize that effective strategies are the crucial factor in shifting student patterns.

"First things first" suggests that educational purpose is clarified before strategies are selected and systems or networks are designed. The best use of new technologies is to support curriculum rich learning experiences that are standards-based and likely to elevate the skill levels of participating students.

A poem is better than a tome.

If this planning process stands any chance of modifying or enhancing the daily practice of teachers throughout the district, the committee must translate the goals into a simple but compelling format that will "grab" all teachers' attention and then win their support by passing various tests of practicality, worth and reasonableness.

In all too many places, the planning documents are too long, too grand, and too imposing. They seem more like publicity documents than blueprints for change. They seem written to impress the outside community rather than inspire those responsible for implementing the changes envisioned.

Before moving forward with program design and network design,

First Things First

Western Australia Overarching Learning Outcomes

1. Students use language to understand, develop and communicate ideas and information and interact with others.
2. Students select, integrate and apply numerical and spatial concepts and techniques.
3. Students recognize when and what information is needed, locate and obtain it from a range of sources and evaluate, use and share it with others.
4. Students select, use and adapt technologies.
5. Students describe and reason about patterns, structures and relationships in order to understand, interpret, justify and make predictions.
6. Students visualize consequences, think laterally, recognize opportunity and potential and are prepared to test options.
7. Students understand and appreciate the physical, biological and technological world and have the knowledge and skills to make decisions in relation to it.
8. Students understand their cultural, geographic and historical contexts and have the knowledge, skills and values necessary for active participation in life in Australia.
9. Students interact with people and cultures other than their own and are equipped to contribute to the global community.
10. Students participate in creative activity of their own and understand and engage with the artistic, cultural and intellectual work of others.
11. Students value and implement practices that promote personal growth and well being.
12. Students are self-motivated and confident in their approach to learning and are able to work individually and collaboratively.
13. Students recognize that everyone has the right to feel valued and be safe, and, in this regard, understand their rights and obligations and behave responsibly.

it makes sense to pause for a period of reflection, consideration and recruitment.

The driving question is whether or not the vast majority of teachers in the district will applaud and embrace the goals established by the committee. Drafting the document is merely an opening stage of an extended dialogue that must eventually convert skeptics and doubters into believers willing to work hard on translating goals into realities.

To skip over this recruitment and persuasion stage - as is typically the case - is somewhat like Noah pushing off from land before loading the animals.

"But why should we sail with you, Noah?"

"Because I have a great ark."

Unfortunately, promising great boats, great toys or great bells and whistles appeals to a very small group.

We need something more substantial, more appealing and more valuable.

And those who warn of floods, disasters and corporate needs are also unlikely to fill their technology "arks" with eager volunteers. Even though such warnings and threats are popular strategies in some places, they show a meager understanding of schools as well as the most rudimentary truths of encouraging good change.

"The sky is falling!" wins more recruits for shelters than keyboards and literacy.

2. Identify promising learning strategies

The selection of learning strategies should follow naturally from the setting of project goals.

To illustrate the process, imagine a school that has decided to emphasize the following three outcomes previously listed (on page 10) from the **Western Australia Curriculum Frameworks**.

1. Students use language to understand, develop and communicate ideas and information and interact with others.
3. Students recognize when and what information is needed, locate and obtain it from a range of sources and evaluate, use and share it with others.
6. Students visualize consequences, think laterally, recognize opportunity and potential and are prepared to test options.

Having made this choice, the next step is to identify those practices most likely to produce such outcomes. Who has done the best

work on these capabilities? Which instructional or learning models have been tested until proven effective, reliable and worth adapting for local use?

To address all three statements, the planning group surveys the field seeking models that address all three outcomes simultaneously. The group also looks for strategies capable of winning broad acceptance by the planning group.

As part of the change process, the planning team is seeking books, articles, videos and other materials that will help them to sell the learning strategies. Because they know it is a long and trying journey from theory into practice, they prefer theories and models that are firmly rooted in practical realities. They look for work that "sells itself" because it is communicated in plain but compelling terms that will appeal to classroom teachers.

The planners understand that the test of a good model involves more than good intentions. It should be appetizing, reassuring, reliable and user friendly. With some exceptions, teachers caught in the "daily press" have little patience with models that require heroics and offer months of turbulence and trial.

"Give me something that will work on Monday morning without me sacrificing my weekend getting it all ready."

The planning group settles on the following works as a basis for addressing the three outcome statements:

1. **Mosaic of Thought: Teaching Comprehension in a Reader's Workshop.** Keene and Zimmerman (1997) offer a set of reading strategies to empower young students to read with far more understanding.

2. **Non-Fiction Matters: Reading, Writing and Research in Grades 3-8.** Harvey (1998) shows how to engage students in the exploration of serious questions with passion, resonance and coherence.

3. **Strategies that Work: Teaching Comprehension to Enhance Understanding.** Harvey and Goudvis (2000) propose a strategic approach to reading and thinking that involves questioning, visualizing, and synthesizing among others.

4. **The Art of Teaching Writing.** Calkins (1994) has little to say about technology but a great deal to say about teaching writing as process. She brings the conferencing process to life with great detail and thoroughness based on decades of working with students and teachers.

5. **Creating Writers: 6-Trait Writing Assessment and Instruction** (Spandel, 2000) and **The 6+1 Traits of Writing Center at NWREL.** (http://www.nwrel.org/eval/writing/) Spandel establishes the clear connection between revision and powerful writing. "When we use the language of the traits, students learn that they need to examine their work for clarity of ideas, the appropriate form of organization, the alignment of purpose and audience in their voice, the precision and accuracy of their word choice, and to make sure their sentences are not only formed correctly, but also have a rhythm and cadence that makes their work read smoothly and with style."

6. **In the Middle: New Understandings about Writing,, Reading, and Learning.** Atwell (1998) provides a comprehensive approach to focus student efforts on the development of understanding.

7. **Beyond Technology: Questioning, Research and the Information Literate School** (McKenzie, 2000) - Inspired by information literacy strategies being explored throughout Australia, **Beyond Technology** outlines an approach to research that makes student questioning and thinking central to schooling.

Once these models are identified, the team members must wrestle with the challenge of **orchestration**. They must figure out how to weave these program elements and possibilities into a comprehensive, coherent whole. Much like a poet, they must distill, combine and synthesize so that the pieces merge together and support each other with power, grace and simplicity.

"And where did they teach us that skill in graduate school?"

Good question. There is little in the professional preparation of teachers or administrators that might prepare them for the development of compelling and poetic models. Sadly, it seems that much of higher ed is committed to a kind of pseudo scientific approach to decision-making that often seems designed to filter out the very passions, feelings and more soulful aspects of schooling and learning that might actually ignite enthusiasm, support and allegiance.

Fortunately, the planning team can turn to the inspirational writing and thinking of educators like Deal, Lieberman, Fullan and Joyce as well as other writers about organizational development like Senge, P. (2000), Schwartz, P. (1991), Tucker, R. (1991) and Vail l (1989).

Chapter Three - "Future Perfect Planning" - offers a brief amalgam of the best strategies of such thinkers as applied to technology planning. Translating learning models into daily practice requires a process that is somewhat analogous to seeding a cloud to create rain. The district provides the resources to enable change, but individual

Purgatory to start seeding clouds
Sept. 15, 2000

By Tom Sluis
Durango Herald Staff Writer
http://www.durangoherald.com/1news3077.htm

Cloud seeding will resume at Durango Mountain Resort this

teachers must transform the concepts and strategies suggested by the models into actual lessons that will persist day after day.

It would make little sense to invest huge sums in these new technologies in order to win only occasional use, a special events type of implementation that involved students in doing searches and investigations a few times each year.

The goal should be to integrate the standards-based learning into every day's lessons.

The stretch from theory and model into daily practice is rarely addressed by those who bring new technologies and networks into schools, but the distance is vast. Moore (1991) writes about

Deception Pass
in Washington State

"Crossing the Chasm". And "chasm" may not be an exaggeration.

The challenge of moving past theory into routine practice has been described in great depth by Joyce and Showers. They call it the "challenge of transfer."

It is one thing to sit in the comfort of a staff development session and listen to an expert describing a new technique.

It is quite something else to make that same technique a success on Monday morning with real students in a real classroom. It is irresponsible to install networks without first equipping all teachers with the skills they need to overcome the obstacles and frustrations they will inevitably encounter when they try to use the network to deliver curriculum rich lessons.

3. Combine rich information with powerful tools in a strategic manner

Before designing a network, the planning group should begin to clarify what students will actually be doing with the new technologies. This clarification will begin with a full listing of questions worth considering such as the following:

- Which curriculum concepts, themes and issues will students explore as part of this initiative?
- Which kinds of information sources (electronic and print) will they require to complete a thorough investigation?
- How will students sit? Alone? In pairs? In trios?
- How much time will be desired at a sitting?
- How frequently and for what duration will they need access?
- Will they need access within the social studies classroom or science classroom or further down the hall in the school library or a computer lab?
- What reference tools will they need?
- What mindware like Inspiration™ will best support and extend their thinking?
- What will the teacher be doing? How will the role of the teacher change, if at all?
- What spatial organization of the new technologies will best support the kinds of learning and teaching activities that are anticipated? Should equipment be in rows or peripheral? Would wireless notebooks work best?
- If teachers will be operating more as facilitators of learning than instructors up at the front of the room, which of the

following verbs are most likely to describe their activities and what are the implications for the design of a classroom environment? of a network?

circulating	validating	moderating
redirecting	facilitating	diagnosing
disciplining	moving	troubleshooting
questioning	monitoring	observing
assessing	challenging	encouraging
guiding	motivating	suggesting
directing	watching	modeling
fascinating	seed planting	clarifying

This questioning can proceed by observing examples from other districts and by convening invention teams at each level of the district to try out various models before making a commitment..

The lessons learned and the problems avoided thanks to a year of invention and testing could save the district a huge amount of money, frustration, disappointment and embarrassment, as the focus on delivering practical lessons is likely to bring many design issues into the foreground that might not otherwise emerge until most of the infrastructure had already been nailed down.

Teaching science in a laptop classroom in Antelope Valley, California

Many school networks suffer from the "network starvation" outlined fully in Chapter Nine. To put it simply, understaffing of technical support and underfunding of information resources can lead to a network that has little of substance to offer the leaners. Such networks may scream with speed and bandwidth while possessing nothing worthwhile to deliver.

When planners start with curriculum questions, it should quickly become evident that there is no "free lunch" on the Internet. No district should rely on the "free" Internet alone.

When a student or teacher sits down at any desktop in the district, they should be greeted by a rich information array.

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Those who have spent time exploring curriculum topics with the "free Internet" soon find that it is flawed in many respects, suffering from Info-Glut, Info-Garbage and excessive marketing. They move swiftly to supplement the "free Internet" with other information products for which they pay a hefty price.

The goal is to equip each desktop with a dozen rich and reliable information products.

A student might select from several periodical collections, an atlas, an encyclopedia, a thesaurus, a book of quotations, a dictionary, an almanac, as well as special collections of literature, history and scientific information. The district should build a “new vertical file” for each school offering local developed and collected data.

For those considering which information products they might purchase for their networks, there are a half a dozen or more from which to select. Because all of these are rapidly changing and improving, the choice should be based upon careful testing and evaluation in the field.

Given the cost (a site license will run several thousand dollars per school), the wise school tests these products in a lab with 30 students pushing them to their limits on actual research questions to see how

Prominent Candidates for Purchase

- Electric Library
- EBSCO
- ProQuest Direct by UMI
- SIRS
- InfoTract
- World Book
- Encyclopedia Britannica
- Encarta
- Microsoft Bookshelf (Dictionary, Atlas, Encyclopedia, Almanac, Quotations, Thesaurus, etc.)
- Image Collections & Archives

Listing does not mean or imply endorsement.

well they serve the learning goals set.

Most people think of hardware when they hear the word "equipped," but a network can only support the curriculum if it is loaded with information that is well organized and useful to those exploring curriculum problems and making decisions.

In addition to rich information, the planning committee should identify the most useful problem-solving applications to support student thinking - tools such as spreadsheets, databases, word processors, charting programs, outlining programs and multimedia presentation software that will support analysis and synthesis.

Instead of spending a fortune on instructional software, the committee's emphasis upon curriculum standards inspires them to focus on tools likely to support the following activities:

- Questioning
- Planning
- Prospecting
- Collecting
- Interpreting
- Reporting
- Communicating

4. Emphasize robust professional development, adult learning and the creation of a supportive culture

Once the program content and strategies are evident, attention should turn to mapping out the adult journey that will be required for all teachers in the district to develop the competency, the comfort and the inclination to work effectively with the new tools.

When it comes to teachers learning and valuing the effective use of new technologies, some schools are discovering that the kinds of training programs offered in the past may not represent the most generative method of reaching a full range of teachers and their students. The key term is "generative" - meaning that behaviors and daily practice will be changed for the better as a consequence of the professional development experience.

Fortunately, some schools are now identifying approaches more likely to encourage teachers to employ these technologies on a frequent and sustained basis to enhance student learning.

Lead districts are finding that adult learning, curriculum development projects and informal support structures are proving powerful in

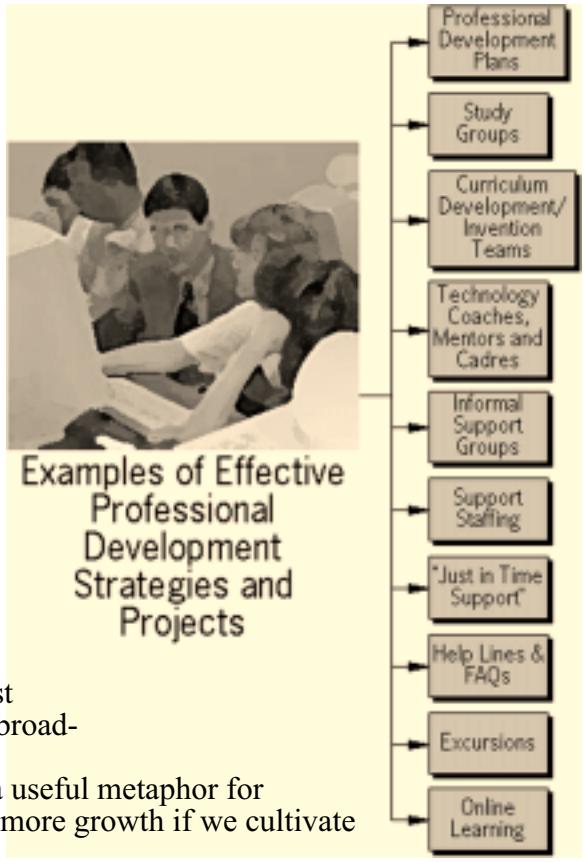
promoting recurrent use aimed at deep curriculum integration.

After two decades of providing software classes to teachers, we need to explore different approaches – those honoring key principles of adult learning while placing both curriculum and literacy ahead of software and technology.

Adult learning strategies are fundamentally different from training strategies and usually more promising because they are tailored to the learning styles, preferences and needs of teachers in ways more likely to win their commitment than the approach more typical of training models.

Becker's research points to the need to do much more than teach technology skills to teachers. We must also convince them of the value of engaging students in problem-based or project based learning with these new tools. One hundred additional hours of learning computer software is not likely to transform traditional teachers into constructivist teachers.

The transformation of teaching styles, preferences and behaviors requires persuasion, learning by experience and the provision of highly personalized learning journeys.



Examples of Effective Professional Development Strategies and Projects

The most effective learning strategies require a change in the ways teachers spend their time and the ways they work together. Frequently we notice how informal support systems, partnerships, teams and collaborative structures may be the most efficacious elements in a broad-based change effort.

Gardening provides a useful metaphor for this process. We will see more growth if we cultivate

the soil and fertilize before planting. An exclusive focus on skills and software is a bit like spreading seeds across a concrete playground.

While some maintain that reluctance to use new technologies is simply rooted in a lack of skill and confidence, there is evidence from Becker and Fullan that teachers need to be recruited. They must be convinced of the value of the new activities and then given ample time to work on teams to invent effective lessons.

In many schools, teachers are isolated from each other and preoccupied with what Fullan calls "the daily press" of getting through their schedule, focused according to Becker on state standards. Quite a few of these teachers are likely to cling to routines they have enjoyed in the past until they are equipped and encouraged to find, invent and test new routines that are suitable and reliable replacements.

This creative exploration, invention and testing will require a change in schools that breaks down isolation, facilitates the work of teams and provides ample time for program development.

Because a previous volume, **How Teachers Learn Technology Best** (McKenzie, 1999), provides a detailed portrait of successful professional development practices, this book will not repeat that material other than to point out the crucial role such investments can play in helping a district to cross the chasm and promote frequent, standards-based usage.

5. Design a network system to support learning goals and activities

Once the program "horse" is directly leading the network "cart," the design process changes dramatically. The chief design issue is **utility**. The design team will want to know clearly and simply what the network can do to help produce the student learning outcomes identified as the main reason for building the network in the first place.

A. Information Power: Quality Information to the User Desktop

When a student or teacher sits down at any networked desktop, how rich and reliable are the information resources made available?

- Does the network support student research and problem solving?
- Does the network support powerful information harvesting in a child friendly manner?
- Is there a periodical collection on every computer such as

EBSCO, Electric Library, or ProQuest which supplies current articles on topics which are supportive of the school curriculum?

- Is there an assortment of electronic reference tools on every computer such as an encyclopedia, an atlas, a thesaurus, and a dictionary?
- Does the network provide user friendly access to information resources available on the Internet with appropriate "interfaces" so that teachers and students may move rapidly and efficiently to useful information?
- Does the network provide adequate bandwidth so that information arrives rapidly and efficiently?
- Does the network provide access to locally collected data (such as historical documents and water quality data) and lesson resources in support of the curriculum?
- Does the network provide access to local resources such as library books, videos, curriculum guides, board policies, personnel policies, etc.?
- Does the design of the desktop or "interface" make location of information and navigation efficient and comfortable?

B. Communication and Collaboration

Does the network reduce isolation, increase contact and support the exchange of ideas, resources, and inventions?

- Can teachers and students conveniently store and find their work on the network so that the work builds and is always available?
- Can teachers and students exchange lessons, instructions, work and information across the network with ease and comfort?
- Do library media specialists work with teachers to design their buildings' information menus so that they are age appropriate, coherent and curriculum relevant?
- Can teachers and students exchange information and ideas with teachers, students, experts and others regionally or globally?
- Can teachers and other staff members share good ideas, questions, interests and needs through e-mail exchanges?
- Can the administrative staff communicate important information and expectations through the network to all groups which have a need to know the information?

C. Access

Does the network offer frequent, easy and convenient access to

resources so that the rich information and powerful tools become part of the daily life of the schools as well as all the staff members and students?

- If all students wished to make use of computers on a daily basis, how many minutes would be possible? If they wish to spend 3-4 hours in a week writing an essay or doing research, is that possible?
- Does the amount of access match program needs?
- To what extent are computers located so that students and staff may use them when they need them?
- Can computers be moved around conveniently to support learning goals in a flexible manner?
- Are all computers located where they are likely to be used 85% or more of the time?
- Are computers placed in specific locations because they are needed there for predefined purposes and goals or are they placed in locations without any clear purpose other than balanced distribution?
- Are computers distributed in line with learning models and research which have been proven effective or are they placed in locations without any clear purpose other than balanced distribution?
- Is there an appropriate balance between "open access" computers as opposed to computers located in scheduled access rooms and labs where an "appointment" is required?
- Is there a plan to move away from "lab-centered" access to "distributed" access as staff and students develop the skills and capacity to sustain a "distributed" system?
- Is there a clear understanding of "critical mass" - the minimal essential number of classroom computers required to sustain significant use? Self-contained elementary classrooms require 1 computer for every 4-5 students. Secondary classrooms require 1 computer for every 2-3 students but most secondary teachers prefer access to such resources only 20-25 per cent of the time because coverage pressures make anything more quite unlikely.

D. Evidence of Use

Can we be sure the technology is used frequently in ways which support our goals?

- Is there a system to keep track of utilization trends and rates in each building?
- Is there a clearly stated expectation about utilization rates?

- Is there a planning mechanism to keep utilization "on the table?"
- What happens if utilization falls below expectations?
- Are all staff expected to do "their fair share?" How are these expectations expressed and then monitored?
- Are the expectations written into curriculum documents as required learning experiences?

Tilting toward Utility

Without a strong curriculum focus, network design criteria will tend to center around the following criteria and issues:

Efficiency - How well does data flow across the network?
Speed - How quickly does the network handle the data tasks assigned to it?
Reliability - Can users count on the network to be operating without interruption?
Security - Are data transmissions safe from outside intrusions and interference?
Cost - Does the network operate within a reasonable budget?
Low Maintenance - Does the network perform its tasks without requiring frequent technical support interventions?
Transparency - Does the network operate in the background without requiring user awareness of network functions and protocols?

Unfortunately, a focus on these utilitarian issues can seriously damage the prospects for curriculum rich use of networks, as the design may be shifted away from what actually works for teachers. The very features that are most important to teachers . . . flexibility, portability, frequent use and relatively open, user-friendly systems can seem threatening to network supervisors who might see heavy traffic and open access threatening to undermine performance and stability.

Even though it seems apparent that networks should serve teachers, students and learning, in many cases networks become self serving in the sense that their health and functioning becomes a goal separate and above the whole issue of student learning and curriculum.

Does the network hum? does it scream?

6. Provide extended funding, technical support and commitment

Because few districts understand the full cost of owning and operating a robust network, there is a tendency to provide insufficient technical support staff and insufficient funding for network development over time. While the computer vendors and network software companies have excelled at the art of promoting rapid obsolescence under the guise of "enhancement" and "upgrades," districts rarely develop an equipment replacement schedule that accurately reflects the reality of keeping up with those enhancements.

Without a comprehensive and all inclusive, long term budget to keep them vibrant, networks have a tendency to "rust." This means rather simply that performance can suffer as new software will start to drag down the speed and response of desktop units bought for an earlier stage of development.

Without appropriate levels of technical support, a district is likely to suffer from what I have called "network starvation" (Chapter Nine). In addition to diminished network reliability and efficiency, such districts also tend to experience a lack of network resource development to support curriculum goals because there are too few technicians to install and maintain the information products required for a robust experience. Even worse, the lack of technical staff can foster a climate of tight control over network resources that may block teachers and librarians from shaping the network experience at a building level. In many districts, educators are not allowed access to file servers and web sites, so they are unable to influence the design of resources in a learner friendly manner.

7. Match rigorous program assessment to learning goals and student outcomes

The recent networking of schools has been accomplished with remarkably little attention to the assessment of results. The lack of data gathering is akin to sailing blindly through the fog. Because we are exploring many uncharted seas, the risks of ship wreck and failure are quite high. And those risks are made all the more serious by a failure to climb the mast so that the program can be adjusted in response to data gathered as the innovation proceeds.

In the best implementations, we combine our knowledge of best practice in other districts with intense local data gathering to find out which strategies are working and which ones are failing or disappoint-

ing. Denial flourishes in a system without assessment and the program can lunge forward toward shallows and hazards without anyone recognizing that there are problems until it may be too late.

The reason we gather data is to steer the program past obstructions and hazards toward success. We shed failing strategies. We redouble commitment to strategies that are working. We gradually shift our energies to those activities that produce the best results.

Without data, all strategies appear equal. We rob both teachers and students of opportunity. We fail to make the most of our resources. We fall more deeply into the trap of doing technology for technology's sake.

Without evidence of student learning, districts can hide behind measures of success that have little to do with schooling.

How many computers? How many wired classrooms? How deep is the penetration?

This preoccupation with counting equipment and measuring penetration is characteristic of industry funded reports like the Star Report that make a fantastic leap from the possession of equipment to assumptions of program quality.

8. Monitor and adjust program elements and strategies in response to experience

In line with the assessment outlined above, each school will need a committee to adjust the program as more is learned about what is working and what is not. Tempting though it is to walk away from this challenge once network installation is complete, the installation is merely a prelude to program development.

Perhaps because of wildly exaggerated promises and forecasts of benefits likely to emerge thanks to networking, many schools fail to install the human decision-making apparatus that is required to convert this investment in networking from what some might call "Fool's Gold" into something of real value. Without ongoing leadership and program development, it is unlikely that the network will make much of an impact upon student learning.