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ABSTRACT

The overall goal of this technology integration work is to identify the content and processes vital to decision making as schools transform education through technology integration. This guide includes a collection of content and process strategies to start the learner on this path. This document contains the following sections: (1) Professional Development Model; (2) Using Processes Portfolios to Guide Decision Making; (3) Strategy: Framework Analysis; (4) Framework for Education; (5) Indicators of an Open, Networked Learning Environment; (6) Learning in Cyberspace; (7) Technology Integration Portfolio; (8) Building a Sound Knowledge Base -- includes worksheets and handouts for presentation; (9) Changing Mental Modes -- includes worksheets and handouts for presentation; (10) Teaching & Learning -- includes worksheets and handouts for presentation; (11) Classroom & Systems Connections -- includes worksheets and handouts for presentation; and (12) References. Also included are two PowerPoint Sound Technology Integration disks (one for Windows and one for Macintosh). (DLS)

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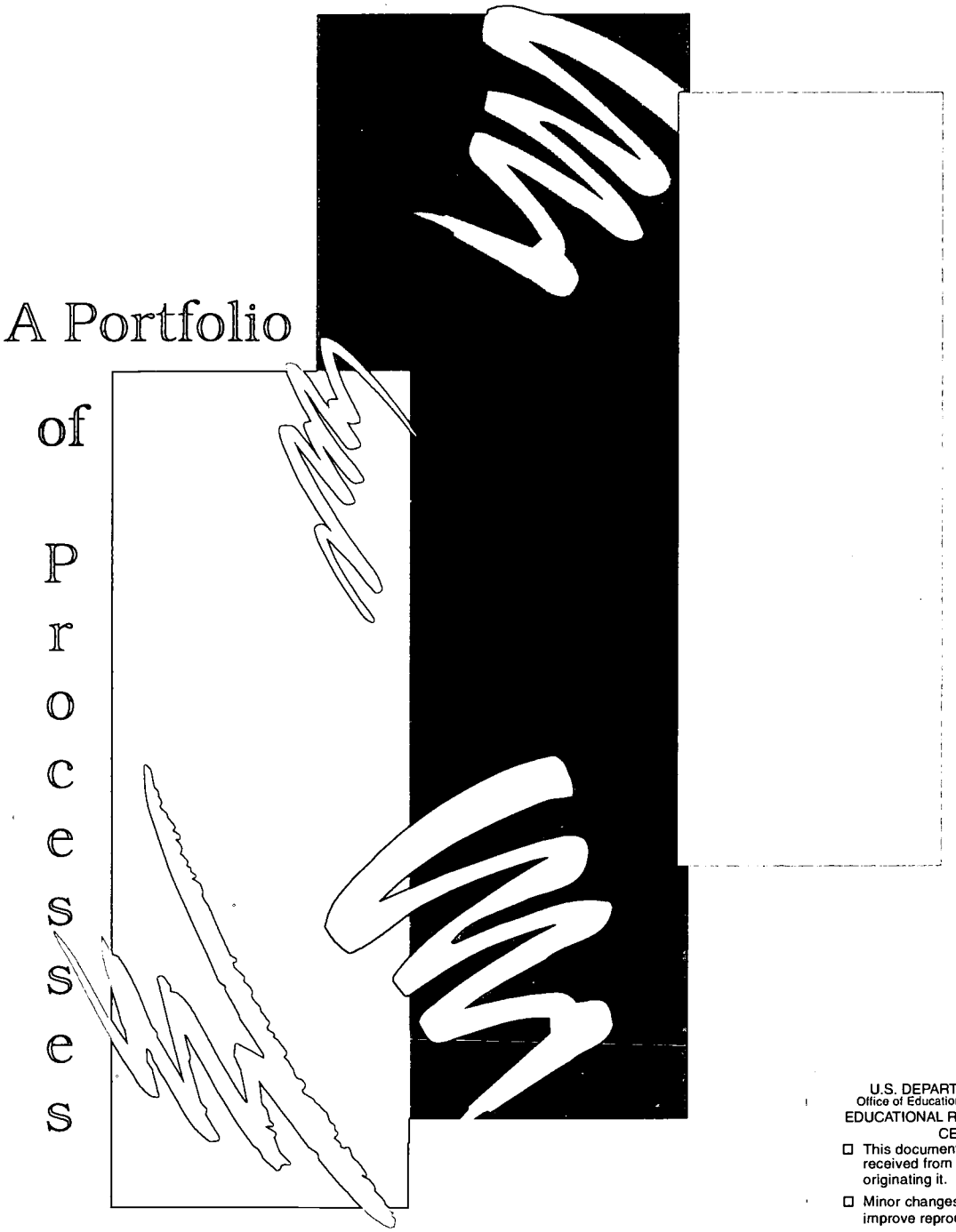
Facing the Challenge of Technology Integration

Facilitator's Manual

ED 421 983



Facing the Challenge of Technology Integration

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Building a Sound Knowledge Base

Changing Mental Models

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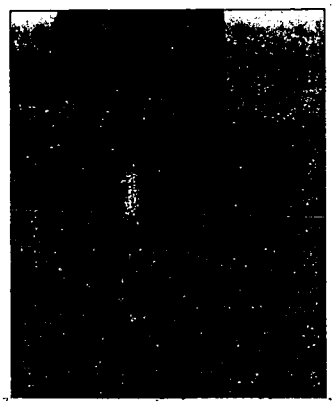


Classroom & System Connections

Introduction

Who could have dreamed, 40 years ago, that the world would be transformed by technology? Technology is the catalyst changing the way we work and play, causing us to generate new ways of being, new models that redefine our culture. Having seen the ways in which technology has transformed the workplace, and most of our communication and commercial activity, the business community and the public in general is exerting new pressure for these changes to take place in education.

At the same time, after a long history of piecemeal attempts at reforms, there seems to be a new willingness to undertake fundamental and comprehensive change that involves entire systems. In *Education on the Edge of Possibility* by Caine and Caine, it is suggested that the central issue with education is that, although the system is becoming more dynamical, the fundamental ideas and purposes of traditional approaches to education still inhibit the appropriate type of change and adaptation. This new paradigm requires a new type of person to respond to this present and future vision of "culture," one not clearly defined, having no previous history, and dynamic and flexible in nature.

As we consider the implementation and integration of technology, understanding new paradigms and models is key to guiding our work toward a future vision, rather than merely perpetuating the status quo. While many recent technology integration approaches have attempted to take advantage of the potential of the technology, most have fallen short of maximizing the power of critical elements of learning and failed to recognize the opportunity for designing new models of learning. Envisioning a redefined culture and dynamic, flexible models that support that culture is not an easy process. Educators, necessarily must engage in a thought process that causes us to question our assumptions and alter our perceptions in order to redefine our world of teaching and learning, change our mental models.

Technology integration can be viewed as the "what" should happen of the process and technology implementation identifies the "how," strategies for making it happen. While integration is perhaps most heavily weighted at the classroom level, for sustainable change to take place, it is vital to connect systems change to student level change. The challenge of integrating technology into schools and classrooms is both human and technological. It is not fundamentally about helping people to operate machines. Rather, it is about helping people, primarily teachers, integrate these technologies to support superior forms of learning. For this reason, theory and research in learning connected to the qualities and features of promising technology are the sources for building a dynamic framework. The frame for technology implementation considers the following: What's needed for the vision to become practice in the classroom? How do systems and individuals respond? How can they be supported in their efforts? What do systems need to do to facilitate those processes?

The Technological World We Live In: Articulating the Vision

A recent article in *Business Week* gives the following insightful description of a new "culture:"
The epicenter of global technology is undeniably Silicon Valley. The valley is a huge brain trust and a daredevil, risk-taking culture. It is a place where entrepreneurship and technical excellence are fostered, an environment for incubating ideas. The ability to transform a concept into a company has reached an art form. At the core of this business culture is an all-things-are-possible attitude, an unerring belief that a new technology, an entrepreneur's vision of the digital future, is the absolute right one. And if it isn't, well, the next one will be. It is Daredevil Business 101, where risk-taking is the norm, and the penalty is not for failure but for not trying.

This description identifies characteristics of a culture that provide insight into a model current students will be living and helping to shape. It also suggests characteristics for a new model for education. New thinking processes, independence in learning, technological fluency, high academic standards, communication, and interpersonal skills are all pieces of the vision. The dynamic, flexible nature of this culture is one of the qualities perhaps most intriguing as we contemplate changes in education. Redefining culture and redefining what it means to be intelligent are the two basic premises from which frameworks for processes to integrate and implement technology stem. The Silicon Valley culture description does not obtrusively articulate the role of technology within the culture but alludes to its pervasive, ubiquitous presence. What does this mean for schools?

Because of the synchronistic relationship in advancing technology and our understanding of learning processes, a discussion of the qualities and features of each forms the base for framework consideration of technology integration and implementation processes.

The Promise of Technology: Restructuring the Learning Process

The technology revolution has propelled us through several stages at record pace. Some of the labels futurists and visionaries have attached to these stages are: the Information Age, the Communications Age, the Digital Decade, and now the Network Revolution. Lines are blurred between and among stages and the interactive process they represent. In an effort to respond to this phenomenon, education reform is currently immersed in a process which exhibits the characteristics of future modes of operating; one that borders on chaos, embraces a dynamic problem-solving process, and requires educators as designers to look for stabilizing patterns.

Educational technologies are deemed promising based on the potential of their unique qualities to influence restructuring the learning process. Today, networking is the foundational concept driving technology developments. Networks provide connections, open up distinct opportunities, and require new rules. They are the momentum for reordering our lives because they provide three powerful infrastructure features:

1) Information Infrastructure

Information plays a superior role as a commodity made available through networks. Only recently has a total reconfiguration of information itself shifted the whole economy and thus our entire culture. Information's critical rearrangement is the widespread, relentless act of connecting everything to everything else. The potential for education is "free" access to information that was once under someone's control, an expansion of both quantity and sources of information, including original documents, experts, and inventors and the format in which information is packaged, digitized resources available synchronously and asynchronously. Add to the discussion mobile, wireless features, and the microcosm of chips which provide a dimension of real-time flexibility to learning, rich resources at our fingertips any time, any place; and both the value of the content and the context of the learning process have been elevated. The Information Age precipitates defining information literacy and identifying new skills characteristic of an Information Literate Person. The following is a much quoted, generally considered authoritative description of an information literate person: *To be information literate an individual must recognize when information is needed and have the ability to locate, evaluate, and use effectively the information needed...Ultimately information literate people are those who have learned how to learn. They know how to learn because they know how information is organized, how to find information, and how to use information in such a way that others can learn from them. Called for is ¡not a new information studies curriculum, but rather, a restructuring of the learning process. Static resources must give way to a learning process based on information resources available for learning and problem solving throughout people's lifetimes.*

2) Communication Infrastructure

The communication infrastructure possesses the capability of computers interacting as an aid to communication and human thinking. Communication is the basis of culture and key to restructuring learning. It is through communication that we construct knowledge and convey meaning to others, one of the key attributes of constructivist learning theory. The difference in our current status of technology communication tools is the number and diversity available. Toolbelts for teachers and students can more easily be filled with a variety of tools that are well-defined, developmentally appropriate, and flexibly used to construct meaning. Digital multimedia formats, including 3-D, animation, virtual reality, audio, video, streaming, channels—push technologies enrich the potential for learning and drive the need for information/communication literacy skills that include understanding how to manipulate systems of visual, mathematical, scientific, and textual representation to support thinking. We're challenged to consider the argument that technology is not just a tool, but a "fifth" language, taking its place alongside speech, writing, arithmetic, and science. Robert Logan sees information technologies as the fifth language in a series of languages that have developed over time. These languages include speech, writing, mathematics, science, and now computers (information technologies). Logan argues that our educational system needs to be substantially modified to reflect the capabilities of computers as an aid to communication and human thinking.

3) Shared Synthetic Environment Infrastructure

Networked contexts for learning, design, development, and innovations include shared synthetic environments, realtime, dynamic, flexible interaction and collaboration where output is seen synchronously and traditional roles diminish. Distributed learning/Distributed production creates an interdependent community of people who become actively involved as co-creators, co-developers, problem solvers. They construct, control, and communicate electronically. Intelligent tools and the concept of shared cognition when the tools understand part of the task, and the person understands other parts of the task extend the potential of this infrastructure. The notion of a shared, synthetic environment as envisioned here is distinguished from a communication infrastructure by the fact that the environment is the shared workspace with learning and design tools built into the workspace. Common tools in this environment might be MOOS, MUDS, and Web-Based Multimedia Authoring Systems.

Why is this important to education? In traditional education models, learners have typically been confined by system structures in their endeavors to create innovation. Interactive,shared,synthetic environments afford the infrastructure to not only open and extend but revolutionize our success in creating innovation. Tools for innovation are available to everyone working in this environment.

Consideration must also be given to four basic trends driving the development of almost all new products today—increasing complexity and customization, miniaturization to microscopic size, multitasking, and our growing interest in the adaptability of mind and body.

A Scenario:

David Moursand describes a scenario that helps give us a picture of the implications of networked environments for learning. In the September 1997 issue of *Learning and Leading with Technology* he states, "Take a look at your own school—the amount of computing power in the school and the nature and amount of connectivity. Now, consider each increasing by a factor of 100. If your school is "average" compared to current schools in the United States, this level of increase would provide each student with a microcomputer that is at least 10 times as powerful as today's midpriced machine. It would provide every student with connectivity to worldwide and local area networks at a bandwidth that supports high-quality interactive video.

Consider a scenario 20 years in the future: Every student has a personal portable microcomputer for use at home and at school. Wireless connectivity to local and worldwide networks is provided in every classroom. A wide range of software tools and educational software is available to every student. Computer-assisted learning and distance education are routine parts of the teaching and learning environment, both at school and at home. These methods of instructional delivery provide access to instruction in the full range of coursework that is appropriate to K-12 students. The combined power of current hardware and software supports high-quality voice-input systems. Tool and educational software are both "intelligent"—that is, they reflect the steady progress that has been occurring in artificial intelligence."

Such scenarios that speculate about the future are useful in considering the potential of technologies in the process of technology integration.

The Vision Takes Shape in the Brain Gymnasium

The second basis for our work of developing process models for technology integration, and implementation is the concept of redefining intelligence.

We once believed that reason and logical analysis could solve all problems. A rational mind was all that we needed. In school, if we were good at narrow problem solving we did well on IQ tests. High scores on aptitude tests made us believe that storing information—the kind that could be called up on demand—was the best use of the mind. This old blueprint for intelligence may have served us reasonably well at one time. But not now, and not in the future. Now it limits our thinking. It leaves us aware only of the known, the understood, and the controllable. It suffocates fresh perceptions. It treats new information as just more data to be fed into well-established formulas of thought. Anything that doesn't fit is rejected. We are unaware of the subtle biases in our perception and thought.

We need a new vision of intelligence, one that integrates the right brain of images and creativity with the left brain of words and calculations, in the context of the social environment.

Controversy over a definition of intelligence has served as the catalyst for research on learning and resulted in the emergence of multiple theories. Many theories of learning have been tested in schools since the early 1940s. The three major ones are behaviorism, mastery learning, and inquiry learning. More recently, theories of constructivism, multiple intelligences, and brain-based learning have attracted our attention. Widespread agreement now exists among educators and psychologists (Collins, Brown & Newman 1989; Resnick 1987) that advanced skills of comprehension, reasoning, composition, and experimentation are acquired not through the transmission of facts but through the learner's interaction with the content. The emergence of constructivist view of learning called for teaching basic skills within authentic contexts, for modeling expert thought processes and for providing for collaboration and external supports to permit students to achieve intellectual accomplishments they could not do on their own. Multiple Intelligences theory, primarily resulting from the research of Howard Gardner, asks us to consider eight primary forms of intelligence comprising the learning process. In his work, Gardner thought of intelligence as the ability to solve problems or create products. And, most recently advancements in brain research propose a new paradigm emerging with spellbinding implications. This new paradigm has as its core an understanding of what "human potential" means and the challenge to teach to actualize that potential. Eric Jensen, author of *Brain-Based Learning* states that each successive study of the brain's potential has documented that the previous ones were often too modest. Learners are far more capable than ever imagined. We have been vastly underestimating the capacity of the learner. A

second assertion is his challenge to educators to begin to think of presenting as "learning to get out of the way of the learner." He goes on to say, "The brain is trying to learn, in order to survive. Design learning so that it is more based on learner needs for reaching social, economic, and personal agendas. Provide richer, complex, multi-sensory immersion environments. Offer options for learning."

Our purpose here is not to attempt to articulate all learning theories or give a comprehensive analysis of the principles of each, but rather to propose that in order to appropriately apply each of these theories of learning, teachers must possess a solid knowledge base of the underlying foundation of each, continue to study them, reflect upon them, and make appropriate applications for their own students and their own situtations. Classroom educators as action researchers will further our understanding of how learning theories and promising technologies restructure learning as they create models merging principles of learning theory and technologies qualities and features. The technology integration process requires this foundation if the decision-making framework is to result in fundamental changes beneficial to students.

Decisions about technology integration are the centerpiece for decisions about technology implementation. They guide the development of support systems that operationalize technology integration. Although the two cannot be separated, this work addresses them separately to bring special focus to the critical elements of each. Elements of technology integration focus most directly on the classroom as a learning environment and take into account the variables of curriculum, instruction, assessment, learning theory, technology features and qualities. Establishing frameworks that support a dynamic, flexible model of learning is the challenge in each of the elements.

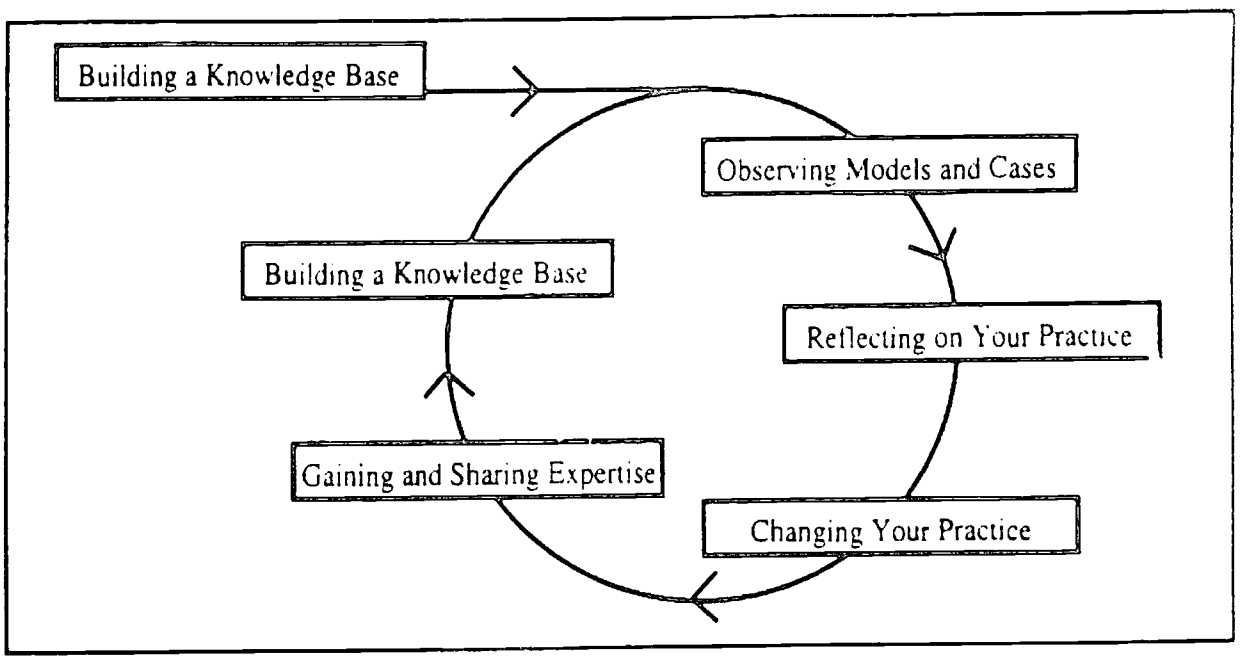
The overall goal of this technology integration work is to identify the content and processes vital to decisionmaking as schools transform education through technology integration. Major components considered here are:

- Building a Sound Knowledge Base
- Changing Mental Models
- Teaching and Learning
- Connections to the System

A collection of content and process strategies to start the learner on this path are provided in the body of this process portfolio manual.

The NCREL Professional Development Model

The design of this workshop is based on a model developed by the North Central Regional Educational Laboratory (NCREL). Professional growth is conceptualized as five dimensions that are developmental and cyclical.



Building A Knowledge Base
Acquire new knowledge, information, and skills.

Observing Models and Cases
Study instructional examples in order to develop a practical understanding of the research.

Reflecting on Your Practice
Analyze your instructional practice on the basis of new knowledge.

Changing Your Practice
Turn your theoretical and practical knowledge into plans for instructional change.

Gaining and Sharing Expertise
Refine your instructional practice while sharing your practical wisdom with colleagues.

Adopted from the North Central Regional Educational Laboratory's *Strategic Teaching and Reading Project.*

Using Process Portfolios to Guide Decision Making

The use of portfolios is a popular method for collecting information to support student progress. To date it is less utilized as a tool for individual, classroom, or systemic change. Portfolio definitions vary to some degree, but a general consensus among educators seems to be that a portfolio is a purposeful collection of work that provides evidence of progress or achievement toward a goal(s).

Instructionally, assembling a portfolio can help develop self-reflection, critical thinking, responsibility for learning, and academic content area knowledge, skills, and processes. Portfolios with well structured criteria provide an avenue for close analysis of individual work, comparisons over time, identification of strengths and weaknesses, goal setting, and a picture of the individual or group as a learner(s) when matched to a vision of success.

The process approach to technology integration proposes the use of portfolio to collect purposeful content, processes, frameworks, and strategies; provide a longitudinal record of progress in relation to the desired outcomes for technology integration; and provide varied and rich data from which continuous improvement decisions can be based.

The Process Portfolio Template has five sections:

- Introduction: Narrative that articulates the philosophical grounding of the organization, the purpose(s), audience(s) and goals of the technology integration process portfolio.
- Building a Sound Knowledge Base: Process and content data that identifies an established knowledge base and sets direction for continuous learning.
- Changing Mental Models: Process and content data that guides the work of envisioning and attaining an open, networked education system.
- Models and Frameworks for Teaching and Learning: Process and content data that informs decisions and provide the basis for creating new learning models.
- Connecting Classrooms and Systems: Process and content data that helps define the relationship between a vision of teaching and learning at the classroom level in an open, networked environment and the system as a whole.

Building a Technology Integration Portfolio

Design Guidelines

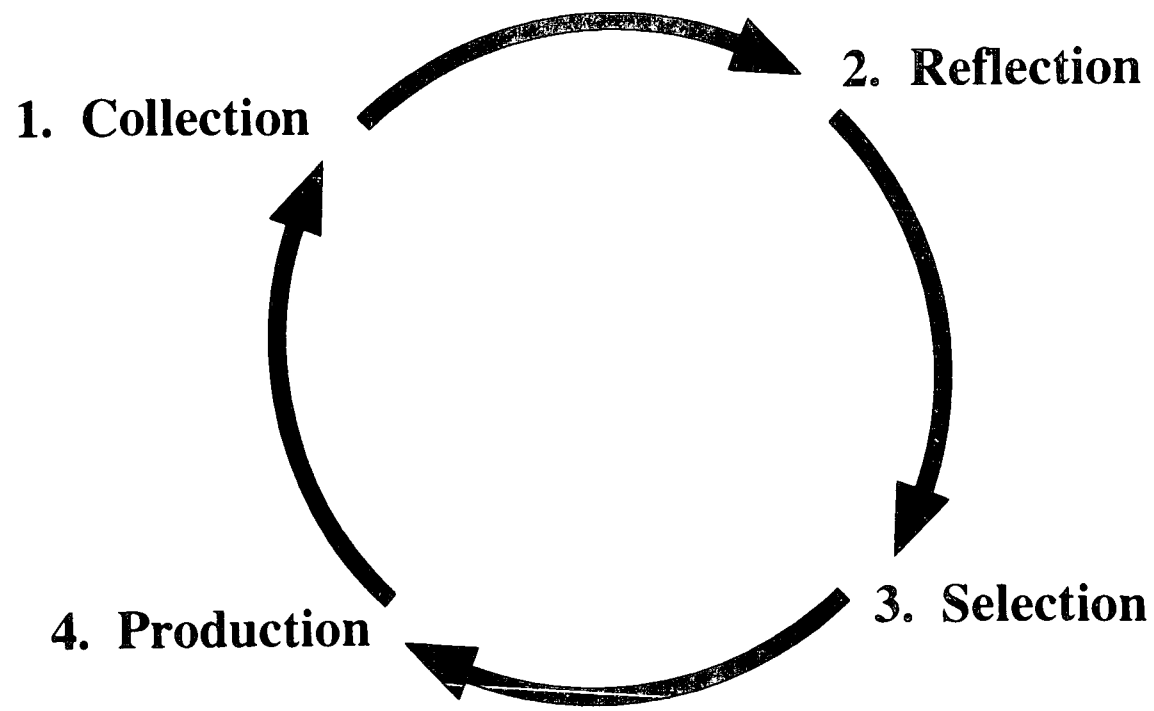
The following guidelines provide a starting structure for making choices about what to include in your portfolio.

- The purpose to be served by the portfolio
- The specific content, processes or skills to be developed or assessed by the portfolio
- A statement of the project's vision and objectives
- A description of the student population, school, and community
- Within each area of consideration, a description of goal implementation levels, processes, and outcomes should be included.
- The portfolio information is organized as a three-tiered pyramid:
  - the first level highlights important findings;
  - the second level describes data, the context, and additional observations; and
  - the third level contains illustrations using narrative data, case study accounts, and sample materials.
- A continuous record or summary of progress, decision making, challenges, and recommendations should be included.

A Process for Building a Technology Integration Portfolio

The technology integration portfolio is more than a collection of data. It is a compilation of evidence intended to advance understanding of successes and challenges encountered as a result of technology integration efforts. The steps below provide a framework to guide this process.

1) **Collection**
   Continuous, varied, rich data to illustrate key processes, strategies, accomplishments, and learnings.
2) **Reflection**
   Individual and collective reflection using data collected and questions posed
3) **Selection**
   Stories based on careful selection of data to share and make what you have learned clear to people not involved.
4) **Production**
   Organize evidence for easy access by reviewers so it is meaningful to the intended audience.
5) **Projection**
   Use portfolio to make decisions about next steps, action planning, resource allocation. Use data and learnings to identify impact areas and indicators of success.



Strategy: Framework Analysis

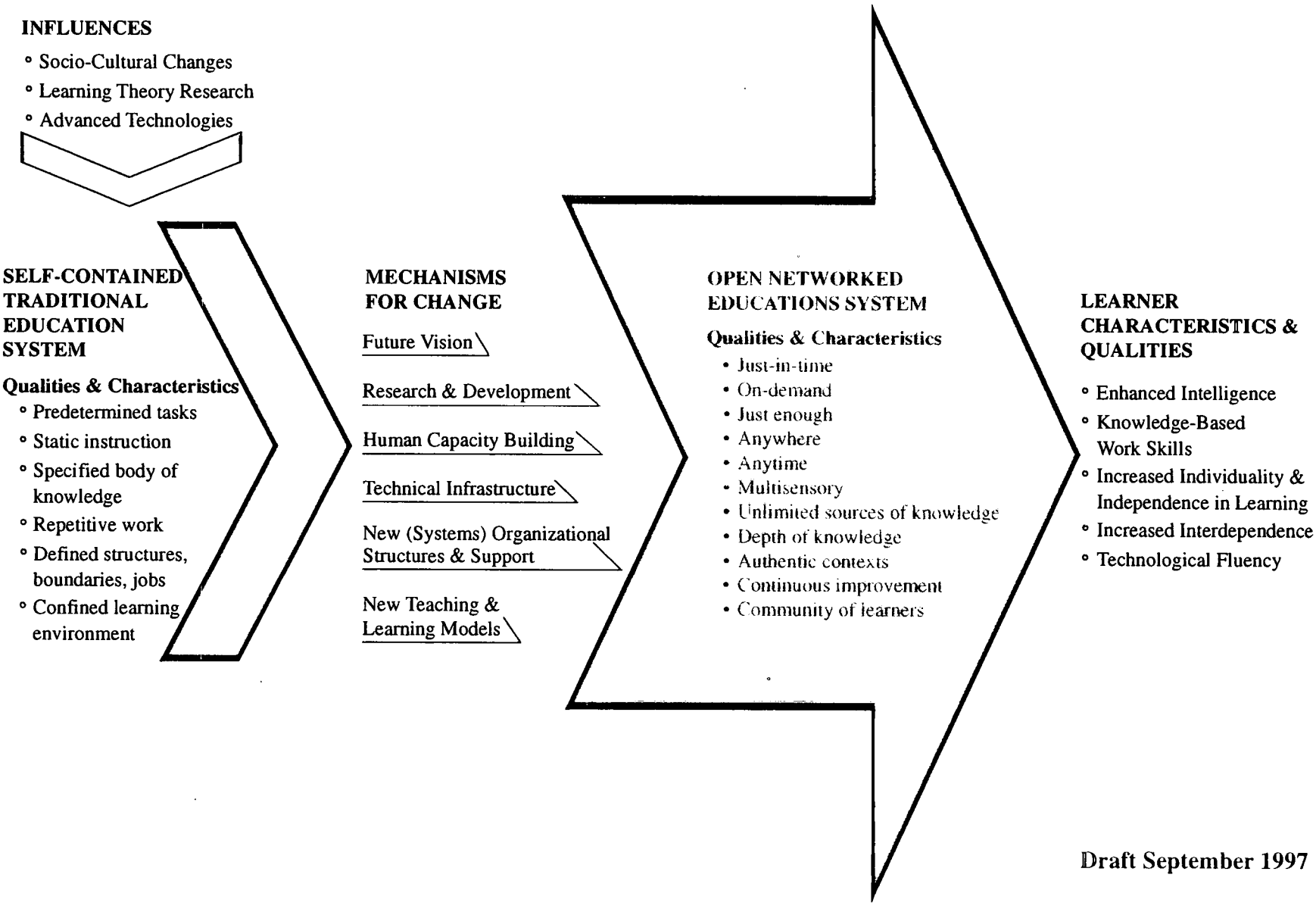
The Framework for Education graphic found on page 11 is based on current trends taking place in today's society, including the education sector, as well as information from three areas of study: how people learn; the qualities and features of current and emerging technologies; and the knowledge, skills and qualities vital for workers in the future. Its purpose is to portray two educational paradigms and mechanisms important to the transition from a traditional system to an open, networked system. Schools today are caught between these two paradigms. Our challenge is to discover the processes and content that will provide the foundation for continuous improvement and transformation of existing learning environments.

Framework Analysis is a strategy designed to cause us to reflect on the information provided and contribute to a better understanding and articulation of the vision inherent in an Open, Networked Education System Framework.

Strategy Blueprint:

- Study the Framework for an Open, Networked Education System and accompanying indicator sheet found on pages 11 and 12 of this portfolio.
- From your perspective, what additions or deletions need to be made to the indicator sheet? Write them on the indicator sheet.
- In groups of 3 or 4, discuss the Open, Networked Education System Framework and indicators.
- Generate an agreed upon list of indicators.
- In the right hand column of the indicator worksheet on page 12 list corresponding indicators in each category for a traditional education system.
- The Learning in Cyberspace Chart on pages 13 and 14 focuses on specific features of the worldwide web as a networked learning environment. In the space on the right hand side, indicate what each of these categories means to you as a learner. What do they mean for learning in an open networked education system?

Framework for Education



Draft September 1997

Indicators of an Open, Networked Learning Environment

Governance Shared ownership and responsibility Shared decision making (Top-down/Bottom-up Model) Problems identified at any level and solutions sought by all levels Student involvement valued and encouraged A collaborative management system is in place Individuals are the focus Change is seen as growth	
Organization/Climate/Structure/Support Flexible schedule Flexibility and student choice in learning and scheduling Risk taking and innovation assumed and supported Inquiry-driven Minimal time constraints School is everywhere Network technical infrastructure Boundaries are flexible Resource allocation supports vision	
Teaching and Learning Process, content, and cognition emphasized Fluid, dynamic, and serendipitous Changing roles for students and teachers, community of learners On demand Real time Anywhere Collaborative Unlimited sources of knowledge Dynamic instruction, responsive to student needs Focus on self-assessment Multiple, multisensory tools Assessment, curriculum, and instruction intertwined Partnerships Intellectual quality, deep understanding Emphasis on whole person	

Learning in Cyberspace

Features of the Web Learning Environment

Open
- Based on commonly accepted protocols and technical standards
- Open to anyone who has tools
- Supports multiple hardware platforms
- Flexible—gateways provide connections between differing network protocols
- Open to integration with other media complex

Distributed
- No central point of control—information is housed all over the planet
- Equal access regardless of location

Dynamic
- Changing all the time because Web sites are so easy to customize, the Web can be changed as student needs change
- Fluid

Globally accessible
- Resources instantly available
- Research is easy, prolific, and accessible
- Feedback can be speedy
- Ease of distribution—counter balanced by extra time needed for set up and maintainence

Asynchronous
- Things don't happen at the same time
- Messages, conferences, communication, and learning can occur at any time

Synchronous
- Things do happen at the same time
- Interaction is in real time
- Synchronous learning

Filtered
- Class members are hidden behind electronic "screens" and can remain anonymous
- Shyer students are sometimes more likely to respond
- Allows time to think, compose responses
- Potential advantages for certain groups—for example, disabled
- Lack of social interaction can be difficult

Learning in Cyberspace

Features of the Web Learning Environment

Interactive
- Hypermedia environment/interactive
- Collaborative contruction of Web pages, learning experiences
- Shaping of online environment
- See others work and profit from their inspiration and understanding
- Comment on each others work via e-mail, conferencing, other Internet features
- Tools in development to expand this feature

Archival
- Permanent records are stored—materials, online interactive sessions
- Records made available for scholarly research or future classes
- Records can be used by program evaluators to show the extent of student and teacher participation
- Student discussion records, groups and project work and commentaries can be used to add to the content of the course

Hypermedia Environment
- Reader doesn't need to follow any text sequentially from beginning to end, but can diverge at any time by clicking and following different routes
- Hypermedia supports browsing and skimming.

What's available today:

- Listening to music
- Reading text
- Taking part in experiments
- Delivering presentations
- Group discussions
- Online courseware
- Simulations
- Searching libraries
- Facilitating support
- Watching video clips
- Asking questions
- Accessing databases
- Projects
- Publishing
- Socializing
- Videoconferencing/face to face interactions
- Interactivity
- Authoring/designing

Technology Integration Portfolio

Write an introductory narrative section for your portfolio here. Include the philosophical grounding of your classroom, school, or district as well as the purpose, goals, and audience for this portfolio.

Introduction

"The best way to predict the future is to make it."

Alan Kay

Building a Sound Knowledge Base

Starting Point...
Learning is a function of the relationship between the learner, the information, and the environment within which it is embedded. There is much we do not understand about learning, but we currently know more than we are using. Current and emerging technologies bring features to the learning environment that may significantly improve learning. Critical to decision making for technology integration is a sound knowledge base that merges what we know about learning with our understanding of features and qualities of technologies.

Guiding Questions:

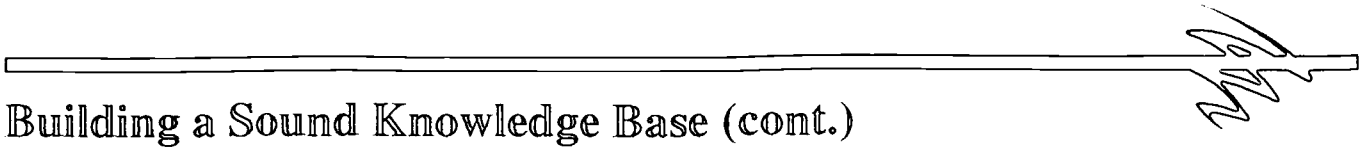
- What content knowledge is vital to teaching and learning in an Open, Networked Education System?
- In what ways will technology support teaching and learning in this environment?
- What processes will guide the development of new learning models?

Process Strategies: Work and Tools for Technology Integration
The strategies section engages learners in a set of experiences that employ selected processes as tools for considering important content or issues related to building a sound knowledge base. The processes and content in these experiences are intended as "starters" for schools in building their individual portfolios. Learners will accomplish the goals of this section by systematically participating in the work described below.

Strategy 1: Redefining Intelligence
See Appendix A for instructions and resources
Strategy 2: What is Understanding
See Appendix B for instructions and resources
Strategy 3: How do we Learn?
See Appendix C for instructions and resources
Strategy 4: Technology Frameworks
See Appendix D for instructions and resources
Strategy 5: Capacity Building
Strategy 6: A Research Process Model

Technology High Points:

- **Learning/Theories**
  Funderstanding: About Learning/Theories
  <http://www.funderstanding.com/theories.html>
  Ed Exchange: Brain Based Learning
  <http://www.nhptv.org/kn/edx/brain.sht>
  Teachers & Technology
  <http://www.snowcrest.net/banders/appletech/pb12.html>
  Engines for Education by The Institute for Learning Sciences
  <http://mirrors.org.sg/ee/nodes/I-M-INTRO-ZOOMERS-pg.html>
  The BrainTainment Center
  <http://www.brain.com/>
  Multiple Intelligences: Gardner's Theory
  <http://www.cua.edu/www/eric_ae/digests/tm9601.htm>
  The Building Tool Room
  <http://www.newhorizons.org/trm_intelligence.html>



Building a Sound Knowledge Base (cont.)

- **Technology Features and Qualities**
  - Information Infrastructure
  - Push Technology: Pointcast
    <http://www.pointcast.com/>
  - Streaming: Real Networks
    <http://www.real.com/index.html>
    Live and on-demand audio, video & animation for the internet.
    Link to Timecast-Live Clips & More <http://www.real.com/R/HP-1R/www.real.com/content/index.html>
  - **Multimedia Environments**
  - Virtual Reality
  - The VRML Repository
    <http://www.sdsc.edu/vrml/>
  - VRML Resource Center
    <http://www.refraction.com/vrml/>
  - VRML MeshMart: Your one stop source for 3D mesh objects on the World Wide Web
    <http://www.meshmart.org/indes.htm>
  - **Communication Infrastructure**
  - Multimedia Environments
  - NetPodium: Live Interactive Broadcasting
    <http://www.netpodium.com/what/default.asp>
  - Intelligent Agents
  - Intelligent Agents
    <http://pattie.www.media.mit.edu/people/pattie/>
  - Firefly Network
    <http://www.firefly.net/>
  - **Shared Synthetic Environment Infrastructure**
  - Cocoa Internet Authoring for Kids
    <http://cocoa.apple.com/cocoa/home.html>
  - NCSA Habanero: Java Object sharing Collaboration Framework
    <http://it.ncsa.uiuc.edu/~jackson/Slides/Overview/>
  - CoVis: Learning Through Collaborative Visualization
    <http://www.covis.nwu.edu/>

Checkpoint: What this means to me...

Strategy: Redefining Intelligence

Appendix A

Intelligence is a topic of great interest to the general public and to the education community. Scholars debate the definition of intelligence, how to measure it, and its value in relation to social factors. In education programs, adopted definitions of intelligence have served as the basis for considerable decision making. Developments in the study of intelligence during the 20th century are causing educators to re-examine their thinking about this concept.

Strategy Blueprint:

1) What does intelligence mean to you? Write your definition of intelligence.

2) What definition of intelligence operates in your school, district, or classroom?

3) How do you know? List indications of that definition in operation?

4) What role might technology play in developing intelligence?

Read and discuss in small groups two articles related to intelligence. Revisit your work in items 1,2,& 3 above. With a different colored pen/pencil, add information you think will improve any of these three items.

1. **What's something you understand really well?**

2. **How did you come to understand it?**

3. **How do you know you understand it?**

The items on the left-hand side of the page are categories of information associated with learning. In the boxes on the right hand side of the page, identify the conditions in each category that facilitated your learning in the example identified on page 2. List ways technology can enhance or extend each area.

Always in Context:

Field dependent Field independent Flexible environment Structured environment Interdependent Independent Dependent Relationship driven	

With Input Preferences:

Visual external Visual internal Auditory external Auditory-internal Kinesthetic-tactile Kinesthetic-internal	

By Processing It:

Contextual-global Sequential-detailed/linear Conceptual (abstract) Concrete (objects & feelings)	

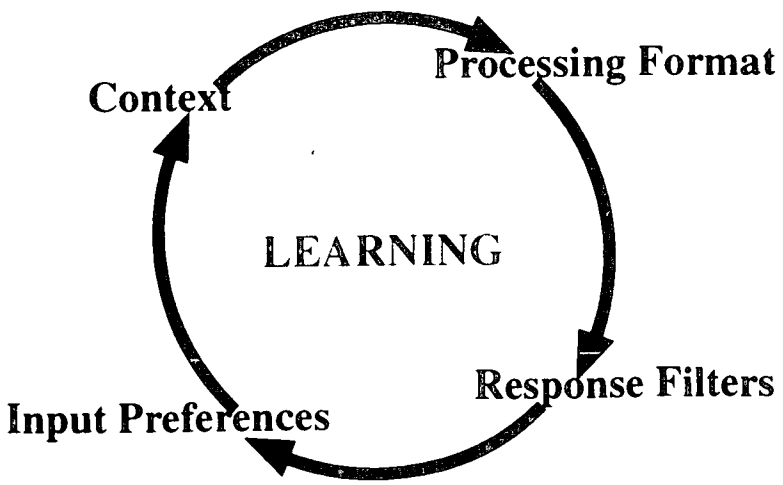
Then Reacting to It:

Externally referenced Internally referenced Matcher Mismatcher Impulsive-experimental Analytical reflective	

Brain-Based distinctions in the Learning Process

Traditional	Open
Context for Learning	
Field independent	Both field dependent & independent
Structured environment	Flexible environment
Independent	Independent and interdependent
Content driven	Learner driven
Input Preferences	
Authority driven	Learner driven
Choice narrowed	Multisensory, multi-modal
Less A/K at higher levels	Visual, auditory & kinesthetic
Processing Format	
Sequential	Global-sequential-global
Abstract	Concrete to abstract
Curriculum mandated	Learner-driven
Response Filters	
Externally referenced	Both external & internal
Match	Both match & mismatch
Reflective	Both reflective & experimental
Curriculum driven	Learner driven

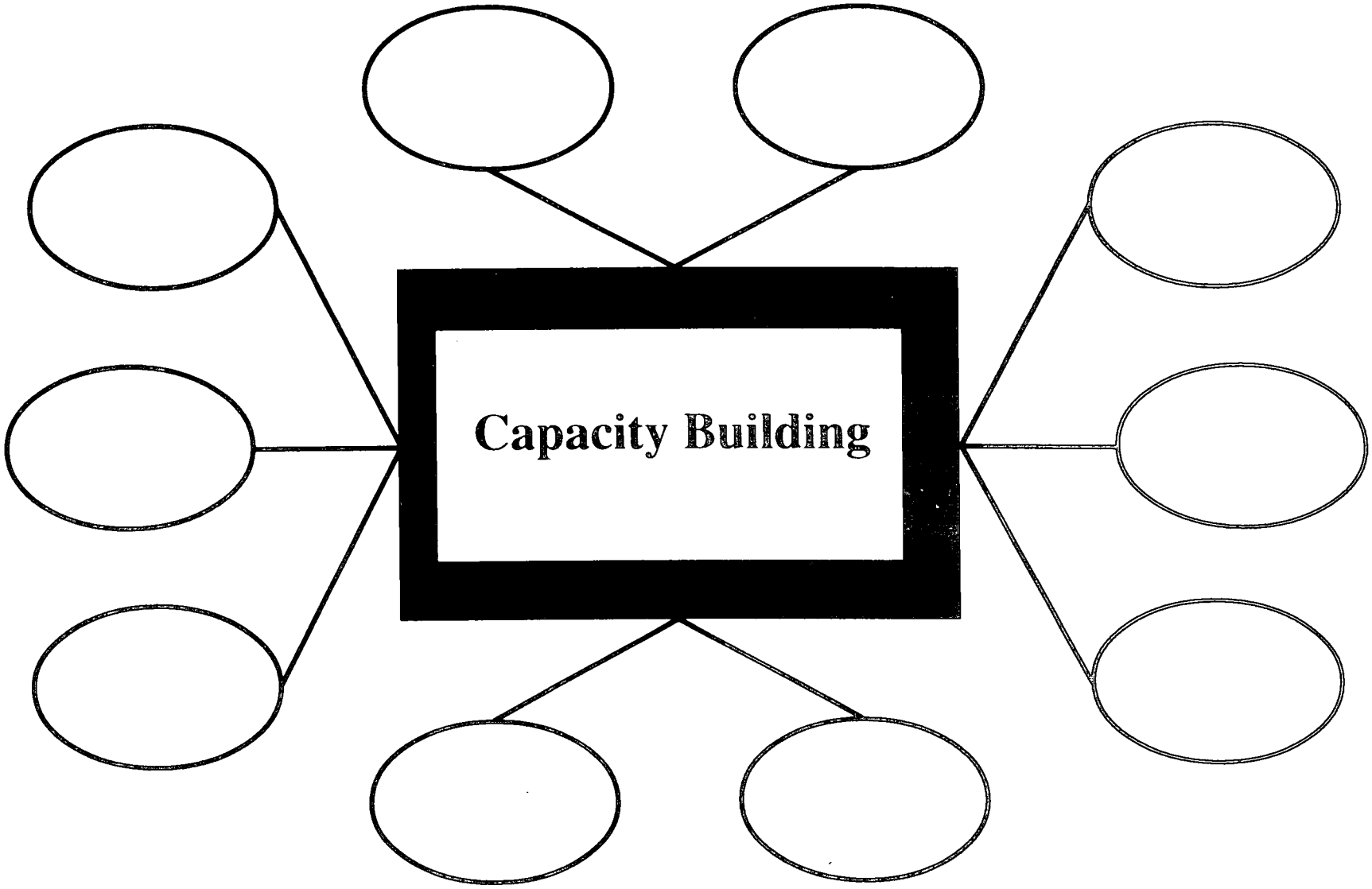
Taken from *Brain-Based Learning* by Eric Jensen



Framework for Considering Technology Features and Qualities

Framework	What	How
1) **Technologies that enhance learning communications.** ◦ Networked Learning		
2) **Technologies that support building depth of knowledge.** • Networked Learning		
2a) **Technologies that facilitate authentic learning contexts.** • Networked Learning		
2b) **Technologies that facilitate cognitive processes and tasks.** • Networked Learning		
3) **Technologies that support collaborative knowledge integration.** ◦ Networked Learning		
4) **Technologies that support accessing and utilizing original sources for learning.** • Networked Learning		
5) **Technologies that support a continuous cycle of systematically gathering information about student learning and giving feedback.** • Networked Learning		
6) **Technologies that support utilization of a variety of instructional approaches and strategies.** • Networked Learning		
7) **Technologies that facilitate access to and utilization of a variety of multisensory tools.** • Networked Learning		
8) **Technologies that facilitate efficiency of work and learning.** • Networked Learning		
9) **Technologies that promote dynamic, flexible qualities of learning models, i.e. anytime, anyplace.** • Networked Learning		

Appendix D



Defining A Knowledge Base

Strategy: Information Skills Research Model

Phase I: Presearch

- Identify an area of interest or purpose
- Pose individual or group questions
- Expand thinking via: brainstorming, exploration, outlining, list making, webbing, clustering, mapping

Phase II: Search

- Pose a refined, specific question(s)
- Formulate a search plan: identify information providers, sources, and tools; search for relevant information

Phase III: Interpretation

- Asses usefulness of information
- Employ process of: paraphrasing, infering, synthesizing, analyzing, trend analysis, pattern recognition, comparing and contrasting, drawing conclusions, summarizing

Phase IV: Communication

- Apply the information to construct meaning
- Select an appropriate medium for sharing knowledge

Phase V: Reflection and Assessment

- Assess both the content and the process: Tools: Self Reflection, Critical Friend
- Assess product(s) against established criteria

Journals are one tool useful in this phase. One format for journal entries is the following questions:

My questions: what the question was, why it was of interest, what was already known before the search began

My search process: description of the sequence of steps in the search

What I learned: three or four major findings or conclusions

What this means to me: description of how the author developed as a researcher and the impact of the new knowledge on the author

References: list of references used

Adapted from *Follett Information Skills Model and I-Search Method*

"It's not what you know that bothers me, it's what you know that isn't so."

Asa Hilliard

Changing Mental Models

Starting Point...

New interest has surfaced in examining the concept of mental models as a process for creating new learning models. We can set about to envision and create unimagined possible futures, and then link our imaginations to actions that make them real. The importance of this process to technology integration is two fold. 1) We are challenged to create technology infused learning when the technology is continually emerging. 2) Many education reform efforts experience only temporary success.

Guiding Questions:

- In what ways does the concept of "mental models" relate to technology integration?
- What content and processes will facilitate changing mental models?
- What resources are available to build a knowledge base for changing mental models?

Process Strategies: Work and Tools for Technology Integration

The strategies section engages learners in a set of experiences that employ selected processes as tools for considering important content or issues related to changing mental models. The processes and content in these experiences are intended as "starters" for schools in building their individual portfolios. Learners will accomplish the goals of this section by systematically participating in the work described below.

Strategy 1:	The Ladder of Inference See Appendix E for instructions and resources
Strategy 2:	Action Research See Appendix F for instructions and resources
Strategy 3:	Reflection See Appendix G for instructions and resources
Strategy 4:	Multiple Perspectives See Appendix H for instructions and resources
Strategy 5:	Making Mental Models Explicit See Appendix I for instructions and resources

Technology High Points:

The link between individual learning and organizational learning
<http://iir1.uwaterloo.ca/MOTW96/readings96/Kim.html>

Mental Models and Distributed Objects
<http://www.innergy.com/ix/arc/4474.html>

Checkpoint: What this means to me...

Strategy: The Ladder of Inference

Appendix E

As educators, we operate in an environment of self-generating beliefs which remain largely untested. We adopt those beliefs because they are based on conclusions, which are inferred from what we observe, plus our past experience. We can't live our lives without adding meaning or drawing conclusions. But, we can improve the quality of those results.

The ladder of inference is a strategy that provides a structure for facilitating improved communication by:

1) becoming more aware of our own thinking and reasoning (reflection);
2) making our thinking and reasoning more visible to others (advocacy);
3) inquiring into others' thinking and reasoning (inquiry).

The ladder rungs illustrate how rapidly we can leap to knee-jerk conclusions with no intermediate thought process, as if rapidly climbing up a ladder in our minds.

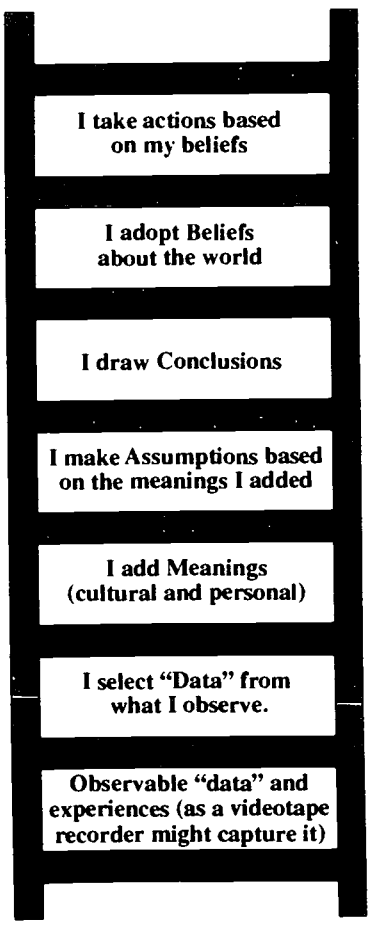
The value of these skills is perhaps most apparent in their absence. Individuals who are undisciplined in reflective thinking have difficulty hearing what others actually say. Instead they hear what they expect others to say. They have little tolerance for multiple interpretations of events because they often "see" only their own interpretation.

Our ability to achieve the results we truly desire is eroded by our feelings that:

- Our beliefs are the truth.
- The truth is obvious.
- Our beliefs are based on real data.
- The data we select are the real data.

The rungs on the ladder—

The reflexive loop: (our beliefs affect what data we select next time)



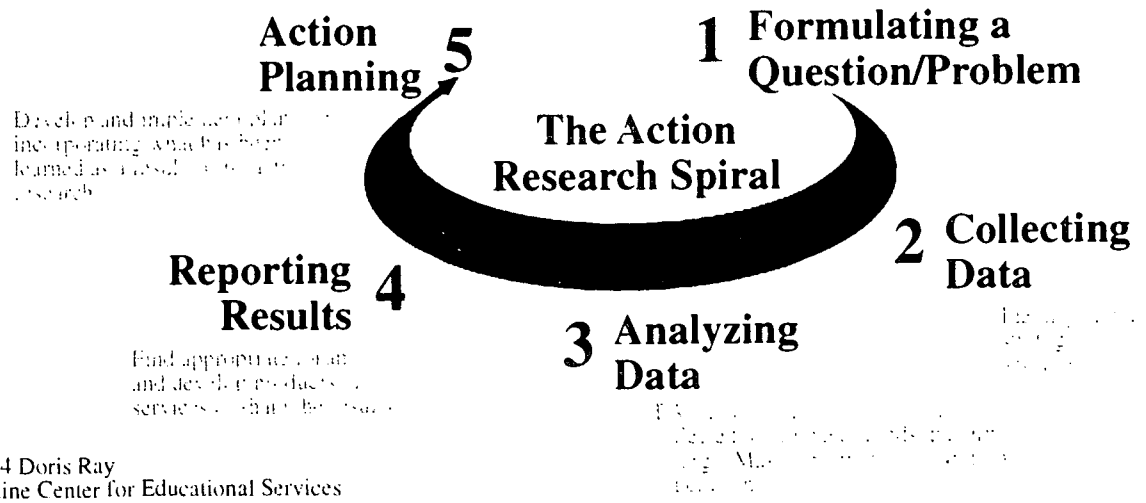
Adapted from: *The Fifth Discipline Fieldbook* by Peter Senge, *The Ladder of Inference* by Rick Ross

Action research defined is a systematic, disciplined inquiry process for the purpose of improving practice. Individuals or groups engage in action research to strive to understand and solve specific problems or issues within an area of study. It is:

- conducted by those who want to do something about their own situation.
- a disciplined inquiry approach to planning and acting.
- collecting evidence which leads to a clear assessment of the current situation.
- clustering the evidence in ways which lead to a deeper understanding.
- using evidence to identify the next steps in a complicated process.

Carl Glickman, Professor of Education, Stanford University, California, and author of *Renewing America's Schools* urges educators and schools to engage in a critical self-study process such as action research. He writes, "Do not act unless you can study what you act. It is irresponsible for a school to mobilize, initiate, and act without any conscious way of determining whether such expenditure of time and energy is having a desirable effect. To study without acting gets a school nowhere; to act without study gets a school somewhere—lost. Studying and acting, when integrated, lead to the same result—an educative, purposeful tool."

The process of action research has five sequential and spiraling steps:



8/94 Doris Ray
Maine Center for Educational Services

Approaches to Action Research

Collaborative action research is conducted by a team of educators. This helps break through the isolation of schedules and structures; it contributes to the knowledge base in education; and it provides participants the opportunity to influence decision-making and inform action.

Classroom action research usually focuses on a particular classroom or group of students. Classroom action research is designed to study a change, a problem or an area of interest in classroom management, the curriculum-instruction-assessment cycle, strategies or materials, or students' cognitive, affective, or social behaviors.

Schoolwide action research engages participants in the study of a change, an issue or problem of common concern within the school. It usually focuses on school improvement and may be conducted by a school improvement committee or other leadership group.

Sources of Data

There are many possible data sources for utilization in Action Research. Some suggestions to start you off are:

Anecdotal Records: Written, descriptive, longitudinal accounts of what an individual or group says or does over a period of time.

Document Analysis: a picture of an issue, a school, or population can be constructed using a variety of documents: letters, memos, flyers, handouts, brochures, publications, schedules, bulletin board displays, schools rules.

Observer's Notes: Contextual descriptions of behaviors, events, and understandings. Field notes often include subjective impressions and interpretations.

Interviews: Unplanned interviews are like naturally occurring informal chats. Planned, unstructured interviews use one or two rich opening questions to stimulate responses. Structured interviews use a series of predetermined questions.

Logs: Usually organized chronologically, logs can be particularly useful when enhanced with diary-like entries and notes.

Portfolios: Collections of materials organized for a particular purpose or around a particular issue.

Questionnaires: Written questionnaires can be of two types. Open questionnaires ask for information in respondents own words. Closed or multi-choice questionnaires ask respondents to select among possible responses.

Tape or Video Recordings: Recording lessons, meetings, or discussions can produce large amounts of useful data which can be later transcribed and analyzed.

Focus Groups: Focus groups are targeted toward specific issues and usually involve 5-8 persons. Participants respond to structured questions.

Adapted from *The Action Research Planner*, edited by Stephen Kemmits and Robin McTaggart, Deakin University Press, Victoria 3217, Australia and *The Maine Center for Educational Services* newsletter.

Strategy: Developing Reflective Practice

Appendix G

Reflective thinking, in distinction from other operations to which we apply the name of thought, involves (1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring, to find material that will resolve the doubt, settle the dispose of the perplexity. (Dewey, 1933, p. 12)

Dewey characterized reflection as comprising five phases. The phases need not necessarily occur in any particular order but should fit together to form the process of reflective thinking. The five phases are:

- Suggestions are the ideas or possibilities which spring to mind when one is initially confronted by a puzzling situation. The more suggestions available, the greater the need to suspend judgment and to consider each in an appropriate manner. Therefore, suggestions are an impetus for further inquiry.

- Problem or intellectualization is when the puzzle is seen as a whole rather than as small or discrete entities on their own. It is seeing 'the big picture' and recognizing the real cause for concern. It is understanding the perplexity of a situation more precisely so that courses of action may be more fully thought through and intellectualized.

- Hypothesis formation is when a suggestion is reconsidered in terms of what can be done with it or how it can be used. Acting on a working hypothesis involves making more observations, considering more information, and seeing how the hypothesis stands up to tentative testing.

- Reasoning is when the linking of information, ideas, and previous experiences allows one to expand on suggestions, hypotheses, and tests, to extend the thinking about and knowledge of the subject. 'Even when reasoning out the bearings of a supposition does not lead to its rejection, it develops the idea into a form in which it is more apposite to the problem.'

- Testing is the phase in which the hypothesized end result may be tested. In so doing, the consequences of the testing can be used to corroborate (or negate) the conjectural idea.

Reflection on practice or reflective thinking may be demonstrated through thinking aloud and/or journal writing.

Strategy: Developing Reflective Questioning

Appendix G

Reflective questioning creates opportunities for individuals to reflect aloud, to be heard by one or more colleagues, and to be prompted to expand and extend thinking through follow-up questions

—Ginny V.Lee and Bruce G. Barnett
Using Reflective Questioning To Promote Collaborative Dialogue

Reflective questioning is a technique in which one person prepares and asks questions that are designed to provide opportunities for the respondent to explore his or her knowledge, skills, experiences, attitudes, beliefs, and values. It encourages the respondent to explore his or her own thinking; it is not intended to direct the respondent to a conclusion pre-determined by the questioner.

Strategy Blueprint:
Three things need to be considered when deciding if this strategy might be beneficial; the context in which it will be used, the purpose for its use, and the relationship between the questioner and the respondent.

Context and purpose:
Any context that calls for thoughtful and personal consideration invites reflective questioning. Processes may include considering alternative courses of action, examining relations between desired and achieved outcomes, clarifying beliefs or values, exploring commonalities within a group, or reviewing the significance of an experience.

Reflective questioning is appropriate only if its purpose is to support the respondent(s) in a personalized process of exploration. The questioner must be willing and able to work with whatever ideas, information, thoughts, and feelings arise. In contrast, the questioning process loses its reflective quality when the questioning is designed to lead the respondent to see what the questioner wants him or her to see, or to assess or evaluate the response.

Relationship with the respondent:
The questioner's professional (and perhaps personal) relationship to the respondent influences the questioning process, as does the way the questioner treats the information received.

Strategy: Considering Multiple Perspectives Appendix H

The Multiple Perspectives Strategy is designed to open up or widen points of view from which teams or individuals regard an issue, challenge or problem. Rotating between roles encourages viewing the issue from as many vantage points as possible. Applied to technology infused learning, this strategy facilitates exploration of different perspectives of people involved or affected by technology integration.

The participants in this strategy step into the shoes of other stakeholders, such as teachers, students, administrators, school boards, parents, community. The point is not just to look at extremely different perspectives, but to capture as many differences as possible from stakeholder groups involved.

Strategy Blueprint:

Form teams of at least four members

1) Prepare a wheel, about eighteen inches in diameter, out of thick paper or card board. In the center, identify technology integration (An Open Networked Environment) as the topic for consideration.
2) Divide the wheel into equal segments, one for each member of the team. Write each team members name on a segment of the wheel.
3) Write cards with the names or titles of key stakeholders concerned with the issue of technology integration and place them evenly spaced around the outside of the wheel.
4) Turn the wheel. When it stops, the names of participants will be in line with one of the key stakeholders. At each turn of the wheel, each team member must add to the understanding of the person to which he or she has moved.
   For example, Gail's name lands adjacent to the student card at the edge of the wheel. Gail goes to the flip chart for the "student" stakeholder position and completes this sentence, "From my perspective as_____the critical elements within technology integration are..."
   Comments may concern the problem or challenge (written in one color) or ideas for resolution (written in a different color). All comments should be written as if you are the person whose card you have landed on.

   If you feel you don't understand this stakeholder's perspective, ask yourself additional questions, playing the role of that person:
   Time: What time frame am I operating within? When did I begin to look at the problem or issue? When will it, effectively be a non issue for me?
   Expectation: What do I expect will happen, if all continues as expected? What do I hope (or demand) should happen? Who should deal with this? What do they want me to do?
   Examination: How closely am I willing to examine technology integration? From how far away do I see it? What else is aggregated with this issue as I see it?
   Understanding: What do I see about the problem no one else sees? What understanding of the problem occupies my vision? What data is my understanding of the problem based upon?
5) When the process is completed, full descriptions of each perspective are recorded. As a team, talk through technology integration from each perspective. In each case, how does the way you are thinking and seeing limit your capacity for dealing with the challenge?

   Record all inputs; you might want to use them later or come back to them at some point of the discussion. You can ask yourself: "What do the differences mean for our work? How can we utilize the differences for improving our work?

Variation:
A set of cards containing the names of key stakeholders can replace the wheel concept.

1) Place the key stakeholder set of cards in the center of the table.
2) Each team member draws a card from the pile and responds on the corresponding flip chart as in the directions above.
3) Reshuffle the cards before each new round begins. Team members draw a new card for each round.

Compile the correlating flip charts from each team to develop a whole group snapshot of key stakeholder perspectives.

Adapted from: *The Fifth Discipline Fieldbook* by Peter Senge

The software product *Inspiration* by Inspiration Software, Inc. may be used to generate the information in this activity electronically. Web Site: <*www.inspiration.com*>; phone: 503-297-3004.

Strategy: Making Mental Models Explicit Apppendix I

Mental models are the images, assumptions, and stories which we carry in our minds of ourselves, other people, institutions, and every aspect of the world. This strategy provides the framework for individuals to expose the mental models they possess concerning the integration of technology with teaching and learning.

Strategy Blueprint:
For this interview process, form groups of three. Each person in the group is assigned a letter. (A, B, or C)
For the first round (three minutes):

- Letter "A" person will be the interviewer, letter "B" person will be the interviewee, and letter "C" person will be the recorder.
- Person "A" asks person "B": Describe your picture of a technology infused learning environment.
- Person "C" records the responses of person "B".
- Probing questions could be: Describe technologies, what students and teachers are doing, etc.

In the second round (three minutes):

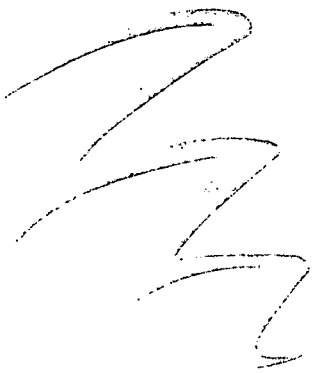
- Person "A" is the recorder, person "B" is the interviewer, and person "C" is the interviewee.
- Repeat the questions.

In the third round (three minutes):

- Person "A" is the interviewee, person "B" is the recorder, and person "C" is the interviewer.
- Repeat the questions.

Recorders return interview responses to the respondent to whom they belong.

Compare recorded mental models of technology integration to espoused theory(s) of intelligence shared in the section: Building a Sound Knowledge Base. Note and record connections or disconnections. Identify one goal and create an action plan.



"Technology is beginning to spawn questions we never thought of asking before

Unknown

What is Curriculum?

Starting Point...
The first and most important decision necessary for designing learning experiences is defining what curriculum is. Academic standards initiatives engage educators in focused conversations to identify knowledge, skills, and processes that define and structure academic disciplines. Critical thinking approaches view content as explicitly thinking. Expanding the concept of curriculum to a networked educational environment sets different parameters and raises new questions. The investigation of curriculum issues and identification of frameworks for decision making is critical to improving teaching and learning.

Guiding Questions:

- What content and processes will guide curriculum changes?
- What are the desired characteristics of curriculum models for open, networked learning systems?

Process Strategies: Work and Tools for Technology Integration

Strategy 1: What is Curriculum: Curriculum Profile
Curriculum Rating Scale
See Appendix J for instructions and resources

Strategy 2: Analyzing Content/Thinking/Technology
See Appendix K for instructions and resources
Standards-Driven Frameworks
See Appendix K-1 for instructions and resources
Approaches to Design
See Appendix K-2 for instructions and resources
Exhibits, Projects, Assignments
See Appendix K-3 for instructions and resources

Strategy 3: Information Literacy
See Appendix L for instructions and resources
Digital Literacy
See Appendix L-1 for instructions and resources

Strategy 4: Web-Based Learning
See Appendix M for instructions and resources

Strategy 5: Taking A Closer Look
See Appendix N for instructions and resources

Strategy 6: Designers Workshop
See Appendix O for instructions and resources

Technology High Points:

- **Resources:**
  Standards at McRel
  <http://www.mcrel.org/standards/index.html>
  National Standards and State Curriculum Frameworks
  <http://enc.org/reform/fworks/nf_index.htm>
  NCTM Standards
  <http://carson.enc.org/reform/journals/ENC2280/nf_280dtocl.htm>
  International Society for Technology in Education
  <http://www.iste.org/> then: National Educational Technology Standards

What is Curriculum? (cont.)

Project (NETS)
<http://www.iste.org/specproj/standards/nets/index.html>
Technology for All Americans: International Technology Education Association
Executive Summary and ordering information
<http://scholar.lib.vt.edu/TAA/Execsumm.htm>
Curriculum: Critical Issues
<http://www.ncrel.org/sdrs/areas/cuOcont.htm>
Welcome to 21st Century Problem Solving
<http://www2.hawaii.edu/suremath/home.html>
Critical Thinking Library
<http://www.sonoma.edu/cthink/K12/K12library/library.nclk>
then: Universal Intellectual Standards

Checkpoint: What this means to me...

Strategy: Curriculum Profile

Appendix J

Respond to the following items from your perspective (i.e. teacher, administrator, program coordinator etc.).

1) **Curriculum is:**

2) **What frameworks guide curriculum decisions?**

2a) **In what ways are content knowledge, thinking, and technology addressed?**

3) **Who participates in a curriculum decision-making process?**

4) **Decisions regarding curriculum are data driven.**
Sources of data used are:

Collection methods are:

5) **In what ways are you actively engaged in creating dynamic, flexible curriculum models that embrace open, networked education?**

Emerging models are:

Strategy: Curriculum Rating Scale

Appendix J

Based on the indicators of an open networked education system, rate the following curriculum categories in your organization. Identify what needs to change in each area to facilitate movement on the continuum.

Curriculum Definition

0———————5

Curriculum Frameworks

0———————5

Curriculum Decision Making

0———————5

Curriculum Assessment

0———————5

Curriculum Innovation

0———————5

Strategy: Analyzing Content/Thinking/Technology Appendix K

Three focus areas currently comprise standards work: 1)Academic Content Standards, 2)Intellectual Reasoning Standards, and 3)Educational Technology Standards. Different initiatives have taken different approaches to the articulation and integration of these three areas.

- The Resource Manual which accompanies this Participant Manual contains examples of each.
- Individually examine the National Council of Mathematics Standards, the Intellectual Reasoning Standards, and the National Educational Technology Standards.
- Form teams of four, designate a recorder and discuss the following questions:
  1) How are content, thinking and technology frameworks being utilized in your district?
  2) What's working in the process your district is engaged in?
  3) What's not working in the process your district is engaged in?
  4) In what ways will the processes in place in your district help you attain an open networked education system?
- Record responses to each question on flip charts and display.
- In a large group discuss the patterns that have emerged from team responses.

National and statewide initiatives have focused on curriculum by engaging educators in conversations to identify important knowledge, skills, and processes of academic content areas. While the end products differ from state to state, a unifying purpose exists and organizing formats are similar.

The following is a typical organizing format:

- Standards
- Benchmarks
- Performance Indicators
- Units of Study

Standard **Benchmark** **Performance Indicators** **a.** **b.** **c.**	
Standard **Benchmark** **Performance Indicators** **a.** **b.** **c.**	

Strategy: Approaches to Designing Standards Based or Standards Referenced Systems

Appendix K-2

Once the pieces of the format are established, a decision about the approach or approaches which will best serve the needs of the district is necessary. Four approaches are suggested below:

- **Approaches that rely on external assessments:**
  Students must meet or exceed a specific cut-score on assessments that are external to the classroom. Assessments can use traditional forced choice items and/or performance tasks.

- **Approaches that use core courses:**
  General standards that cut across a number of subject areas are embedded in specific, required courses. Students' grades in these courses represent their performance on these standards.

- **Approaches that rely on projects, exhibitions, and portfolios:**
  Students complete performance tasks, exhibitions, and portfolios that demonstrate their knowledge of specific standards or combination of standards.

- **Approaches that report performance on individual standards:**
  Individual teachers report students' performance on specific standards.

Marzano and Kendall, *A Comprehensive Guide to Designing Standards-Based Districts, Schools, and Classrooms*, p. 223

Strategy: A Closer Look at Exhibitions, Projects, and Assignments

Appendix K-3

What is the relationship among different types of student work?

1) **Assignments** form the broad base of school work. These are experiences usually initiated by the teacher to build skills, and provide knowledge of facts, generalizations, principles, concepts and thinking strategies of a discipline. At the assignment level students receive instruction in specific skills related to the study of academic content areas.

2) **Project work** is designed intentionally to allow students to show they can apply what they know and deepen their understanding of important principles, concepts and reasoning abilities of an academic discipline. At the project level students engage in authentic tasks that represent targeted learning goals.

3) **Exhibitions** are collections of projects juried by an audience outside the classroom and performed and defended by the student. Exhibitions are designed to show mastery of important content and the transfer and application of content knowledge to real world experiences. At the exhibition level students must be able to demonstrate performances such as reading, writing, and oral presentations, visual presentations, data gathering and analysis, model making, game making and playing.

Adapted from Wally Ziko, Computer Technology Teacher, Shaw School–Wild River House

Strategy: Information Literacy Scavenger Hunt

Appendix L

The concept of information literacy has been interpreted in various ways. Recent work has focused on more clearly defining what information literacy is, identifying the skills necessary to be an information literate person, and finding ways to translate that to curriculum in K-16 schools. Through the Information Literacy Scavenger Hunt, individuals will explore online resources to find answers to the questions identified.

Question	Answer Source
What is a commonly held definition of information literacy? Definition:	
Locate a rationale for information literacy as an area of study. Rationale:	
Locate and list three rich sites for further knowledge building about information literacy. Notes:	
Identify critical elements found in current models of essential skills for Information Literacy. Notes:	
Cite one example of an information literacy lesson plan. Notes:	
Locate web-based experiences that would help learners gain information literacy skills. Notes:	
Locate two examples of K-12 Information Literacy efforts. Notes:	

In groups of three or four, share what you discovered on your scavenger hunt.

Strategy: Digital Literacy

Appendix L-1

In this strategy, focus is drawn to the conept of digital literacy. Incorporating digital literacy into curriculum requires a shared understanding of what it is.

- What is digital literacy? Write your definition.

- What are the digital literacy skills students in your schools are currently attaining?

- How and where do they attain them?

In the box below, identify performance indicators that are articulate what success looks like in each of these areas for individuals who exhibit digital literacy:

Visual:
Mathematical:
Textual:
Other:

Strategy: Analyzing Web-Based Curriculum

Appendix M

The web sites listed below represent web-based projects with different characteristics. Select one and analyze it based on its curriculum merits. Does it embrace what we know about learning? Does it respond to a definition of curriculum that is dynamic and flexible? Does it take advantage of the features and qualities of a networked environment? In what ways does it respond to content standards, intellectual standards, technology standards, and new literacies? What changes would you make in the project to align it with the criteria identified?

Technology High Points:

AT&T Learning Circles
<http://www.ieam.org/iearn/circles/lcguide>
TEAMS Distance Learning for All k-12 Educators
<http://teams.lacoe.edu>
Global Schoolnet Foundation Projects & Programs
<http://www.globalschoolnet.org/project/index.html>
The Annenberg CPB Projects Learner Online
<http://www.learner.org/>
KIDLINK Network KIDPROJ
<http://www.Kidlink.org:80/KIDPROJ/>
Current Project Overviews <http://www.Kidlink.org/KIDPROJ/PROJ97>
NASA's Quest Project
<http://quest.arc.nasa.gov/>
What's Happening At Quest: A Schedule of Events
<http://quest.arc.nasa.gov/common/events/>
Pacific Bell Knowledge Network Explorer
<http://www.kn.pacbell.com/wired/bluewebn/>
Tenet Internet Projects Registry
<https://new-database.tenet.edu:8101/tnp/owa/tn.main.pg>
Projects organized by Activity Structures of Judi Harris
NickNacks Telecollaborate
Develop a Telecollaboration
<http://www1.minn.net/~schubert/LeadNet.html>
Projects Organized According to Purpose
<http://www1.minn.net/~schubert/EdHelpers.html>
This Month's Featured Projects

Taking A Closer Look

A Long Standing View of Learning...

This chart may serve as a framework for taking a closer look at elements of teaching and learning.

Date	Learning Goal	Learning Task	Instruction	Assessment	Student Role	Teacher Role	Results

48

An Emerging View of Learning...

Date	Learning Goal	Learning Task	Instruction	Assessment	Student Role	Teacher Role	Results

Appendix V

Strategy: Designer's Workshop

Appendix O

The Teacher and Learning Section of the resource binder accompanying this manual contains several models showing content and processes viewed essential when designing telecollaborative learning experiences. Compare at least three different models discussing the advantages and disadvantages of each.

It's your turn to design a learning experience that represents a dynamic, flexible curriculum in a networked environment. Adopt or create a model to use as a framework.

Does Instruction Make a Difference?

Starting Point...

All human beings are born with intrinsic motivation.— Deming

In the role of teacher, educators have the opportunity to bring together elements and conditions which promote intrinsic motivation and promote lifelong learning. What types of instruction accomplish different learning goals? How are student and teacher roles changing?

Guiding Questions:

- What content and processes facilitate changes in instructional approaches?
- What instructional approaches best serve learners in an open, networked education system?

Process Strategies: Work and Tools for Technology Integration

Strategy 1: Venn Diagram
See Appendix P for instructions and resources

Strategy 2: Instruction Profile: Story Telling
See Appendix Q for instructions and resources
Myths and Symbols
See Appendix Q-1 for instructions and resources

Strategy 3: Approaches/Methods/Strategies/Tools
See Appendix R for instructions and resources

Strategy 4: New "AGOGY"
See Appendix S for instructions and resources

Strategy 5: 21st Century Manuscripts
See Appendix T for instructions and resources

Strategy 6: Analyzing Web-Based Instruction
See Appendix U for instructions and resources

Technology High Points:

INCS: The Media and Communication Studies Site—Constructivism at Work
<http://www.aber.ac.uk/~dgc/medmenu.html>

Media Literacy
<http://www.yahoo.com/News_and_Media_Literacy/>

CaseNet: Active Learning in International Affairs
<http://csf.colorado.edu/CaseNet/>

American Communication Association
<http://www.uark.edu/depts/comminfo/www/ACA.html>

Christopher Harper's Web Page
<http://pages.nyu.edu/~harperc/>

The WWW Virtual Library
<http://vlib.stanford.edu/Overview.html>

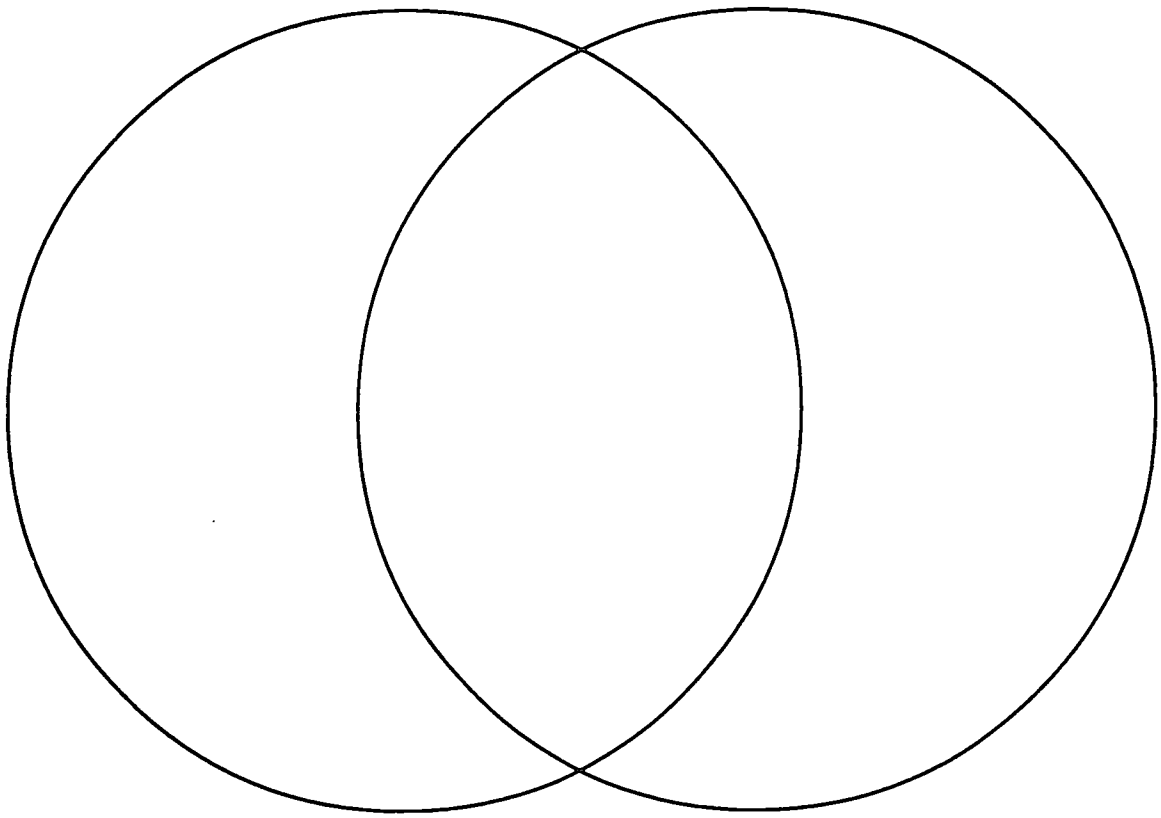
The Web: Design for Active Learning
<http://www.atl.ualberta.ca/presentations/activelearn/>
then link to: Active Learning Exemplary Sites
<http://www.atl.ualberta.ca/presentations/activelearn/activel.html#alearn>

Checkpoint: What this means to me...

Strategy: Venn Diagram of Teaching and Learning

Appendix P

In the Venn Diagram below, record characteristics of teaching in the left hand circle, characteristics of learning in the right hand circle, and common characteristics in the middle overlap space. Below each area of the diagram, list ways technology may enhance and extend teaching and learning. What similarities and differences does the diagram reveal regarding teaching and learning?



Teaching **Learning**

Strategy: Instructional Profile

Appendix Q

Respond to the following items based on your perspective (i.e. teacher, administrator, program coordinator etc.)

1) Instruction is:

2) What frameworks guide instructional decisions?

2a) In what ways is instruction aligned with curriculum and assessment to attain content knowledge, thinking, and technology standards?

My repertoire of practices includes:

- Facilitation
- Presentation incorporating multisensory technologies
- Coaching
- Modeling
- Consulting
- Mediation
- Telementoring
- Teleapprentice

3) Who participates in an instructional decision-making process? Who provides instruction?

4) In what ways are decisions regarding instruction data driven?
Sources of data used are:
Collection methods are:

5) In what ways does technology enhance and extend instruction?

6) In what ways are you actively engaged in creating dynamic, flexible instructional models that embrace open, networked education?

Emerging models are:

Strategy: Myths and Symbols

Strategy Blueprint:
Part 1
In your mind, walk through "A Day in the Life of a Student." Record your perception of instructional experiences a student encounters throughout the day.

A variation of this strategy is to actually take the place of a student for a day and experience what that student experiences.

Part 2
With a partner, share your instructional profile. Are you changing intelligence through teaching? Create a symbol that represents instructional practices in your classroom, school, district.

Can you identify any "Myths" about student learning that are influencing instructional practices? List them. Select one and practice reflective questioning to understand the basis for the "myth."

The notes from this strategy will be used in the next strategy.

Instructional Approaches, Methods, and Tools

Study the Instructional Approach Chart. In each approach category, indicate the percentage of time this approach is in operation in your classroom, school, or district.

Approach 1 **Examples of teaching methods and strategies:**	Approach 2 **Examples of teaching methods and strategies:**	Approach 3 **Examples of teaching methods and strategies:**	Approach 4 **Examples of teaching methods and strategies: (distributed via a networked system)**
[illegible]	Direct Instruction Strategies: • See List in Approach 1 Indirect Instruction Strategies: • Strategies • [illegible] • Case Studies • Reflective Discussion	Direct Instruction Strategies: • See List in Approach 1 Indirect Instruction Strategies • See List in Approach 2 Experiential Learning Strategies: • Field Observation, Job Shadowing, Work Study • Focused Imaging • Simulation • Project-Based • Problem-Based • Authentic Tasks Interactive Instruction Strategies: • Role Playing • Interviews • Brainstorming • Concept Mapping and • Concept Webbing • Concept Formation • Concept Attainment • Cooperative Learning	Direct Instruction Strategies: • See List in Approach 1 Indirect Instruction Strategies: • See List in Approach 2 Experiential Learning Strategies: • See List in Approach 3 Interactive Instruction Strategies: • See List in Approach 3 Other Strategies: • Facilitation • Coaching • Presenting • Consulting • Negotiation • Mentoring • Reflection • [illegible] • [illegible] • Cognitive [illegible]

Analyze each approach with respect to the following variables:

- Methods & strategies,
- Information control,
- Teacher/student role(s),
- Decisionmaking process,
- Definition of intelligence,
- Vision of learning
- Technology's role

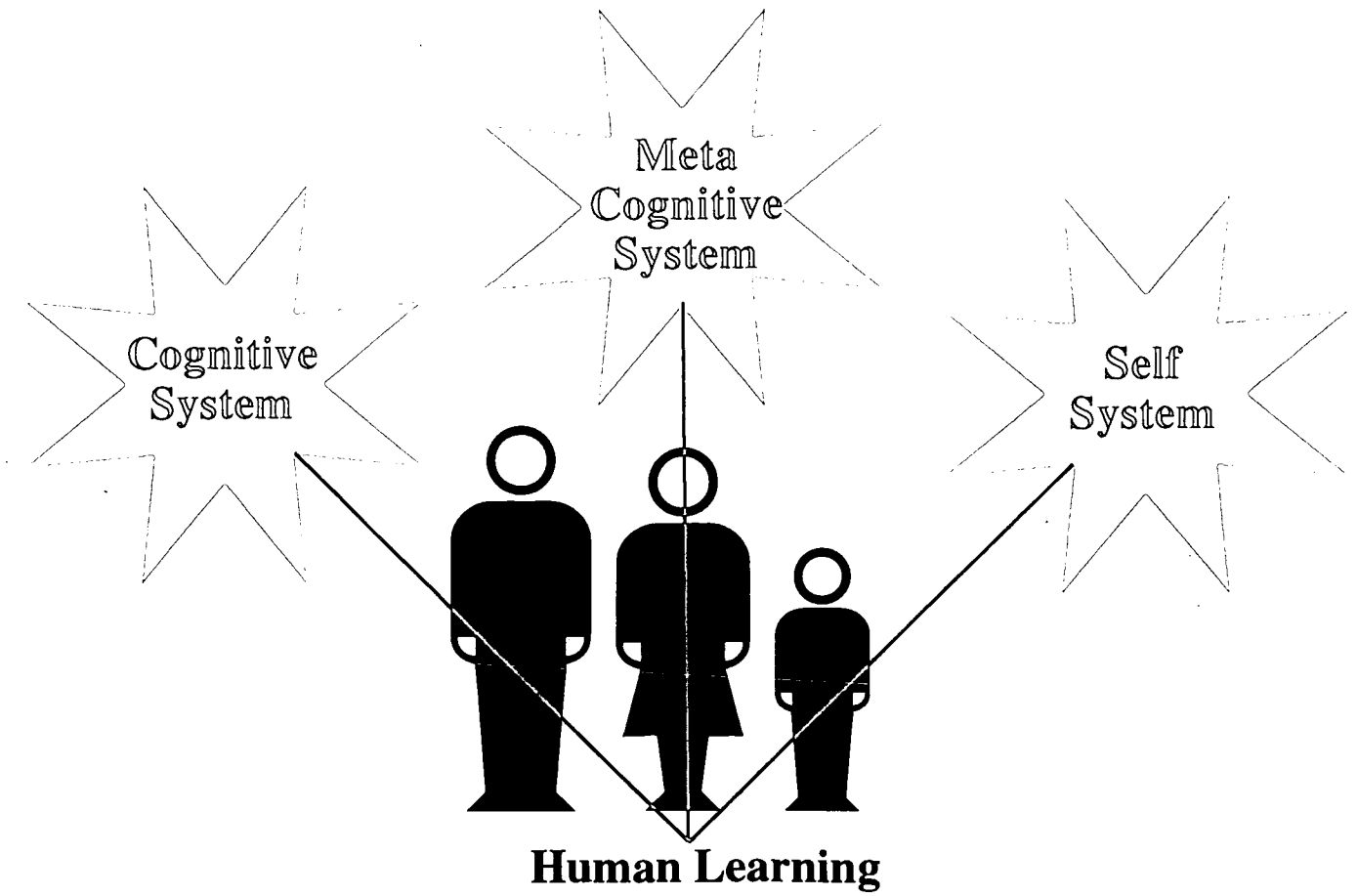
When considering the landscape of instructional practice, look at the type of innovation in relation to the type of knowledge it is intended to increase.

The first step of making instruction improve student learning is to identify the learning outcome and instructional goal up front.

What are different possible learning outcomes? Three different learning outcomes comprise human learning.

1) Improve the cognitive system
   Instructional goals are aimed at improving student understanding of content knowledge and understanding in respective areas of study.
2) Improve the meta cognitive system
   Instructional goals aimed at improving student processes of thinking about thinking.
3) Improve the self system
   Instructional goals aimed at students understanding themselves better, their goals and motivation.

Our job is to take kids to levels of thinking and information processing they've never been to before. The challenge presented by an open, networked education system is to think in new ways. Based on the three learning goals identified here, what does a networked system offer teaching and learning?



Strategy: 21st Century Manuscripts

Appendix T

Write your story as an instructional leader in the 21st Century. Write specifically about the integration of technology in the instructional process of an open networked education system.

Look back at the Instruction Profile generated previously. Use the profile and your 21st century manuscript to determine the spread between the paradigm under which you are operating and an envisioned paradigm.

Strategy: Analyzing Web-Based Instruction

Appendix U

The web sites listed below represent web-based projects with different characteristics. Choose one and analyze it by considering these questions.

1) Does the instructional approach facilitate accomplishing learning goals in all three areas of human learning indicated on page 56.
2) Does the instructional approach make a current method electronic or does it portray a new approach?
3) What changes would you make in the project to improve instruction?

Technology High Points:

AT&T Learning Circles
<http://www.iearn.org/iearn/circles/lcguide>
TEAMS Distance Learning for All k-12 Educators
<http://teams.lacoe.edu>
Global Schoolnet Foundation Projects & Programs
<http://www.globalschoolnet.org/project/index.html>
The Annenberg CPB Projects Learner Online
<http://www.learner.org/>
KIDLINK Network KIDPROJ
<http://www.Kidlink.org:80/KIDPROJ/>
Current Project Overviews <http://www.Kidlink.org/KIDPROJ/PROJ97>
NASA's Quest Project
<http://quest.arc.nasa.gov/>
What's Happening At Quest: A Schedule of Events
<http://quest.arc.nasa.gov/common/events/>
Pacific Bell Knowledge Network Explorer
<http://www.kn.pacbell.com/wired/bluewebn/>
Tenet Internet Projects Registry
<https://new-database.tenet.edu:8101/tnp/owa/tn.main.pg>
Projects organized by Activity Structures of Judi Harris
NickNacks Telecollaborate
Develop a Telecollaboration
<http://www1.minn.net/~schubert/LeadNet.html>
Projects Organized According to Purpose
<http://www1.minn.net/~schubert/EdHelpers.html>
This Month's Featured Projects

Assessment: Data Driven Learning

Starting Point...
At the heart of an assessment discussion is a general consensus that assessment drives instruction and, in turn learning. A growing number of educators today believe that we must rethink assessment if we are to prepare students for a knowledge-based society. Focusing on assessment provides an opportunity to critically examine our current positions and practices. Two key elements for consideration are: *Are we assessing what's important and what we value? *Is assessment both serving students for continuous improvement and involving them in the process?

Guiding Questions:

- What content and processes may facilitate changes in assessment practices?
- What assessment models may improve student learning in an open, networked learning environment?
- In what ways is classroom assessment connected to the organizational assessment system?

Process Strategies: Work and Tools for Technology Integration

Strategy 1: Guiding Principles
See Appendix V for instructions and resources

Strategy 2: Assessment Profile
See Appendix W for instructions and resources

Strategy 3: Assessment Rating Scale
See Appendix X for instructions and resources

Strategy 4: What Does Success Look Like?
See Appendix Y for instructions and resources
Links Between Targets and Methods
See Appendix Y-1 for instructions and resources
The Assessment Options
See Appendix Y-2 for instructions and resources
Links Between Targets and Methods
See Appendix Y-3 for instructions and resources

Strategy 5: Analyzing Web-Based Assessment
See Appendix Z for instructions and resources

Strategy 6: Weaving the Tapestry
See Appendix AA for instructions and resources

Technology High Points:

NCREL: Pathways to School Improvement
<http://www.ncrel.org/sdrs/areas/asOcont.htm>
Assessment & Accountability
<http://www.nwrel.org/eval/index.html>
CRESST Home Page
<http://cresst96.cse.ucla.edu/index.htm>
ERIC Clearinghouse on Assessment and Evaluation
<http://ericae2.educ.cua.edu/main.htm>
Improving America's Schools: A Newsletter on Issues on Reform
<http://www.ed.gov/pubs/IASA/newsletters/assess/

Northwest Regional Educaational Laboratory
<http://www.nwrel.org/nwedu/nwedu.html>
Authentic & Performance-Based Assessment Links:
Office of Educational Research and Improvement
<http://inet.ed.gov/pubs/OR/Consumer Guides/perfasse.html>
ERIC Portfolio Assessment InfoGuide
<http://ericir.syr.edu/cgi-bin/markup_infoguides/Alphabetical_list_of_InfoGuides/Portfolio_Assessment-5.96>
ASCD Site of Educational Issues
<http://www.ascd.org/>
Guide for Alternative Assessment in Social Studies
<http://www.coe.ilstu.edu/jabraun/socialstudies/assessment/frames.html>

Checkpoint: What this means to me...

Strategy: A Set of Guiding Principles

The following set of guiding principles for assessment provides a starting point for rethinking current assessment processes and practices. Underlying principles for assessment work need to reflect a different set of beliefs if they are to be of value in helping us utilize assessment as a powerful learning tool.

Guiding Principle 1: Accountability—assessment demonstrates a commitment to all students meeting identified high quality standards. Students are assessment users.

Guiding Principle 2: Flexible—assessment is flexible, accommodating differential learning.

Guiding Principle 3: Standards-based—student learning and performance are measured against standards through the use of valid and reliable instruments.

Guiding Principle 4: Anchored—quality internal assessment practices are correlated to norm-referenced assessment practices.

Guiding Principle 5: Ongoing—assessment is continuous, embedded in the teaching and learning process and providing feedback for student improvement.

Guiding Principle 6: Focused—assessment targets are focused with expectations clearly defined. Clear and appropriate targets are essential.

Guiding Principle 7—Assessment processes and practices incorporate features and qualities of an open, networked education system.

Strategy: Assessment Profile

Respond to the following items based on your perspective (i.e. teacher, administrator, program coordinator etc.)

1) Assessment is:

2) What frameworks guide assessment decisions?

2a) In what ways is assessment embedded in teaching and learning as a continuous process, aligned with standards in content knowledge, thinking, and technology?

3) Who participates in an assessment decisionmaking process?

4) In what ways are decisions regarding assessment data driven.
Sources of data used are:

Collection methods are:

5) In what ways does technology enhance and extend the assessment process?

6) In what ways are you actively engaged in creating dynamic, flexible assessment models that embrace open, networked education

Emerging models are:

Strategy: Assessment Rating Scale

Rate your classroom, school, or district in the following assessment areas. Write indicators beside each area that further define the rating you chose.

Assessment Definition
1———— 5

Assessment Frameworks
1———— 5

Assessment Decisionmaking
1———— 5

Assessment Assessment
1———— 5

Assessment Innovation
1———— 5

Strategy: What Does Success Look Like?

Respond to the questions below in the space provided.

1) If a group of knowledge worker employees were to infer your educational values for your students from what they see in your assessment practices, would they be pleased with what they saw?

2) Identify as many reasons as you can why involving students in the process of developing, administering, scoring, and interpreting results of classroom assessment might enhance their motivation to succeed.

3) List as many ways as you can for making the assessment process a part of the learning process—not just a source of scores and grades.

Links Between Achievement Targets and Assessment Methods

TARGET TO BE ASSESSED	ASSESSMENT METHOD			
	SELECTED RESPONSE	ESSAY	PERFORMANCE ASSESSMENT	PERSONAL COMMUNICATION
KNOWLEDGE MASTERY	Multiple choice, true/false, matching, and fill-in can sample mastery of elements of knowledge	Essay exercises can tap understanding of relationships among elements of knowledge	Not a good choice for this target—three other options perferred	Can ask questions, evaluate answers, and infer mastery, but a time-consuming option
REASONING PROFICIENCY	Can assess application of some patterns of reasoning	Written descriptions of complex problem solutions can provide a window into reasoning proficiency	Can watch students solve some problems or examine some products and infer about reasoning proficiency	Can ask student to "think aloud" or can ask follow-up questions to probe reasoning
SKILLS	Can assess mastery of the knowledge prerequisites to skillful performance, but cannot rely on these to tap the skill itself		Can observe and evaluate skills as they are being performed	Strong match when skill is oral communication proficiency; also can assess mastery of knowledge prerequisite to skillful performance
ABILITY TO CREATE PRODUCTS	Can assess mastery of the knowledge prerequisite to the ability to create quality products, but cannot use them to assess the quality of products themselves		Can assess: (1) proficiency in carrying out steps in product development, and (2) attributes of the product itself	Can probe procedural knowledge and knowledge of attributes of quality products, but not product quality
DISPOSITIONS	Selected response questionnaire items can tap student feelings	Open-ended questionnaire items can probe dispositions	Can infer dispositions from behavior and products	Can talk with students about their feelings

Taken from Higgins, Richard J., *Student Centered Classroom Assessment*

Assessment Methods and Tools: Lists of Possibilities

Selected Response Assessment
- Multiple choice
- True-false
- Matching
- Enhanced choice

Brief Constructed Responses
- Fill in the blank (word-s) or (phrase-s)
- Short answer (sentence-s) or (paragraph-s)
- Label a diagram
- "Show your work"
- Visual representation
  - Web
  - Concept map
  - Flow chart
  - Graph/table
  - Illustration

Essay Assessment
- Autobiographies
- Advertisements
- Directions/manuals
- biographies
- Essay tests
- Essays
- Journals
- Logs and field notes
- I-search papers
- Magazines/news articles
- Poetry
- Research papers
- Responses
- Reviews
- Scripts
- Summaries
- Written critiques
- Case studies
- Proposals

Performance Assessment Products
- Essay
- Research paper
- Log/journal

Performance Assessment Products (cont.)
- Lab report
- Story/play
- Poem
- Portfolio
- Art exhibit
- Science project
- Model
- Video/audiotape
- Spreadsheet
- Cartoons
- Computer designs
- Web sites
- Computer simulations
- Videotapes
- Portfolios

Performances
- Oral presentations including multimedia use
- Dance/movement
- Science lab demonstration
- Athletic skills performance
- Dramatic reading
- Dramatizations
- Enactment
- Debate
- Musical recital
- Teach a lesson
- Role playing
- Story telling
- Broadcasts
- Oral critiques

Process Focused
- Oral questioning
- Observation" kid watching"
- Interview
- Conference
- Process description
- "Think aloud"
- Learning log

Understanding Reasoning: Some Organizing Structures

In most instances, the assessment process involves better understanding student reasoning and facilitating improvement in these abilities. Attaining clear targets in this arena may be challenging. The following is a structure for organizing reasoning abilities into workable frameworks.

Analytical Reasoning—When we reason analytically, we reason through the component parts of something: its ingredients, internal functioning, and how its parts fit together. Our instructional challenges here are to be sure students have access to whatever knowledge they need to see inside something and that they have guided practice in exercising their thought processes in this manner. Our assessment challenge is to ask them to tap into that knowledge base and apply their reasoning skills to a novel analytical task.

Synthesizing

Example: We have just finished studying the structure of the short story as a literary form. In addition we have just finished reading a short story. We now have two different sources of knowledge and understanding about short stories to tap as we strive to integrate them. This integration process is one of synthesizing. Thematic instruction encourages students to bring knowledge and productive patterns of reasoning together from several disciplines, as they explore their particular theme. Such curricular place a premium on synthesizing insights from divergent sources and present wonderfully rich opportunities to develop and assess student mastery of this way of reasoning.

Comparative Reasoning

Comparative reasoning refers to the process of figuring out how things are either alike or different. To understand this kind of reasoning, we must see that a proficient reasoner begins with a clear sense of those things to compare and then identifies the basis or bases of similarity or difference before proceeding to draw out specific points of comparison, highlighting why those particular points are important.

Classifying

To reason productively in this manner, we must first know the categories and the attributes of things found within each, as well as the attributes of those things to be classified. Then we can compare each thing to be classified with the categorical options and place it in its appropriate group.

Inferential Reasoning

In this case we reason productively when we can infer principles, draw conclusions, or glean generalizations from accumulated evidence. Reasoning travels from particular facts to a general rule or principle. We also reason inferentially when we apply a general rule or principle to find the solution to a problem. Reasoning here travels from the general to the specific.

Evaluative Reasoning

We reason evaluatively when we judge the value or appropriateness of something by logically applying proper judgmental criteria. When we express and defend a point of view, we reason evaluatively. Evaluating the quality of student writing is evaluative reasoning. Our instructional task is to help students understand the criteria they should be applying when they defend their point of view on an issue. Our assessment challenge is to determine if our students are able to apply those criteria appropriately, given a novel evaluative challenge.

Links Between Achievement Targets and Assessment Methods

This chart is used with the sets of cards found in the Resource Manual. Directions for the strategy accompany the cards.

TARGET TO BE ASSESSED	ASSESSMENT METHOD			
	SELECTED RESPONSE	ESSAY	PERFORMANCE ASSESSMENT	PERSONAL COMMUNICATION
KNOWLEDGE MASTERY				
REASONING PROFICIENCY				
SKILLS				
ABILITY TO CREATE PRODUCTS				
DISPOSITIONS				

Strategy: Analyzing Web-Based Assessment

Appendix Z

The web sites listed below represent web-based projects with different characteristics. Choose one and analyze it by considering the following questions.

1) What learning target(s) are assessed in this project?
2) Is their alignment between the learning target, assessment method and tools?
3) In what ways is assessment continuous and dynamic, embedded in the teaching and learning process?
4) Who would most benefit from assessment results in this project?
5) In what ways do the qualities and features of an open networked system improve assessment in this example?
6) What changes would you make in assessment in this project?

Technology High Points:

AT&T Learning Circles
<http://www.iearn.org/iearn/circles/lcguide>
TEAMS Distance Learning for All k-12 Educators
<http://teams.lacoe.edu>
Global Schoolnet Foundation Projects & Programs
<http://www.globalschoolnet.org/project/index.html>
The Annenberg CPB Projects Learner Online
<http://www.learner.org/>
KIDLINK Network KIDPROJ
<http://www.Kidlink.org:80/KIDPROJ/>
Current Project Overviews
<http://www.Kidlink.org/KIDPROJ/PROJ97>
NASA's Quest Project
<http://quest.arc.nasa.gov/>
What's Happening At Quest: A Schedule of Events
<http://quest.arc.nasa.gov/common/events/>
Pacific Bell Knowledge Network Explorer
<http://www.kn.pacbell.com/wired/bluewebn/>
Tenet Internet Projects Registry
<https://new-database.tenet.edu:8101/tnp/owa/tn.main.pg>
Projects organized by Activity Structures of Judi Harris
NickNacks Telecollaborate
Develop a Telecollaboration
<http://www1.minn.net/~schubert/LeadNet.html>
Projects Organized According to Purpose
<http://www1.minn.net/~schubert/EdHelpers.html>
This Month's Featured Projects

Framework	What	How
1) **Technologies that enhance learning communications.** • Networked Learning		
2) **Technologies that support building depth of knowledge.** • Networked Learning		
2a) **Technologies that facilitate authentic learning contexts.** • Networked Learning		
2b) **Technologies that facilitate cognitive processes and tasks.** • Networked Learning		
3) **Technologies that support collaborative knowledge integration.** • Networked Learning		
4) **Technologies that support accessing and utilizing original sources for learning.** • Networked Learning		
5) **Technologies that support a continuous cycle of systematically gathering information about student learning and giving feedback.** • Networked Learning		
6) **Technologies that support utilization of a variety of instructional approaches and strategies.** • Networked Learning		
7) **Technologies that facilitate access to and utilization of a variety of multisensory tools.** • Networked Learning		
8) **Technologies that facilitate efficiency of work and learning.** • Networked Learning		
9) **Technologies that promote dynamic, flexible qualities of learning models, i.e. anytime, anyplace.** • Networked Learning		

"Seeing the forest as well as the trees is a fundamental problem for organizations."

Peter Senge

Connecting The Classroom to The System

Starting Point...

At the core of successful technology integration is a vision of teaching and learning that places technology as the centerpiece of school reform. The Connections component of this portfolio focuses on content and processes that facilitate meaningful links between the work of students in the classroom and the system as a whole. A systemic approach embraces a synthesized model featuring dynamic, flexible qualities to accommodate "bottom-up, top-down" processes. Systems thinking is an underlying conceptual framework for understanding the interrelationships of a system's multiple parts. Responsive systems are those that embark on a continual journey to understand these interrelationships, organize around a set of core values, and are guided by a commitment to a shared vision.

Guiding Questions:

- What content and processes are vital to connecting teaching and learning to the system?
- What content and processes will facilitate the generation of a shared vision?
- What content and processes will promote systems thinking?
- In what ways can technology accomplish the goals of this section?

Process Strategies: Work and Tools for Technology Integration

The strategies section engages learners in a set of experiences that employ selected processes as tools for considering important content issues related to connecting classrooms and systems. The processes and content in these experiences are intended as "starters" for schools in building their organizational portfolios. Learners will accomplish the goals of this section by systematically participating in the work described below.

Strategy 1:	What's Happening/What's Not Happening? See Appendix BB for instructions and resources
Strategy 2:	Building a Shared Vision See Appendix CC for instructions and resources
Strategy 3:	Value Statements See Appendix DD for instructions and resources
Strategy 4:	Focus Groups See Appendix EE for instructions and resources
Strategy 5:	The Rain Forest Metaphor See Appendix FF for instructions and resources

Technology High Points:

ASCD Systems Thinking & Chaos Theory Network
<http://enhanced-designs.com/stct/>

System Thinking
<http://w3.ag.uiuc.edu/AIM/Discovery/Mind/sys-thinking.html>

The Thinking Page
<http://www.world.std.com/~thinking

Checkpoint: What this means to me...

Strategy: What's Happening? What's Not Happening?

The chart below is space for you to record discoveries you've made about your district as a result of experiences in this workshop. On the left hand side of the chart, list the technology integration efforts that are happening in your district connected to 1) Building a Sound Knowledge Base, 2) Changing Mental Models, 3) Teaching and Learning, and 4) Connecting the Classroom to the System.
On the right hand side, record what is not happening.

TECHNOLOGY INTEGRATION

Technology Integration Efforts	What's Happening?	What's Not Happening?
1) Building a Sound Knowledge Base		
2) Changing Mental Models		
3) Teaching and Learning		
4) Connecting the Classroom to the System.		

Share the chart information with a partner and brainstorm possible action steps. Record these steps at the bottom of the page.

Appendix BB

Strategy: Scenario Building
Scenario planning and writing encourages people to describe plausible futures, particularly in light of innovations perceived to affect them. Collectively these stories serve to create a shared picture of the future, provide content for looking at underlying values and assumptions, and provide an opportunity to hear different perspectives which in turn reveal similarities and differences among individual views. The are "rehearsals" for creating a desired or envisioned future.

Strategy Blueprint:
Based on the indicators for an open, networked learning environment, write a scenario that depicts your view of this system including elements of:

- governance,
- organization and climate,
- teaching and learning including curriculum, assessment, and instruction.

In a team of three or four, share your individual scenario with team members.

Write a team scenario that reflects a common, shared vision. The commonalities from individual team member scenarios should provide the basis for this team effort.

Build consensus on the team scenario.

Strategy: Value Statements

Appendix DD

Values are deeply held views, of what we find worthwhile. They are derived from many sources. They evolve from an accumulation of experiences and guide our behavior as we put them into action. The purpose of this strategy is to prompt us to look at the scenario we've written and consider whether there is alignment between what we value, how we espouse those values, and eventually how that plays out in actions.

Strategy Blueprint:
From the team scenario, identify the underlying values reflected by the scenario. Write them as statements.

Continue on to Component 2: Organizational Structure and Support

Strategy: Focus Group

Appendix EE

The objective of a focus group is to acquire a set of responses from a group of people familiar with the topic, service, experience or product being discussed. It is a qualitative rather than quantitative study. It gives you a feel for important issues but doesn't give you any numbers for judging how widespread a concern or idea might be or how strongly an opinion is held. The value lies in the richness of the data the focus group discussion generates and the leads it provides in looking for patterns of experience.

A focus group consists of 8-12 people working with a moderator to express opinions and attitudes and to discuss a specific topic that all group participants are familiar with. They are peers who share some important criteria. A typical focus group session runs from 1 to 2 hours.

Focus Group: Tips & Tricks

- Keep the group size manageable 8-10, 12 is maximum.
- Set up groups a week in advance, enough warning but not so long they'll forget.
- Don't reveal too much of the topic content or questions ahead of time.
- Conduct the focus group in a comfortable, neutral setting.
- Have coffee and goodies available if possible.
- Have a recorder present, if possible—or record the session with an audio tape player.
- Explain the purpose of the study.
- Maintain confidentiality.

As a Focus Group Moderator...

- Make sure the participants are comfortable in the physical space (appropriate light, temperature, noise level, uninterrupted time, etc.)
- Give clear instructions about the purpose of the group, how the information will be used, and how long the discussion will last.
- Give ground rules; one person speaks at a time, etc.
- Affirm that the information they provide is confidential.
- Establish rapport with the group, be relaxed and at ease.
- Start with introductions and a non-threatening warm-up question.
- Flow from point to point as smoothly as possible—no abrupt shifts in topics.
- Keep the discussion "on purpose" avoid going off track onto unrelated topics.
- Do not lead the participants or "put words in their mouths."
- Avoid talking too much—keep yourself out of the discussion as much as possible.
- Include everyone in the discussion.
- Ask follow-up questions if appropriate, probe for clarity if necessary.
- A good moderator works at being an invisible source in the room, letting the participants have the air-space.
- Bring the discussion to a close with a short summary of participants points.
- Thank the participants.

Strategy: The Rain Forest Metaphor

Appendix FF

The following briefly describes characteristics of biological systems as a model for organizations. Compare the culture of your organization to the key features of a New System listed at the bottom of the page. Respond to this question: If your school district demonstrated the key features of a New System, what impact would it have on technology integration? Record your responses at the bottom of the page.

- Biological Systems are adaptable, resilient and capable of generating perpetual novelty. (List of attributes for company of the future.)
- To achieve these qualities, however, biological systems make sacrifices—in efficiency, controllability, predictability, and immediacy. (List of attributes for company of the past.)
- We lose tightness and control and predictability. We gain flexibility and extraordinary resilience.
- Natural systems not only change, they change how they change.

What does the New System look like?

Key features:

- Viewing oneself as a continuous learner instead of the processor of answers.
- Individuals try out new ideas and processes.
- People join with others in different groups and for different purposes.
- People bounce ideas off each other, with one thing leading to another in a way that was never anticipated, they play with endless variations and possibilities.
- There is a buzz of activity, experimentation, innovation, reaction and creativity.
- This activity looks just like young children at play.
- Implicit within possibility and variety is uncertainty.

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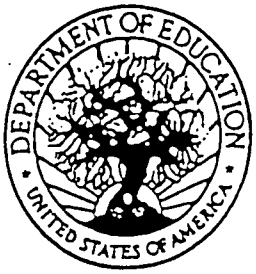

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