

Development Discussion Papers

Using the Internet as Counterpoint in Monitoring and Evaluation for Ghana Education

Conrad Wesley Snyder, Jr., John R. Kuglin,
Alex Philp, and Meriwether Beatty

Development Discussion Paper No. 761
June 2000

© Copyright 2000 Conrad Wesley Snyder, Jr.,
John R. Kuglin, Alex Philp, Meriwether Beatty,
and President and Fellows of Harvard College

Harvard Institute for
International Development

HARVARD UNIVERSITY



Using the Internet as Counterpoint in Monitoring and Evaluation for Ghana Education

Conrad Wesley Snyder, Jr., John R. Kuglin, Alex Philp, and Meriwether Beatty

Abstract

Monitoring and evaluation are reflective procedures for systemic and program reform. They prompt relevant questions, create perspectives on current practices and possibilities, offer remedial advice, invite new visions and activities, and value our efforts in terms of overall intentions. As a gauge of reform, particularly in Ghana and other LIC countries, their readings have been disappointing, and most reform, even though well-financed, has disappeared without contributing to quality schooling. With limited conceptions of schooling, much of what can be done within the traditional school is done somewhere. Success accompanies credentialed teachers and adequately cared for and nurtured children, within resource-rich learning environments. Because these are not universal conditions, and rarely found within Ghana, serious educational pathologies are noted in most monitoring and evaluation analyses with disturbing regularity. Through three notable philosophical investigators we look for essential criteria for quality education, then review what the Internet provides as exemplars and support for schooling. Armed with criteria and intervention and information search mechanisms, we are able to set up a counterpoint to current practices through Internet resources. The Internet cuts through the constraints of Ghana's systemic problems, erodes excuses of inadequacy from practical examples in other systems, and invites debate and critique within an otherwise debilitated system.

Keywords: monitoring and evaluation, quality schooling, educational reform

JEL Classification: I20

Wes Snyder is Faculty Associate of HIID, field team leader of the monitoring and evaluation project in Ghana, and Professor at the University of Montana.

John R. Kuglin is Executive Director of the Earth Observing System education project at the University of Montana.

Alex Philp is a Ph.D. candidate in interdisciplinary studies at the University of Montana and Assistant Director of the EOS education project.

Meriwether Beatty has Masters from Harvard's GSE and John Hopkins and is currently Research Associate at JSI.

Using the Internet as Counterpoint in Monitoring and Evaluation for Ghana Education

Conrad Wesley Snyder, Jr., John R. Kuglin, Alex Philp, and Meriwether Beatty

Educational reform is omnipresent, presented as omniscient, and for the most part is, in fact, impotent. It is variously defined as “to change into another and better form,” “to make better by the removal of faults or abuses,” “to correct or put an end to malpractices,” or “to induce to be better.”¹ Reform isn’t a change from nothing but a change from something that is already in place to something new that is hopefully better. When possible, reform is based on monitoring and evaluation information about the present system that is used to judge the value of the old program and then compare that to the value of its replacement or correction with a new form. That is, there is an implicit, if not explicit, comparison from which the reformer argues for the merits of the intervention.

In schooling, the attempts to create a better educational program have had mixed results. In some cases, the innovations or interventions were abuses themselves, bad ideas, or corrupted implementations that exacerbated the problems urging attention in the first place. Summarizing years of failure and ambiguity, with only occasionally recorded success, Fullan noted:²

We are not only dealing with a moving and changing target; we are also playing this out in social settings. Solutions must come through the development of *shared meaning*. The interface between individual and collective meaning and action in everyday situations is where change stands or falls.

He went on to point out that reform isn’t about particular changes. It relates directly to “changing the culture and structure of the school.” This follows Welsh’s admonition that reform is unlikely in event-based cultures, which are all too common:³

...recursive behavior is the outcome of systems entrapped in event based cultures. The event culture segments all programs. The segments are self-contained with a clear start and end point known to the actors. They also have a pseudo-rationality that defines the role and script for the actors in the drama. The pseudo-rationality is incorporated in techniques and methodologies that define and specify the activity and sub-activities and the acceptable reporting and assessment formats. The actors applying the technique and/or methodology have low belief in it, they are aware that there will be a low application or none, but they also know that it provides them with high justificatory and high political currency. The system works to ensure their corporate and individual survival.

¹ *The Winston Dictionary*, Philadelphia: The John C. Winston Company, 1957.

² Michael G. Fullan, with Suzanne Stiegelbauer, *The New Meaning of Educational Change*. (London, England: Cassell, 1991, p.5.

³ Thomas Welsh, *Event Culture Entrapment* (Cambridge, MA: Harvard Institute for International Development, 2000). Paper produced under the Performance Monitoring and Evaluation (PME) project in Ghana.

In the realm of meaning, we look to the philosophers for clarity and guidance, and the lure of educational reform has been compelling even for them. Many philosophers have actually gone so far as to try out their ideas on young children with apparent, even if temporary, positive effects. Bertrand Russell, co-author of *Principia Mathematica*, which established him in the history of the philosophy of mathematics, and *On Education*, which proffers his notions of schooling, opened his Beacon Hill School in 1927 to educate his own children because “we wanted an unusual combination: on the one hand, we disliked prudery and religious instruction and a great many restraints on freedom which are taken for granted in conventional schools; on the other hand, we could not agree with most ‘modern’ educationists on thinking scholastic instruction unimportant, or in advocating a *complete* absence of discipline.”⁴ His school limped along with serious funding issues, taking most of his salary to support. It was a success within its purposes but was never noted as a new direction for education. There are corresponding hopes for many schools today, and the essentialist and direct instruction movements live on with continuing success but little enthusiasm from more radical reformers.⁵

In education, Russell was more noted for his offer to help A.S. Neill, founder of the famous Summerhill School (one of those Russell felt where “children fail to get the necessary training, and are always going to the cinema”) when he ran afoul of the Ministry of Labour by having a Frenchman teach French. Russell offered the following advice to the Ministry:

...I quite understand the principle of confining employment as far as possible to the British without regard for efficiency. I think, however, that the Ministry is not applying the principle sufficiently widely. I know many Englishmen who have married foreigners, and many English potential wives who are out of a job. Would not a year be long enough to train an English wife to replace the existing foreign one in such cases?

Russell’s most famous student, Ludwig Wittgenstein, author of *Tractatus-Logico-Philosophicus* and the master of ‘language games,’ trained also as a teacher at the Lehrerbildungsanstalt within the Austrian *School Reform Movement*. This movement was a post-war attempt to rebuild Austria through secular, republican, and socialist instructional ideals. Wittgenstein’s motivation was more concerned with morality, not the dominant Catholic conservative version, but a religious individualism that depended on personal responsibility to foster change and a better life.⁶ Wittgenstein thought of philosophy as a grammar that can salve the ‘troubles in our thought’ by straightening out thoughts. This approach was more like instruction or therapy, which lent itself easily to an instructional approach, and this was Wittgenstein’s style in all his interactions.⁷⁸

⁴ *The Autobiography of Bertrand Russell*, London: Unwin Paperbacks, 1975, p. 387.

⁵ See Conrad W. Snyder, Jr. *Structuring the Classroom* Development Discussion Paper, No. 749 (Cambridge, MA: Harvard Institute for International Development, February, 2000).

⁶ See Ray Monk’s *Ludwig Wittgenstein: The Duty of Genius* (New York: Penguin Books, 1990). We shall return to this theme of personal responsibility as a theme for change in a corrupt and confusing environment, such as that posed by an event based culture.

⁷ Newton Garver, “Philosophy as Grammar,” in Hans Sluga and David G. Stern, editors, *The Cambridge Companion to Wittgenstein* (Cambridge, UK: Cambridge University Press, 1996).

⁸ The noted Ghanaian philosopher, Kwasi Wiredu rejected Wittgenstein’s notion of philosophy as a method. There are no agreed techniques to philosophy, and many cultures have different methods and language constraints that preclude the development of a universal philosophical method. Wiredu, like Russell and later Dewey (whom Wiredu aligned directly with), held philosophy to be more like a science with universal generalizations; whereas, Wittgenstein’s approach left philosophy as mere grammar, where “[g]rammar is not accountable to any reality. It is grammatical rules that determine meaning and so they are not answerable to any meaning and to that extent are arbitrary.” (*Philosophical Grammar*). Wiredu was an early mentor of Harvard’s Anthony Appiah.

Wittgenstein went on to teach in several primary schools in rural Austria, always offering his own brand of an open kind of instruction, clearly not shaped by the larger, formal movement even if consistent with it. Clarity of thought and personal responsibility were the key themes of Wittgenstein's 'movement.' Students were urged to pursue questions, working along with one of the greatest inquirers of modern philosophy. Wittgenstein was intolerant of sloppy language and inadequate thinking, so he was likely to apply very strict discipline in promoting clear thought. He worked very hard at teaching children to think clearly and helped many students after hours to fulfill their potential in dealing with academic questions. But, the parents resented the future investment implications of this work and none of his pupils were given additional opportunities, despite their promise and the tutelage under the "modern Socrates."⁹ Although Russell represented the classical scholastic education, where there were essential facts and skills to learn and a discipline required to learn them, Wittgenstein probed and pushed students to find their own way through the language games of academic and life problems. His intention was to teach his students to think clearly so that they would be able to undertake any new inquiry.¹⁰ Even this single innovation, by a committed teacher hoping to help impoverished children, was completely ignored in these rural schools, and landed him in trouble from time to time. This has been the fate of many progressive interventions that don't match the 'shared meaning' of what school is and its content in their local context. In LIC countries, schooling in fact exists in weak 'family resemblances' to international forms and the shared meaning ironically links to paths out of the local predicament.

Russell was also connected to one of the leading American educationists and radical progressives, whose influence seems to be gaining new following in the current pantheon of educational reform ideas. John Dewey was with Russell in China at the time when Russell nearly died (and his death and a lengthy obituary were in fact reported, prematurely, by the *Manchester Guardian*). Russell's relative emphasis on standardized basic skills versus Dewey's social cognitive development highlighted their contrasting approaches to philosophy. Dewey's educational theory was couched within the context of a political agenda, namely *democracy*, rather than the stark rationalism of Russell's educational notions. Dewey maintained that schools should "enable the child to translate his powers over into terms of their social equivalencies; to see what they mean in terms of what they are capable of accomplishing in social life." His democratic emphasis stressed participation and equality (rather than homogenization), as well as recognizing the distributed intelligence resulting from social cooperation. He noted the importance of context in schools, which suggests recognition of the situated nature of cognition, and the need for authentic activities in school instruction to maximize their contribution to the future citizen. Dewey's tradition has given rise to a sociocentric view,¹¹ which broadens the notion of who learns (and holds that knowledge results from the interactions of

⁹ Wittgenstein was likened to Socrates because he preferred to question rather than provide direct instruction. A good set of examples was the aim for clear thinking. He reworked his examples time and time again until they provided unambiguous distinctions that were important to the clarification of a point. And yet, Wittgenstein noted that Socrates' "craving for generality" was the opposite of his more flexible idea of 'family resemblances'! For example, for the question of 'what is x,' Socrates seeks to identify what examples of x have in common to establish their 'essence.' Wittgenstein points out that the examples overlap with other families as well and they only have an arbitrary commonality determined by their grammatical rules.

¹⁰ Unfortunately, Wittgenstein used a great deal of aversive encouragement, and he later returned to his school communities to apologize for his disciplinary actions while caught up in the academic experience.

¹¹ J.F. Soltis, "Education and the Concept of Knowledge," in *Philosophy and Education*, edited by J.F. Soltis (Chicago, IL: National Society for the Study of Education, 1981), pp. 95-113.

people) and recognizes that individuals participate in different and numerous discourse communities to make sense of experiences. But, it would be a mistake to categorize Dewey as a clear advocate of any current movement.¹² His positions were unique and complicated. In the area of ideational creation, he tried to bridge the false dichotomy of rationalism and realism with his own special and complicated notions of construction linked firmly to experience. He recognized the creative capacities of the individual but joined it with a real environment. There was no dualism of ideas versus reality. Truth was created in the social language game, but for Dewey, it is verified and recreated if found wanting in experience. He abandoned the use of the word ‘truth’ for the phrase ‘warranted assertability.’ In educational terms, the child and the curriculum were not different things—the child and the curriculum were connected inextricably such that the child would create ideas in terms of his/her social community but these were affected by the warranted assertions of ‘our’ research inquiry in the domain.

Resemblances and differences between three of the greatest philosophers of the 20th century illuminate the essential elements of effective educational reform. Russell emphasizes the importance of content and skills, and his position reflects that of many traditional concerns with individual development. Wittgenstein emphasizes clarity in thought and personal responsibility for the inquiry. This position is reflected in the new emphasis on *thinking* in instructional development and the increased recognition of language and its power in thinking. He also underlined the importance of connections in learning the language game to the ‘stream of life.’ That is, “children do not learn that books exist, that armchairs exist, etc., etc.—they learn to fetch books, sit in armchairs, etc., etc” (*On Certainty*, p.62e). Dewey emphasizes linking the individual to the inquiry to increase motivation and importance (as part of a personal life stream), and he recognized the social context of learning and the corresponding lack of authenticity of school instruction. Dewey’s program encourages the critique and defeat of any hegemony over ideas and the importance of representation, in his terms, through a radical democracy. In these connections we have the extension of individual development from basic knowledge to thinking, the increased importance attributed to the situation in which something is learned, and then the broadening of learning itself to the enculturation of students into new discourse communities. These themes run through many reforms of education and mark reasonable targets for the consideration of the role of technology in schooling and the use of the Internet in monitoring and evaluating the progress of schooling. Technology is a trigger for innovation and a fertile reference for attempts and possibilities.

REFORM FOCI

Education continues to be a societal challenge, both locally and globally. “Mass schooling, almost everywhere, is clearly intended to be the dominant means of the intergenerational transmission of culture.”¹³ But, we remain uncertain of its structure, processes, or content, and we have still not dealt effectively with the issues raised by philosophers and practitioners from the early 20th century. There appears to be no

¹² See Richard S. Pravat, “Misreading Dewey: Reform, Projects, and the Language Game,” *Educational Researcher*, 24, 7 (1995): 13-22. The views of this insightful paper are followed in this paper.

¹³ John W. Meyer’s *Introduction* to J.W. Meyer, D.H. Kamens, and A. Beavot’s *School Knowledge for the Masses: World Models and National Primary Curricular Categories in the Twentieth Century* (Washington, D.C.: The Falmer Press, 1992), p. 1.

universally effective instructional method, and the intended dominance of culture precludes a universal content even as local culture gives way to an international conception of schooling. We find our schools are factories of rote memorization, poor transmitters of local culture (and often counter to traditional cultures), and provide limited foundations for work and life. Thus, the importance of reform in almost every formal schooling system is firmly established in the action and rhetoric of educators. But, we waiver in our enthusiasm for new interventions and innovations, we complain about the perceived deficits in program implementation across education systems, and we note with dismay that reforms of today seem to recede to the background quickly with few residues of their touted accomplishments. There is no question that the needs of education are many, urgent and yet, continuing, and complex.

- How can we address the vast individual differences that confront a schooling system? Can we provide sufficient depth and variation in learning while addressing the social/cultural needs of learners?
- How can we deal with the increasing complexity of curricula? How do we provide the latest information, the varying points of view, and the interrelationships that exist among subjects and topics?
- How can we meet the various learning preferences and needs of teachers and learners? Is there a way to engage learners in the learning process so that they develop in the best ways they can? Is there a way to continue the education and training of teachers so that they are well endowed to create a quality-learning environment in the schools?
- How can we help parents ensure quality education for their children? With increasing difficulty and complexity of material and gaps in time from exposure, school topics are not easy for parents to take up so that they can help their children with homework, extra support, and tuition. How can we provide everyone with access and review?
- How do we help those learners who are not part of the mass schooling system? Or how do we help older, mature learners? How do we help those learners who have special needs that aren't easily accommodated in local schools? How do we address those learners not proximate to educational facilities or opportunities?
- Is there a way to provide the wealth of information of a world encyclopedia that is updated regularly, the process of generative topics that motivate wider and deeper engagement of new information and operations, and the fun of educational activities that reinforce learning and encourage further development?
- Is there a way to authenticate contexts in which learning takes place?
- How can we ensure that schools always have the best of information, resources, and activities available for their program? Textbooks, readers, and instructional materials are static and fixed, usually with a limited viewpoint and rigid structure. How can we provide our schools with flexible information so that they can meet the local and individual needs of their community and culture?
- How can we help schools, teachers, parents, and learners manage their educational activities and processes?
- How do we ensure that students are capable of participating in numerous discourse communities to enable their continual education? If these communities are different

than conventional classroom discourse, how do we prepare students for these new contexts?

This paper discusses the use of the Internet as a reference for monitoring and advancing reform, particularly in those environments where ideas are locally constrained by special interests and partisanship, dominant ideologies and beliefs, informational deficits and inadequacies, and ineffective institutional myths and cultural influences.¹⁴ The notion of a computer-based support system, which we shall call the *Electronic School Network* (ESN),¹⁵ is not totally new but, with the development of Internet, provides a mechanism to address all of these issues, as long as specific remedies are subjected to dialogue and review and supplement other forms of interaction and practice. An ESN is an empowering, richly intelligent, communication system that aids existing efforts in education, offers examples of actions and ideas from other contexts, and opens up new creative possibilities. It releases children and teachers from the limitations of geography, supports life-long learning and flexible learning times, encourages wide-ranging collaborations and friendships, increases the consilience of disciplines through the exploration of interconnections and interrelationships in knowledge domains, encourages deeper understanding through mental models, simulations, instant informational connections, and continuous assessment, provides a vast, global, up-to-date information resource, and generally, helps emulate what learners will face in the new world of work and play. ESN reflects the new era of technology-supported education. In this era, multiple contexts and contacts are available for deep learning and better use of distributed intelligence.

As a tool for monitoring and evaluation the ESN provides various levels of comparison between the current system and its circumstances and those that prevail in other contexts. The network is a counterpoint for local evaluations. Gaps between what is and what is somewhere else or could be available locally reflect educational needs that can be addressed through the Internet. Therefore, the network sets a normative reference for educational quality. The specific components and level of interaction and use remain local decisions based on local values, but the magnitude of comparative information increases dramatically and the possibilities for new ideas and pressure for change further open the system to dialogue and debate. Here, technology is used as a catalyst for change, based on the value of the information provided and the opportunities not presently available in the local system.

CONTEXT OF TECHNOLOGY

Notions and attitudes about technology have changed significantly over the latter decades of the 20th century. Early advocates were overwhelmed by the possibilities of technology, and accordingly, they promised grand educational improvements and vast structural changes to the educational enterprise, almost immediately with the use of technology in the schools. Assumptions about learning styles, customs and traditions, technical competence, novelty, complexity, and organizational flexibility were overly optimistic

¹⁴ Carol H. Weiss, "The Four I's of School Reform: How Interests, Ideology, Information, and Institution Affect Teachers and Principals," *Harvard Education Review*, 65, 4 (1995): 571-592.

¹⁵ An electronic school network is an idea developed by John R. Kuglin for the state of Montana. We build on that idea in the context of international development.

and enthusiastic, as well as naive. By the late eighties, we were looking for ways to better utilize the power of technology within the existing mass schooling program. The factory metaphor gave way to a more social and organic notion of educational change, and the question asked was “does technology provide a significant dimension to the learning experience that would be impossible or at least severely restricted in its absence.” No longer fixated on looking at technology in the absence of other educational and social resources, the answer to this question is a resounding, “yes!” We recognize the separate advantages and possibilities of computer assistance in education, particularly in light of new advances in technology, but now we focus on a better understanding of technology’s fit within the fabric of the educational adventure. Education encompasses so many aspects of society and culture that the components of education entail numerous interactions in a social community, as well as information assembly, transmission, storage, and use. Learning cannot be easily pressed into a single delivery form, and its complex social context is a crucial backcloth to societal success. Different individuals learn in different ways and at different rates, and they come to the process with different experiences, intellectual competencies, and social/cultural bases. Technology enables the expansion of educational hopes and improves the individualization of an educational program. Also, technology enables new resources to come into the classroom, and even into the home, so that learning becomes a deep, enriching activity for all. In the realm of monitoring and evaluation, technology exposes us to more variations in schooling programs and methods/materials.

The demands of the modern classroom are substantial, and we can no longer depend on the schooling process alone for continuing education. Mass education remains mired in the organizational and institutional frames of the past. We need to overcome the many disadvantages of the classroom environment.

- A teacher is faced with an incredible array of interactions per day.¹⁶ In the arrangement of learning activities, many, different transitions occur that require facile and clear communication. The teacher and learners must deal with a very intricate social context that contains extensive communication processes and engagements.
- Each classroom has large numbers of individuals for a single teacher to efficiently develop individualization programs. Materials constrain exploration of topics, and the teacher’s time is limited to assist in either individual remediation or enrichment.
- Educational topics have expanded and their complexity and variation have increased with the universalization of education and advances in knowledge. In the 20th century there has been a general shift towards social studies, expansion of mathematics and science instruction, increase in foreign languages, and the presence of instruction in the aesthetics and physical education. The curriculum directions reflect the evolution of a functional theory of socialization attached to a generalized worldwide ideology.¹⁷
- Teachers have little time for in-depth discussion among reflective colleagues. It’s hard to think of modern schools as learning organizations. Teachers remain isolated

¹⁶ Philip W. Jackson’s *Life in Classrooms* (New York: Teachers College Press, 1990) estimate that a teacher participates in about 1,000 interpersonal exchanges in a day in the classroom.

¹⁷ John W. Meyer and David H. Kamens’ *Conclusion: Accounting for a World Curriculum* in J.W. Meyer, D.H. Kamens, and A. Beavot’s *School Knowledge for the Masses: World Models and National Primary Curricular Categories in the Twentieth Century* (Washington, D.C.: The Falmer Press, 1992), p. 175.

and decoupled from their colleagues for the most part. Concerted effort must be expended to increase interactions and communication.

- Learning takes a great deal of effort and organization. Structured learning environments are very important so that the materials are clear and the intents easily recognized. Classroom management is a major determinant of the efficacy of the learning environment. A good teacher can make the academic material and activities flow so that learners remain motivated and engaged. But this is difficult to do all the time and every day. Other support is required.
- In the individualization of instructional programs, understanding assessment is a key attribute. Some teachers can operate on vague information and actuate programs that are beneficial in the broad sense, but it's very hard for a teacher to have sufficient time to carry out assessment, diagnose the results, design an individual response, and maintain an engaging flow to the classroom activities.
- In order to equip students to deal with multiple discourse communities, the experiences of traditional classrooms are inadequate. Wider exposure to other cultures, attitudes, cognitive experiences, and social interactions through the Internet provides access for practice and development.
- With multiple contacts and varying situations, individuals become aware of their strengths and the need for dependencies with others to maximize intelligence. The opportunity to practice authentic environments is increased by these multiple exposures and familiarizations.

Modern schooling has become more complicated and complex—no longer just reading, writing, and arithmetic. Some would say, not even the 3Rs are now taught well and that the intent to do so is misguided in any case. Advocates for simpler notions of education or for better accomplishments at least in the 3Rs argue for simpler curricula, but democratic processes encourage increased complexity to cater for diverse interest groups and opinions. Carl Bereiter went so far as to suggest that education give up 'education' and focus on training.

...to say that schools should abandon education but continue training children is to say that schools should narrow their teaching efforts to a simple concern with getting children to perform adequately in reading, writing, and arithmetic.¹⁸

Society needs individuals who understand the complexity of a modern world, so we're unlikely to move back to training modes or simplistic curricula. But it's generally agreed that we need to do less, more deeply. We're faced with a paradox in education. There is a great deal to learn and there are many relevant environments that we must master. If we try to 'educate' children as widely as possible, we run the risk that they will get very little out of the program and certainly very little at the level of 'understanding.' If we offer them a little, then will they learn enough for the complexities of the world (the functional argument again)? New technologies neutralize this conundrum and offer possibilities. Even if inapplicable for some resource reasons, technology, through the access of Internet, provides a rich well of ideas and examples.

Technology has come a long way since programmed learning and primitive teaching machines (e.g., Skinner's "Teaching Machines" in the *Scientific American*, 1961).¹⁹ The

¹⁸ Carl Bereiter, "Moral Alternatives to Education," *Interchange* 3 (1972):25-41.

hardware advances render old criticisms and concerns less valid, and the possibilities for interaction are vast and growing. More importantly, the notion of learning, and correspondingly, teaching, has changed. Emphasis is now on engaged learning, which entails more learner interaction with the content domain, more connections established across materials and individuals (increased complexity), more collaboration and cooperative learning, recognition of distributed learning, and more links between learners within schools and across schools. Technology in this context is a tool for learning. In a study of nine case study sites, the OERI/DOE (through a contract with SRI International) found that technology served educational reform by enhancing the learning environment in the following ways:

- Learners were involved with authentic, challenging (more complex) tasks.
- New roles evolved for learners and teachers that entail more active participation by students and more facilitation by teachers.
- Professionalization of teachers was encouraged.
- Creation of a culture that supports learning both within the classroom and beyond the school walls resulted. Motivation is higher and maintained, and learners are more likely to work cooperatively and even provide peer tutoring.

Not only is technology successful as a tool for the improvement of learning, but also it appears to be a useful catalyst for the reform of schools, so that schools strive toward higher-order skills by all students (with significant results with impoverished students). This is the proposition of this paper: impoverished schooling environments need to recognize new possibilities, compare local activities to other available programs, and monitor progress in combining and adopting technological suggestions.

Learning Problem

...there are certain subject matters, and topics within many subject matters, that are particularly troublesome, that confuse generation after generation of students, and that not uncommonly puzzle the very teachers who have the responsibility of cultivating students' understanding of them.... These topics and concepts are our "targets of difficulty..."²⁰

A key intention of education is for learners to understand the deeper meanings of the disciplines and if totally successful, understanding how to learn to so that they continue to develop throughout their life and in environments other than school. And yet schooling has usually offered syntactic, mimetic, superficial knowledge rather than rich extensible and revisable explanation networks, where current knowledge can build and extend to new situations and the explanations are revised as the understanding deepens with improved construction and continued reflection. To achieve full understanding, the learner must have access to several resources:²¹

¹⁹ The first teaching machine is reputed to have been developed in the first century AD to train Roman gladiators. Sidney Pressey invented the first teaching machine for schooling. B.F. Skinner developed what he called a 'learning machine' after a visit to his daughter's school, where he noted "...[t]he teacher's doing all the wrong things. I came back here and immediately began working on teaching machines" (see his biography by Daniel Weiner (1996)). Skinner saw most schooling as an avoidance of punishment rather than a yearning and striving for accomplishment. Experimental results for his learning machines were excellent, but the replacement of a teacher was seen as a loss of 'inspiration' in the classroom (rather ironic given Skinner's observations of the nature of that inspiration).

²⁰ David N. Perkins, Judah L. Schwartz, Mary Maxwell West, & Martha Stone Wiske, *Software Goes to School: Teaching for Understanding with New Technologies* (New York: Oxford University Press, 1995), p. xv (Introduction).

²¹ David N. Perkins refers to this as the "Access Framework" in his "Person Plus: A Distributed View of Thinking and Learning" in G. Salomon's *Distributed Cognitions* (New York: Cambridge University Press, 1993), pp. 88-110.

- Access to knowledge (content facts plus supporting knowledge in related areas, knowledge about how to solve problems, and knowledge about what kind of evidence is needed),
- Access to representations (conceptual hooks, schemas),
- Access to retrieval mechanisms (memory), and
- Access to new implications, elaborations, applications.

We are aware that learners suffer when they are deprived of physical resources, like books, instructional materials, classrooms, media, etc., but we sometimes don't think of the deficits associated with mental life. Learners need access to adequate educational experiences that will build revisable and extensible explanation networks. Schools, particularly those in impoverished environments organized around unqualified teachers, frequently just present the facts in a didactic form that encourages rote memory and simplified, prefabricated, conceptual structures.²² Externally, we 'see' understanding when a student can offer good explanations, articulate richly relational knowledge, and display a revisable and extensible web of explanations. Schooling can do this, but the successes are too rare, and technology-supported learning environments have more 'hooks' for teachers to employ to engage learners and promote positive learning opportunities.

...The prescription is that the subject must be made to show new aspects of itself; to prompt new questions; in a word, to change... The teacher who can get along by keeping spontaneous interest excited must be regarded as the teacher with the greatest skill...²³

Change is effective if it remains within the bounds of the individual's language culture. As Wittgenstein pointed out:

...if I hear a tune with understanding, doesn't something special go on in me—which does not go on if I hear it without understanding? And what?—no answer comes; or anything that occurs to me is insipid. I may indeed say: 'Now I've understood it,' and perhaps talk about it, play it, compare it with others, etc. *Signs* of understanding may accompany hearing.

It is wrong to call understanding a process that accompanies hearing. (Of course its manifestation, expressive playing, cannot be called an accompaniment of hearing either.)

For how can it be explained what 'expressive playing' is? Certainly not by anything that accompanies the playing.—What is needed for the explanation? One might say: a culture.—If someone is brought up in a particular culture—and then reacts to music in such-and-such a way, you can teach him the use of the phrase 'expressive playing.'

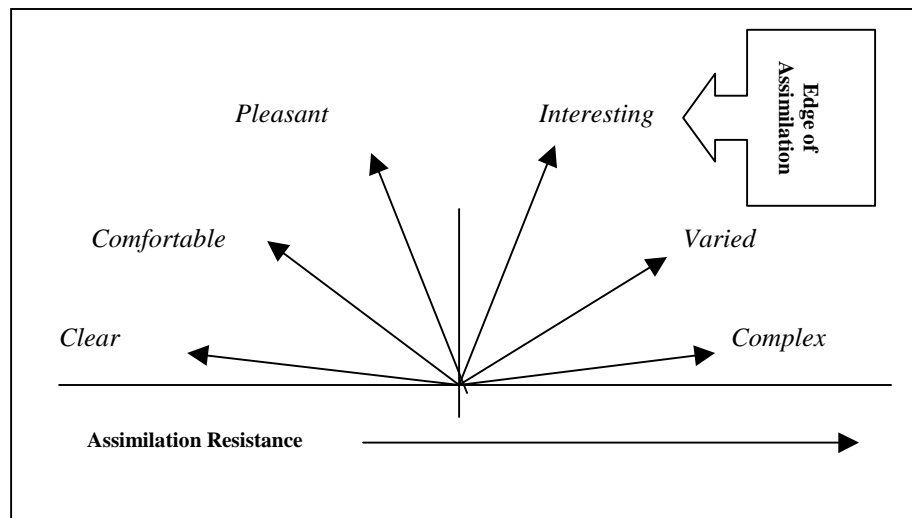
In other words, understanding exists within a culture, a stream of life. As the experience differs from the individual's life, that experience resists assimilation by the individual in its richest or fullest terms. This connects to Dewey's concern that the child and the curriculum are a single process. Only that within the child's culture can be learned. For dramatic changes, dramatic connections are necessary and this may entail a cultural change.

²² David N. Perkins, David Crismond, Rebecca Simmons, & Chris Unger, "Inside Understanding," in David N. Perkins, Judah L. Schwartz, Mary Maxwell West, & Martha Stone Wiske, *Software Goes to School: Teaching for Understanding with New Technologies* (New York: Oxford University Press, 1995), pp. 70-87 (Chapter 5).

²³ William James' *Talks to Teachers* (Cambridge, MA: Harvard University Press, 1899).

A key consideration for the development of understanding is motivation. As pointed out by William James, motivation is enhanced by changes that evoke spontaneous, intrinsic interest. For each individual we know that the availability of effective schemas is associated with their state of motivation. When the schemas are simple, little can be incorporated but if the material presented remains simple, then the learner experiences boredom. When complex, then more extension and revision is likely and feelings of mastery and self-efficacy are experienced. Changing material presents new aspects to be assimilated. If the assimilation resistance (AR) of the material is low, then the learner experiences pleasure, and if AR is high, then confusion results. The *edge of assimilation* lies at that point where there is hope of assimilation but the resistance of the material is sufficient to maintain interest. How do we judge and utilize this edge is the question for mass education. The problem can be seen symbolically as the ‘Spectrum of Affect.’²⁴

Spectrum of Affect



Each individual has a variant spectrum of affect that moves the edge of assimilation to some personal point of accommodation and assimilation potential.²⁵ A teacher faces vast individual differences in the effectiveness of instructional materials for individuals. Inevitably, any choice engages some and loses others. Technology enables the teacher to accommodate more variation in the classroom, and provide more varied experiences and opportunities to meet the individual variance. Without engagement and intrinsic motivation, little is understood and taken in, and the learners’ schemas are not enriched. The technical aspirations of education, when considered from this cognitive perspective, are to maximize the complexity of schemas and maintain instruction at the level of the edge of assimilation.

The individual differences don’t stop within a classroom. With access to media in general and the internet in particular, the world becomes accessible, with all its resources and

²⁴ Gudrun Eckblad, *Scheme Theory* (New York: Free Press, 1980).

²⁵ See the work of Conrad W. Snyder, Jr., Warren D. Walsh, & Peter R. Pamment, “Three-Mode PARAFAC Factor Analysis in Applied Research,” *Journal of Applied Psychology*, 68, 4 (1983): 572-583; Pieter M. Kroonenberg & Conrad W. Snyder, Jr., Individual Differences in Assimilation Resistance and Affective Responses in Problem Solving. *Multivariate Behavioral Research*, 24, 3 (1989): 257-284; and Conrad W. Snyder, Jr. “Multimode factor analysis.” In J.R. Nesselroade, & R.B. Cattell (Eds.), *Handbook of Multivariate Experimental Psychology* (2nd ed.) (pp. 289-316), Chapter 8. (New York, NY: Plenum, 1988).

varying perspectives. Large-scale cultural diversity overlays the intrinsic individual differences of the local context. Learning is carried out within a larger learning community where values, attitudes, and cultural styles mingle or clash to create more possibilities for understanding and communication.

It's difficult to measure the effectiveness of technology. Because technology is an ambiguous, inclusive term, impact is complicated in education systems where so much is going on, and technology advocates hope for more impact than traditional assessments afford. Add to this the fact that technology is changing itself so rapidly, particularly in the area of computer technology, the meaning of effectiveness becomes hard to pin down. At its best,

...technology applications can support higher-order thinking by engaging students in authentic, complex tasks within collaborative learning contexts.²⁶

...technology can facilitate deep exploration and integration of information, high-level thinking, and profound engagement by allowing students to design, explore, experiment, access information, and model complex phenomena.²⁷

However,

Teachers must be offered training in using computers, but their training must go beyond that to the instructional strategies needed to infuse technological skills into the learning process.²⁸

The technology learning curve tends to eclipse content learning temporarily; both kids and teachers seem to orient to technology until they become comfortable. ...[T]eachers' first technology projects generate excitement but often little content learning. Often it takes a few years until teachers can use technology effectively in core subject areas.²⁹

We can expect a steep learning curve in monitoring and evaluation applications of the Internet. It will take a while to master the technology and create mechanisms that can utilize the information.

Contextual Learning Problem

Most instruction assumes a cognitive core that is independent of context. Schooling experiences are, in this perspective, merely illustrative problematic situations that deepen the individual's knowledge and skills. The claim by situative theorists, like James Greeno,³⁰ is that context-free learning is irrelevant and that effective cognition depends on its context, physical and social, and resides in interactive systems (multiple discourse communities). This means that schooling, as traditionally conceived, is structurally inappropriate for learning, at least to maximize learning. Its rigidity and physical boundaries limit the forms of discourse actually engaged and ignore, for the most part, contacts with external sources. Reforms of traditional systems are impotent or affect trivial aspects of a generally ineffective program, and given their event-based cultural

²⁶ Means, B., Blando, J., Olson, K., Middleton, T., Morocco, C., Remz, A., & Zorfass, J. (1993). *Using technology to support education reform*. Washington, DC: U.S. Department of Education. Available online: <http://www.ed.gov/pubs/EdReformStudies/TechReforms/>

²⁷ Goldman, S., Cole, K., & Syer, C. (1999). *The technology/content dilemma* [Online]. Available: <http://www.ed.gov/Technology/TechConf/1999/whitepapers/paper4.html>

²⁸ Sulla, N. (1999, February). *Technology: To use or infuse*. The Technology Source [Online]. Available: <http://horizon.unc.edu/TS/commentary/1999-02.asp>

²⁹ Goldman, Cole, & Syer, 1999. See above.

³⁰ J.G. Greeno, and the Middle School Through Applications Project Group. "The Situativity of Knowing, Learning, and Research," *American Psychologist*, 53 (1998): 5-26.

embeddedness, the instructional context fuels the continuation of ineffective cognitions and attitudes. Technology offers new possibilities to connect with diverse practices and discourse communities to open up the experiences and provide a broader social base for learning.

The central contextual issue is the extent to which what is learned in one situation can be transferred and applied to another situation. As summarized by Paul Cobb and Janet Bowers:³¹

In the case of the cognitive perspective, a central organizing metaphor is that of knowledge as an entity that is acquired in one task setting and conveyed to other task settings. In contrast, a primary metaphor of the situated learning perspective is that of knowing as an activity that is situated with regard to an individual's position in the world of social affairs.

The individual perspective is legitimized in the situative perspective as one of a possible range of foci for analysis. The usefulness of learning for new situations depends upon the extent of participation in a relevant discourse community. An individual still learns but is part of a community and the learning is embedded in its activities. Communal practices include and are affected by the individual student, and these practices reflect the social context of individual development. What is learned evolves from participation frameworks rather than merely from internal representations and symbols. The role of technology is to broaden the discourse community and maximize interactions and their diversity. This improves the individual's social positioning with respect to any learning experience. As a monitoring device, technology situates the classroom beyond its immediate physical walls. It provides the checks and balances for ideas and concepts, as well as opens new paths for exploration and discovery.

Management Problem

How can we address the needs of the modern classroom—where we have overwhelming demands on the teacher, the students, and their parents, complicated and complex subject areas that run deep in knowledge structures, and limited availability of computer technology that is underutilized even when available. In the case of remote or underdeveloped contexts, computers and Internet linkage will soon be widely available through global communication satellites (e.g., Teledesic plans). Already, the management of classroom activities and participants is a large task, and yet,

There is little fundamental difference between the way we teach today and the way we did one hundred and fifty years ago. The use of technology is almost at the same level.... Ten years from now [about 2005], teenagers are likely to enjoy a much richer panorama of options because the pursuit of intellectual achievement will not be tilted so much in favor of the bookworm, but instead cater to a wider range of cognitive styles, learning patterns, and expressive behaviors.³²

The e-expressionists are creating new possibilities in technology, and these developments already provide extensive assistance to the teacher and administrator for the management of a class and the instructional program. Not only can we help the learner learn, but also

³¹ Paul Cobb and Janet Bowers, (1999). "Cognitive and Situated Learning Perspectives in Theory and Practice," *Educational Researcher*: 28, 29 (1999): 5.

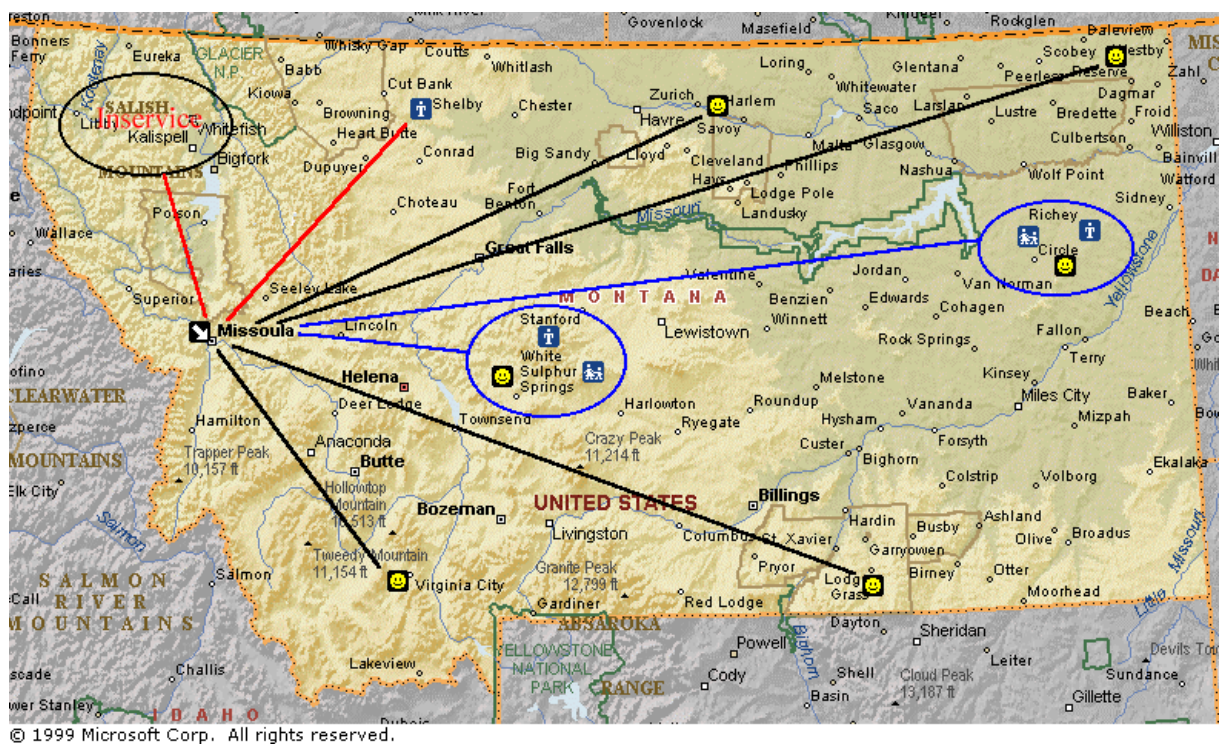
³² Nicholas Negroponte's *being digital* (New York: Alfred A. Knopf, 1995), p. 220.

we can manage the various resources better so that the flow of activities and their possibilities are more effective. In order to take advantage of this diversity and access,

...we reframe education around critical inquiry and the collaborative generation of knowledge in such a way that the experience and cultural contributions of all students are valued. In this scenario, rather than passively internalizing the cultural literacy of socially powerful groups, students actively generate their own intercultural literacy through dialogue and collaborative research with colleagues in their own classroom and in classrooms across the globe.³³

There are many management issues, both within and outside the classroom, when you open up the possibilities. In a rural setting or an impoverished environment, the links can be to a teacher for teacher assistance or training, to a student alone, to groups, either within formal classrooms or not, and to schools. Monitoring where individuals are, where they want to be, what they need and where they might find it, answering questions or finding someone who can answer a question, searching possible resources and then utilizing those resources, and monitoring and evaluating both the service and the progress of the participant, these are management intensive tasks that a computer handles effectively. We attempt such things in the ordinary, unsupported classroom as well, but the demands are excessive and the resources constrained by availability locally.

Various Communication Links Using the Internet



Kuglin offers a pictorial representation of an extensive rural network in Montana. It illustrates the various kinds of contacts and interactions, from individual students to groups of teachers to links between schools. Technology changes the boundaries of

³³ Jim Cummins and Dennis Sayers, *Brave New Schools* (New York: St. Martin's Press, 1997), p. 13.

schools, and magnifies the possibilities for communication and instruction. All of this can be centralized or localized as capacity allows.

Resistance to dramatic structural changes in education has been substantial. Even when efficient communication strategies, like radio, have been very effective, they have been rejected or marginalized in favor of less effective, and possibly damaging, traditional forms. In fact, the attraction of traditional forms is so considerable and resistance to new forms so complete, reform is probably unlikely unless it takes place within the traditional form, changing it, at first, within its own boundaries. This limits our possibilities, but reflects what might work as credibility of a system increases.

The promise of technology is to provide individuals in less advantageous contexts to richer, more interesting, and more challenging experiences. When technology is used to generate normative standards that test current schooling experiences with those possible under other regimes, it becomes a monitoring tool, where we argue by analogy (an argumentative type rarely used but perhaps the more powerful possibility). It's less used because a new vision is not anticipated from ordinary monitoring and evaluation activities. Here, we are setting up international norms from which local activities and programs can be judged and that judgment necessarily compares known possibilities and local actualities.

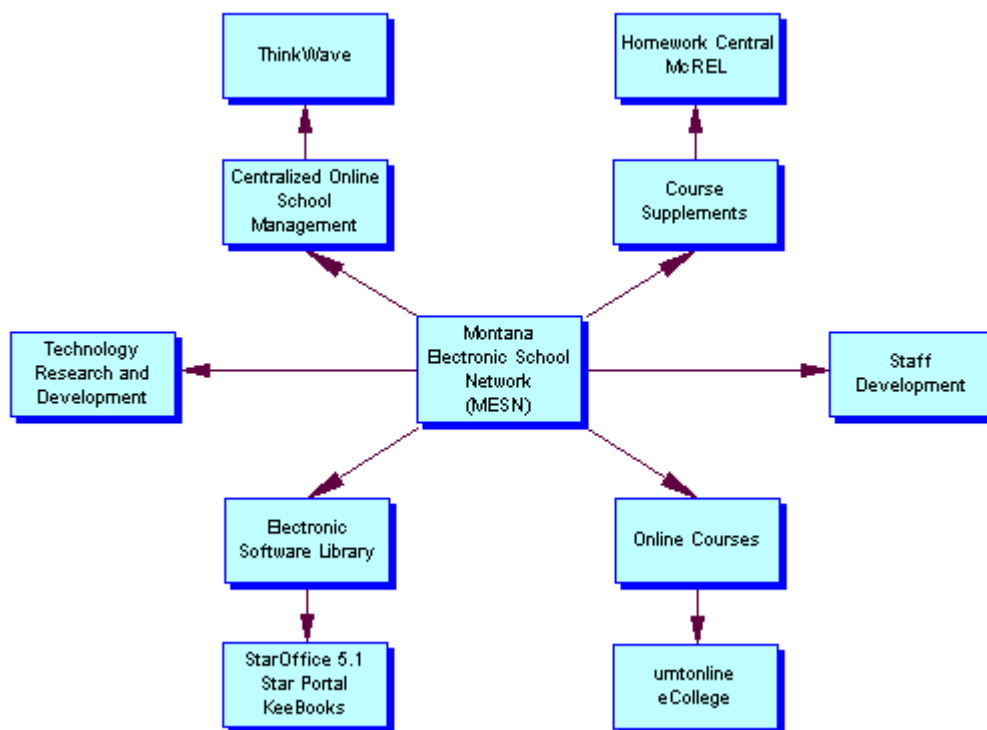
The unit of focus in this monitoring changes with intent and capacity. That is, a system with considerable computer capability can go down to the student level and provide services to enable parents to talk to teachers, and then compare this interaction to those at other schools in other parts of the world. Additionally, through simulations developed in other contexts and sharing experiences from the local one, a broad range of situations can be presented to a classroom in any disciplinary or interdisciplinary area(s). If capability is limited, then more general searches can provide quality instructional materials, experience and examples of work on standards and regulations, and research papers on educational reform for review and consideration. The monitoring power of the Internet depends on availability and capability.

ELECTRONIC SCHOOL NETWORK

Our hypothetical ESN is comprised of six major components: supplementary educational and subject resource materials, full subject courses and meta-courses that can be used in the classroom or at home, continuing staff development opportunities and training programs, library of electronic software that eases tasks and assists in communication, resource tools and information for research and development in education, and a centralized online school management package that enables meta-communication on activities and academic processes. Each of these provides both information for the creation of ideas and initiatives and a normative standard, illustrative of other practicing educational programs, by which to judge local conditions.

For example, in the Kuglin MESN, the network components are centralized around an "expert center," located physically at the University of Montana. Small school systems, remote systems, single schools, teachers, and administrators are neither interested nor likely to monitor the Internet changes and new websites that dramatically alter the possibilities in rapid order. The MESN center reviews and searches the Internet as a

service to the user community. This builds the addresses available for use in the monitoring and development aspects of reform and connects even small entities to a productive site.



The Internet is both a source of creative instructional components and a reference resource for the best instructional materials and strategies available. This means that it serves a monitoring and evaluation function in a dynamic way. The reference items can be viewed in their detail, and in many cases, experienced directly by the inquirer. ‘Ideal’ versions are available for comparison with current practices. They can also be tried out in small sample experiments to look at contextual relevance and ease of use. There is little doubt that the computer will play an active role in modern educational practices, but the Internet is already invaluable as a rich source of what’s possible and what’s available around the world.

For any particular location, an education technology survey is an important first step. Many developments occur without wide recognition and knowledge of their availability could be useful. An example of a survey carried out for USAID/Namibia is available from Stephen Tournas (stournas@usaid.gov).³⁴ This report has many international references for technology use across many countries and websites for Namibia. Based on reports like this, USAID has funded several pilot technology projects. Other useful resources can be found at the following sites for distance education around the world.

- World Bank Distance EducationNet: <http://wbweb4.worldbank.org/DistEd/home.html>,
- Ed-X (Austin, Texas): <http://www.ed-x.com/>,
- International Centre for Distance Learning: <http://www-icdl.open.ac.uk/icdl/>,
- ICDL Africa Database: <http://www-icdl.open.ac.uk/icdl/export/africa/index.htm>,
- European Regional Educational Network: <http://www2.ncsu.edu/ncsu/aern/INDEX.HTML>,

³⁴ Stephen Tournas, *Education Technology Survey for USAID/Namibia* (Washington, D.C.: USAID/G/HCD/BELS, 1998).

Distance Education in Developing Countries: http://members.tripod.com/stewart_marshall/,
Search Engine for Professional Development and Distance Education: <http://eduport.com/>,
Open and Distance Learning Association of Australia: <http://www.usq.edu.au/dec/decjourn/odlaa.htm>,
The Commonwealth of Learning: <http://www.usq.edu.au/dec/decjourn/odlaa.htm>,
Miami University (Ohio) Resource Base (last updated 1997):
http://www.dars.muohio.edu/bob/D_E_sites.html,
Vanderbilt Library (last updated 1997): <http://library.vanderbilt.edu/class/techde.htm>,
Capital Community College (Darling): <http://webster.comnet.edu/HP/pages/darling/distance.htm>,
International Council for Open and Distance Education: <http://www.icde.org/>.

The following list comprises distance education programs at universities around the world. See the World Bank listings for updates and changes

The University of South Africa: <http://www.unisa.ac.za>,
Indira Gandhi National Open University (India): <http://www.indialog.com/ignou/>,
Universitas Terbuka (Indonesia): <http://www.ut.ac.id>,
Open University of Israel: <http://www.openu.ac.il>
Open University of Hong Kong: <http://www.ouhk.edu.hk>,
University of Phoenix (USA): <http://www.uophx.edu>,
Monash University (Australia): <http://www.monash.edu.au>,
The Open Learning Agency (Canada): <http://www.ola.bc.ca/stuserv/dso.html>,
Athabasca University (Canada): <http://www.athabascau.ca>,
Penn State World Campus: <http://www.worldcampus.psu.edu>,
The University of the Philippines Open University: <http://www.uplb.edu.ph/upou/>,
Sukhothai Thammathirat Open University (Thailand): <http://www.stou.ac.th>,
The Open University (United Kingdom): <http://www.open.ac.uk>,
The University of Southern Queensland (Australia): <http://www.usq.edu.au>,
The University of Montana Continuing Education: <http://umtonline.edu>.

Note that the ICDL website has more extensive listings of distance education courses by geographic region (<http://www-icdl.open.ac.uk/icdl/geograph/index.htm>). Educational programs, courses, research, and issues papers are developing faster than can be updated. Facility with the computer and search engines enables access to these resources for monitoring and evaluation of national assets and programs.

Illustrative Contents of ESN³⁵

- Course Supplements and Resources

Targets of difficulty serve as a starting point so that teachers have the technology they need immediately to address learning problems. At home, a network can provide additional information so that the teacher communicates more effectively and continuously with parents. By examining resources for difficulties presently experienced, we can extrapolate the possible reasons for instructional inadequacies, based on new ‘solutions,’ and we can offer immediate help (or at least offer a resource that addresses the difficulties but may need some adaptation).

One complete program is the Florida High School, a virtual school constituted by a regional consortia that includes:

- Heartland Educational Consortium (HEC), representing 5 school districts,

³⁵ Website addresses change from time to time so if the resource addresses do not lead to a useful site, then search similar addresses or use a search engine with specific information about the site wanted. These addresses are provided to get the search started. Nearly all sites mentioned are American. International sites exist and should be catalogued as well; however, these sites reflect the general trend and available resources. Website information does not constitute endorsement of any kind.

- North East Florida Educational Consortium (NEFEC) representing 12 school districts,
- Panhandle Area Educational Consortium (PAEC) comprised of 12 school districts.

The Florida High School offers online courses to all students eligible for high school credit in affiliated school districts in Florida. Any student, with access to a computer and the Internet, can enroll. The goal is to make instruction available at any time and in any place convenient to the student. Most of the current students have been those who will benefit from enrichment of some sort and who reside in rural school districts where resources are limited. This entire program is a supplement to the regular high school experience. Information can be found at: www.fhs.net. Other high school, supplementary materials, and home schooling sites are also available:

Concord High School, Indiana: www.concordhs.com,
Hewitt Homeschooling Services: www.homeschooling.corg,
California Virtual High School: <http://www.vhs.ucsc.edu/vhs/uchs.htm>,
G.W. Fowler High School, New York: <http://freeside.scsd.k12.ny.us/~hcaloi/fowler.html>,
Webware SAT Skill Lessons: <http://www.testprep.com/satmenu.html>,
ThinkQuest Student-Developed Materials: <http://library.thinkquest.org>,
ICONS Simulations: <http://www.icons.umd.edu/current/index.html>,
Dennison Academy: <http://www.dennisononline.com/>,
World Lecture Hall: <http://www.utexas.edu/world/lecture/>,
ICONnect Online Courses: <http://www.ala.org/ICONN/onlineco.html>,
GED and Basic Education Courses: http://www.oltraining.com/be_ged/be.html,
SCET Products: <http://www.scet.org.uk/products/intro.asp>,
Guide to the Internet for Teachers: <http://ietn.snunit.k12.il/help1.htm>.

In addition to core discipline supplementary information, there may be remedial or enrichment packages that offer complete topics. McREL's *Whelmers* illustrate this approach, and they are maintained on the McREL website, www.mcrel.org/whelmers. *Whelmers* is a package of 41 science activities that introduce learners to basic and complex scientific principles. They are correlated with NRC's National Science Education Standards for K-12 levels so that the appropriate complexity and difficulty can be selected. These can be part of any formal curriculum or used at home for enrichment and even 'play.' There's the joke, where one student says to another, "I hate this new technology. I can't tell the difference between school time and play time!" The supplementary materials enable students, parents, and teachers to enrich their learning environments so that deeper understanding is possible. These materials would cost a single user a considerable amount in development resources. Because they are available on the Internet, the costs are low or non-existent and immediate 'fixes' are at hand.

Federal Resources for Educational Excellence locates hundreds of Internet-based education resources supported by agencies across the US government: www.ed.gov/free. Cooperative projects support regular lessons or enrichment and give students the opportunity to study a topic with others across the world at the same time. The following are the major sites for finding and proposing all sorts of online educational projects:

Adventure Online: www.adventureonline.com,
Electronic Emissary Project: www.tapr.org/emissary,

The Electronic Schoolhouse: www.electronic-schoolhouse.org,
Global SchoolNet Foundation: www.gsn.org,
IECC Projects: www.stolaf.edu/network/iecc,
International Education and Resource Network: www.iearn.org/iearn,
Internet Projects Registry: www.gsn.org/pr/index.html,
Kidlink: www.kidlink.org/KIDPROJ,
NSAS Spacelink: www.spacelink.msfc.nasa.gov,
Online Class: www.usinternet.com/onlineclass,
NASA SeaWiFS Projects: seawifs.gsfc.nasa.gov,
NASA K-12 Internet Page: quest.arc.nasa.gov,
David Levin's Learning@web.sites: www.ecnet.net/users/gdlevin/home.html

The Internet enables teachers and students to visit libraries, museums, and exhibits throughout the world, and to carry out research electronically about what's found in those sources.

Exploration ExploraNet: www.exploratorium.edu,
WWW Exhibit Organization: sunsite.unc.edu/expo,
Franklin Institute Science Museum: www.fi.edu,
Hands-on Children's Museum: www.win.com,
Hands-on Science Centers: www.cs.cmu.edu,
Internet Public Library: ipl.sils.umich.edu,
Library of Congress: lcweb.loc.gov,
Museums, Galleries, and Exhibits: 155.187.10.12:80/net/exhibits.html,
National Air and Space Museum: www.nasm.edu,
National Holocaust Memorial Museum: www.ushmm.org,
The Smithsonian: www.si.edu,
WebMuseum Network: sunsite.unc.edu/louvre.

Valuable channels for investigating topics in depth are online links to communications media, including publishers, magazines, newspapers, and television programs.

Cable in the Classroom: www.ciconline.com,
Books A to Z: www.booksatoz.com,
CNN Interactive: www.cnn.com,
Discovery Channel: www.discovery.com,
Hotlinks Online Newspapers: www.naa.org/hotlinks,
The Nando Times: www2.nando.net,
National Geographic Society: www.nationalgeographic.com,
PBS Online: www.pbs.org,
Publishers' Catalogs Home Page: www.lights.com/publisher.

The following sites were developed specifically for children, and offer a variety of educational resources, as well as recreational materials including interactive stories, games, and puzzles.

Berit's Best Sites for Children: http://db.cochran.com/li_toc:theoPage.db,
Bonus.com,
Book Nook: I-site.on.ca/booknook.html,
Cool Places for Kids: www.teelfamily.com/links,
Global Show-n-Tell: www.telenaut.com/gst,
Headbone Zone: www.headbone.com,
Humongous Entertainment: www.humongous.com,
KidNews: www.vsa.cape.com,
KidPub: www.kidpub.org/kidpub,
Kids on Campus: www.tc.cornell.edu/Kids.on.Campus/WWWDemo,

The Kids on the Web: www.zen.org,
Kid's Web: www.lws.com/kidsweb/links.htm,
MidLink Magazine: longwood.cs.ucf.edu:80.

In monitoring, supplemental materials provide suggestive fillers for identified gaps or local targets of difficulty. The materials don't need to be taken as given, but they serve as a source for ideas and application examples. Because the Internet provides both the possibilities and the actualities, it makes monitoring and evaluation a dynamic activity. In the supportive area of supplements, systems can move quickly to fill gaps and provide enrichments to current practices and materials.

- Online Courses

For many target clients, there's a need for a full course, presented via the Internet. Through a Memorandum of Understanding with the Mid-continent Regional Education Laboratory (McREL) in Aurora, Colorado, the Montana ESN has available a suite of courses developed under various curriculum projects organized through this regional laboratory. Each of these instructional courses is linked to the appropriate set of national standards in the subject area. These courses are available to teachers anywhere and constitute an invaluable source of material, either for direct use or for modification and adaptation. These are available at www.mcrel.org/connect. Other regional labs also offer vast amounts of materials and they can be accessed through McREL's website.

Other courses are available through various other agencies and groups. The US Library of Congress provides a limited, but beginning, Internet guide to courses and materials around the world: <http://lcweb.loc.gov/global/internet/training.html>. Some websites for different subjects are provided below:

General Curriculum

Curricular Resources and Networking Projects: www.ed.gov/EdRes/EdCurric.html,
Education World: www.education-world.com,
EdWeb: edweb.cnidr.org,
Micrograms for Elementary Schools: <http://www.micrograms.com/>,
Live Text: www.lit.columbia.edu/k12/livetext,
The Schoolhouse: www.nwrel.org/library/faster.html,
Websites and resources for Teachers: www.csun.edu,
World Education Exchange: www.hamline.edu.

The Arts

ArtsEdge: artsedge.kennedy-center.org/artsedge.html,
ArtsEdNet: www.artsednet.getty.edu,
Sapphire Swan Dance Directory: www.SapphireSwan.com/dance,
Music Education Online: www.geocities.com/Athens/2405/index.html,
The Music Educators Home Page: www.athenet.net,
The Puppetry Home Page: www.sagecraft.com/puppetry.

Language Arts and Literature

Online Books Page: www.cs.cmu.edu/Web/books.html,
Children's Literature Web Guide: www.ucalgary.ca,
CMU Poetry Index: English-www.hss.cmu.edu/petry,
English Teachers' Website: www.mickew.edu.au/english,

Complete works of William Shakespeare: the-tech.mit.edu/Shakespeare/works.html,
Multicultural Book Review: www.isomedia.com/homes/jmele/homepage.html.

Mathematics

Ask Dr. Math: forum.Swarthmore.edu/dr.math/dr-math.html,
Calculators Online Center: www.sci.lib.uci.edu/HSG/RefCalculators.html,
Cornell Math and Science Gateway for high school: www.tc.cornell.edu/Edu/MathSciGateway,
Geometry Center: www.geom.umn.edu,
Math Forum: forum.Swarthmore.edu,
MegaMath: www.c3.lanl.gov/mega-math.

Science

Eisenhower National Clearinghouse: www.enc.org,
Environmental Education Network: envirolink.org/enviroed,
Health Resources: www.kent.wednet.edu/curriculum/health/health.html,
SciEd: www.hpcc.astro.washington.edu/scied/science.html,
Science Learning Network: www.sln.org,
USGS: <http://minerals.cr.usgs.gov/gips/aii-home.htm>
NASA resources: www.nasa.gov.

Social Studies

American History Archive Project: www.ilt.columbia.edu/k12/history/aha.html,
History: www.virginia.edu,
Bosnian Virtual Field Trip: <http://geog.gmu.edu/projects/bosnia/default.html>
History/Social Studies for K-12: execpc.com,
Lesson Plans: www.csun.edu,
Online Resources: socialstudies.com/online.html,
Social Studies: www.kent.wednet.edu/curriculum/soc_studies/soc_studies.html,
Native American Art: <http://indy4.fdl.cc.mn.us/~isk/>
Social Studies Sources: education.Indiana.edu.

Individual schools and school districts sometimes make their materials available. Here are some particularly good lesson plan and curriculum collections from educators and commercial sources:

The AskERIC Virtual Library: ericir.syr.edu,
Columbia Education Center's Mini Lessons: www.col-ed.org/cur,
Connections+: www.mcrel.org/connect/plus,
EE-Link, Environmental Education on the Internet: nceet.snre.umich.edu
Armadillo's K-12 Resources: chico.rice.edu/armadillo/Rice/K12resources.html,
Carrie's Sites for Educators: www.mtjeff.com,
Integrating the Internet: www.indirect.com/www.dhixson,
Kathy Schrock's Guide for Educators: www.capecod.net.schrockguide,
Lane's Homepage: www.ebicom.net,
Pinchbeck's Homework Helper: tristate.pgh.net,
Vose School Education Resources page: www.teleport.com,
Website for Busy Teachers: www.ceismc.gatech.edu/BusyT
Apple's K-12 Weblinks: ed.info.apple.com/education/techlearn/weblinks.html,
Cisco's Virtual Schoolhouse: sunsite.unc.edu/cisco/schoolhouse,
Classroom Connect: www.classroom.net,
Educational Software Institute: www.edsoft.com,
Discovery Channel School: school.discovery.com,
Global Schoolhouse: www.gsh.org,
Houghton Mifflin Education Place: www.eduplace.com,
IBM K-12 Education: www.solutions.ibm.com/k12,

NetSchool: www.netschool.com,
 McGraw-Hill School Division Resource Village: www.mmhschool.com,
 Ptsco Technology Education: www.pitsco.com/wel.html,
 School Net: www.school.net,
Technology and Learning: www.techlearning.com.

In monitoring, these courses represent models to compare with current courses and materials to ascertain the quality of the local system. Because the materials are freely available in many cases, they become a valuable resource bank for local curriculum development.

- Professional Development

The University of Montana’s Earth Observing System (EOS) Education Project³⁶ has designed and constructed a major online education portal for K-16 teacher development. Umtonline (www.umtonline.com) offers a variety of software and professional development courses to the global education community. A technology certificate program and a GIS (geographic information system) cohort model were designed to provide on-line, anytime, anywhere instruction to teachers interested in improving their software skill set. The goal of this GIS instruction is to provide teachers with an effective software tool for incorporating and understanding remote sensing imagery within a spatial context. The flagship of this program is an “Introduction to ArcView 3.2” course designed in consultation with the Environmental Systems Research Institute (ESRI) (www.esri.com). This course provides entry-level instructional materials in GIS with a primary on-line instructor/course designer and teaching assistants. These courses are administered through the Center for Continuing Education at the University of Montana and the presentation platform is managed through eCollege™. The Center for Continuing Education also offers many degree programs and other professional development courses through www.umtonline.com.

Many other universities offer professional development online programs. In fact, this area is growing rapidly to over 25,000 courses and three-quarters of a million students. A Master’s degree costs about US\$9,000-\$10,500 for a two year program at a state-supported university.³⁷ See www.lifelonglearning.com and www.degree/net/distance-learning/home.html for more information on distance education. A general area to look at many possibilities is assembled by the University of North Carolina: www.unc.edu/cit/guides/irg-38.htm and another one is available at www-cmil.unex.berkeley.edu. Some consortia exist such as the Indiana College Network at www.icn.org and California State University, George Mason University, George Washington University, and Park College at <http://uol.com/>. Brigham Young University offers high school coursework as well at <http://coned.byu.edu/ls/webcourses.thm>. Some other universities are:

University of Colorado: www.colorado.edu/cewww/,
 Sonoma State University: www.sonoma.edu/ForLang/Chinese/,

³⁶ The Executive Director of EOS Education Project is John R. Kuglin. See his website at www.kuglin.com and the EOS website at www.eoscenter.com. The websites mentioned in this paper are drawn from his searches through the Internet. His website updates these site suggestions. Website URLs change periodically and it’s essential to keep track of those found to be valuable.

³⁷ This report appears in *Better Homes and Gardens* suggesting the wide interest in the Internet educational opportunities. Bob Eblert, “College @Home,” *Better Homes and Gardens*, October (1999): 162 and 164.

North Dakota University: www.ndsu.nodac.edu/conted/,
Magellan University: <http://magellan.edu/>,
Jones International University: <http://www.jonesinternational.edu/>,
Pacific Western University: <http://www.pwu-hi.edu/home.asp?ID=3>,
Open University, UK: <http://www3.open.ac.uk/courses/essential/index.htm>,
World Class Teacher Training: <http://wctt.4j.lane.edu/>,
Southern Mississippi Online Courses: <http://dl.cice.usm.edu/>,
Virginia Tech Online Courses: <http://www.vto.vt.edu/classes.html>,
University of California: <http://learn.berkeley.edu/>,
Penn State University: <http://www.ed.psu.edu/acsde/default.html>
University of Phoenix: www.uophx.edu.

A valuable way to see how teachers are using online resources for assignments, projects, teaching units, and even courses, is to visit school websites. The following indexes will link directly to schools.

American School Directory: www.asd.com
HotList of K-12 Internet School Sites: www.gsn.org/hotlist/index.html,
School.Net Navigator: school.net/go/navigator,
Web66-Schools on the Web: web66.coled.unm.edu.

- Software Access

Some teachers or schools or systems will want to develop or purchase their own materials and resources. The following websites provide useful tools to focus that effort.

Kinjo Storage and Document Sharing: www.staroffice.com,
Software School Tips: <http://www.swschool.com/>,
Wildridge Software: <http://www.wildridge.com/>,
Benchmark Educational Software: <http://www.benchsoft.com/company/index.html>,
Wwwrrr Internet with Virtual School Ventures: <http://www.wwwrrr.net/>,
Psychsoft source for technology for schools: <http://www.psych-soft.com/>,
Sleek Testing Resources: <http://www.sleek.com/>,
Arabic Instructional Materials: <http://aramedia.com/homeinter.htm>,
Compuwest Software Publishers: <http://www.compuwestinc.com/>,
Ziff Davis UK School Resources: <http://www.zdnet.co.uk/software/home>,
Keeboo Communication Software: www.keebooks.com.

- Management

Not only are there interesting and valuable resources on the Internet for the participants in education, but there are also tools for better management. The following websites provide services in attendance, grade reporting, discipline, records, scheduling, payments, etc., and these are just a sampling of the possibilities.

Thinkwave Educator: www.thinkwave.com,
Modular Management System for Schools: <http://www.cri-mms.com/>,
Block Scheduling for Administrators: <http://198.214.252.200/adminurl.html>,
Education Management Systems: <http://www.ems.-isis.com/>
Oaktree Systems: <http://www.oaktree-systems.com/>,
K12 Planet: <http://www.chancery.com/products/learninglife.html>
Chancery Administrative Software: <http://www.chancery.com/>,
Classroom Timetabling Software: <http://www.saiposa.ch/>,
Alpha Administration Software (Australia): <http://www.alphabus.com.au/>,
Jcoms Textbook Management Software: <http://www.jcoms.com/index.html>,
EduTrak Payment, Scheduling, and Registration Software: <http://www.edutrak.com/>,

Idaho Computer Management Applications Software: <http://www.idahocomputer.net/>.

Additionally, the emergence of PowerSchool claims provision of a back-end application and a front-end portal for K-12 education. For students, it provides real-time access to performance records and resources related to improved performance. For parents and guardians, it provides access to the same performance records, resources, and email contact with individual teachers. For teachers, it provides a mechanism to report grades and attendance directly and confidentially to parents. For administrators, it produces reports with greater ease and accuracy. PowerSchool has strategic relationships with many computer companies, SchoolTone Alliance, EDTECH, iPlanet, AskJeeves, and LinkShare. The website is:

PowerSchool: www.powerschool.com.

- Research and Development

Information is the heart of a monitoring and evaluation system. Most EMIS systems focus on internal system monitoring. There's also a need to review what's going on in other systems so that there's always comparative information available. The following sites are rich in information about current issues, long-term research efforts, review papers, and thought pieces.

Association for Supervision and Curriculum Development: www.ascd.org,
Phi Delta Kappa: www.pdk.org,
Northwest Regional Education Laboratory: www.mwrel.org
American Association of School Administrators: www.aasa.org,
Association for Childhood Education International: www.udel.edu/bateman/acei,
American Educational Research Association: www.aera.net,
American Federation of Teachers: www.aft.org,
American Library Association: www.ala.org,
Council for Exceptional Children: www.cec.sped.org,
Computer-Using Educators: www.cue.org,
Consortium for School Networking: www.cosn.org,
International Reading Association: www.ira.org,
International Society for Technology in Education: www.iste.org,
Music Educator's National Conference: www.menc.org,
National Association of Elementary School Principals: www.naesp.org,
National Art Education Association: www.naea.org,
National Association for Gifted Children: www.nagc.org,
National Association for Sport and Physical Education: www.aahperd.org/naspe/naspe.html,
National Association of Secondary School Principals: www.nassp.org,
National Council for the Social Studies: www.nbea.org,
National Council of Teachers of English: www.ncte.org,
National Council of Teachers of Mathematics: www.nctm.org,
National Education Association: www.nea.org,
National Middle School Association: www.nmsa.org,
National School Boards Association: www.nsba.org,
National Science Teachers Association: www.nsta.org,
National Parent Teacher Association: www.pta.org,
United States Agency for International Development: www.usaid.gov,
World Bank: www.worldbank.org,
United Nations: www.unesco.org,
Harvard Institute for International Development: www.hiid.harvard.edu.

Target Groups for Technology and M&E Information about Technology

Regular (traditional) residence classrooms can benefit significantly from the introduction of technology if it supports, rather than disrupts, the regular academic program. We know that technology is most effective when used as a supplementary resource. The structural problems of education will not be solved by technology. As new reforms are initiated, however, technology can serve to point to new directions and offer ways of overcoming traditional obstacles due to impoverished academic environments. Soon, wider satellite coverage, efficient satellite dishes, and low cost computers will bring the Internet to nearly every point that wants access.

With wide access, the inequities of education will be apparent but remedies will be in sight for some of the problems caused by isolation and resource limitations. In addition to the formal classroom environments, the following groups of learners benefit from the ESN.

- Advanced Placement Contexts
- Remediation for students over a Long-Term Absence
- Confined Students
- Disabled Students
- Home Study Students
- Temporary Absence Remediation for Makeup Sessions
- Elaboration and Parent Review After School
- Thoughtful Practice of Current Topics in a Subject by Enrolled Students
- Review Activities Outside of Class Sessions
- Teacher Review of Topics
- Teacher Use as Supplementary or Component Pieces of Lessons
- Teacher Training
- Teacher/School Communication
- Community Participation

The potential of the ESN is to supplement, improve, or substitute for formal learning environments. It removes all the boundaries to learning: geographic, cultural, resource limits, inadequate facilities, teaching capacities, and local regulatory restrictions that do not cater for special cases. In a formal system, ESN is implemented at the local school district level to work out the bugs and develop the needed professional development programs to enable the teachers and other professional personnel maximally utilize this rich resource. As districts accumulate, the ESN takes in the wider state or regional areas and then national representation. There are always localization issues that require special development work. Although the Internet is easily accessible, there are special needs for training and supervised experience.

In international connections, where deficits in schooling are particularly obvious in developing countries, ESN has enormous potential. Local school entities and school personnel are not ready for reform. They are captured in the event cultures of their localities and their impoverished education systems, existing rather than searching and evolving. If access to the Internet is wide enough, it will generate its own enthusiasm for change but it has to be maximally utilized. So much is available for free and is easy to

download for local use. The Internet encourages the monitoring and evaluation of the local educational program, and then rebuilding it with materials and ideas available from the net.

Because these target groups are vulnerable and ill-served segments of the educational process, they are prime targets as well for monitoring and evaluation information. In some cases, they have no focal point for their constituency. Grouping them with services for the formal system helps to build a more inclusive educational program. And their needs supplement those from the mainstream schooling so that a more comprehensive picture of education emerges and the monitoring and evaluation system extends the vision of education across all society. Only with this view can we impact on the access and quality issues.

DIRECTION FOR MONITORING AND EVALUATION

In the education domain, the Internet illuminates possibilities and examples in educational practice and theory. By comparison with current educational practices, the gaps or differences between what is and what could be highlight needs. Several monitoring criteria arise from our earlier discussion of the philosophical connections that mark the general needs of a quality system:

- Individual students must possess extensive *basic knowledge and facts* across the major disciplines as part of their individual identity. From the teacher's viewpoint:³⁸

As a teacher he is not concerned with adding new facts to the science he teaches; in propounding new hypotheses or in verifying them. He is concerned with the subject-matter of the science as *representing a given stage and phase of the development of experience*. His problem is that of inducing a vital and personal experiencing. Hence, what concerns him, as teacher, is the ways in which that subject may become part of experience; what there is in the child's present that is usable with reference to it; how such elements are to be used; how his own knowledge of the subject-matter may assist in interpreting the child's needs and doings, and determine the medium in which the child should be placed in order that his growth may be properly directed. He is concerned, not with the subject-matter as such, but with the subject matter as a related factor in a total and growing experience.

- Individual students excel at *thinking and application* in these disciplinary areas.
- Each student and class has easy access and challenging experiences in *multiple discourse communities to ensure generalizability and transfer* to new situations. Communal practice is available for the entire class (or other social groups) in wide-ranging situations to ensure broad experiences that are authentic and useful in the life of the student (and society at large).
- Class recognition and practice in the *use of distributed intelligence* so that individuals will understand its power, be aware of individual differences and special skills, and alert students to their own strengths that can be better used in their societies.

³⁸ John Dewey, *The School and Society and The Child and the Curriculum* (expanded edition, Chicago, IL: The University of Chicago Press, 1902/1990), p. 201.

David Perkins has outlined a similar set of themes in his *Smart Schools*.³⁹ To build effective learning environments that maximize the ‘cognitive economy,’ Perkins suggests the following set of specific strategies that would fulfill the above criteria.

Basic Knowledge and Facts

- *Theory One*—Perkins hypothesizes the minimal set of conditions for learning as clear information, thoughtful practice, informative feedback, and strong intrinsic and extrinsic motivation. Most LIC classrooms fail to meet these minimal requirements, and this problem pertains even when interventions are available to lift the system to higher accomplishments.⁴⁰ Reforms frequently emphasize innovation rather than basic foundations.
- *Intrinsic Motivation*—Of the above, intrinsic motivation drives the student to new possibilities. This is facilitated by providing more choices to the students, a sort of “direction by indirection” (as advocated by the Dewey Laboratory School).⁴¹ As illustrated earlier, it’s hard to imagine the effect of standardization being conducive to the emergence of intrinsic interests.
- *Socratic Teaching*—The interactive style of this approach encourages deeper engagement and more individual responsibility for learning. Recall that Socrates was not learner-centered; he was more thinking centered, in the style of Wittgenstein. The intent was to clarify the idea through thinking so that the idea gained strength in explanatory power. Learning to ask questions and construct thought experiments increase the utility of thought and engage the student more completely. As Dewey highlights:⁴²

The only significant method is the method of the mind as it reaches out and assimilates. Subject matter is but spiritual food, possible nutritive material... This fundamental opposition of the child and curriculum set up by these two modes of doctrine can be duplicated in a series of other terms. “Discipline” is the watchword of those who magnify the course of study; “interest” that of those who blazon “The Child” upon their banner... Abandon the notion of subject-matter as something fixed and ready-made in itself, outside the child’s experience; cease thinking of the child’s experience as also something hard and fast; see it as something fluent, embryonic, vital; and we realize that the child and the curriculum are simply two limits which define a single process. It is continuous reconstruction, moving from the child’s present experience out into that represented by the organized bodies of truth that we call studies.

The guide through this process is Socratic questioning and clarification, building the capacity for thinking and application.

Thinking and Application

- *Pedagogy of Understanding*—This pedagogy emphasizes using techniques that focus on understanding performances, mental images, and powerful representations to make complex ideas more accessible. For Wittgenstein, this was the power of analogies and metaphors. He spent enormous energy on the refinement of his metaphors because they provided a way to clarify thought.

³⁹ David Perkins, *Smart Schools: From training memories to educating minds* (New York, NY: The Free Press, 1992).

⁴⁰ See Conrad W. Snyder, Jr., *Structuring the Classroom*. Development Discussion Paper, No. 749. (Cambridge, MA: Harvard Institute for International Development, February, 2000).

⁴¹ As pointed out by Robert B. Westbrook, *John Dewey and American Democracy* (Ithaca, NY: Cornell University Press, 1991).

⁴² John Dewey, *The School and Society and The Child and the Curriculum* (Expanded edition, Chicago, IL: The University of Chicago Press, 1990), pp.187-189

- *Higher Levels of Understanding*—The major goal of education is to build complexity of the subject-matter while remaining within the “interest” bounds of assimilation resistance. That is, again, the material and the psychology are inextricably interrelated. Education is the process by which we increase higher levels of understanding so that the individual can deal with the incredibly complex world in which we find ourselves. This capacity, of course, better enables contributions to society by thoughtful members.
- *Generative Topics*—Emphasis on deep learning, problem solving, explanation, and justification within a limited set of, but broad, interesting, topics that generate a wide range of experiences. Both Howard Gardner and David Perkins have advocated the creation of subject paths into deeper thinking and engagement. This is the practical operationalization of the linkage of curriculum and child. If it degenerates to mere individualistic projects, it does an injustice to Dewey’s reservations about child-centered reform and project activities.⁴³ The connection between child and curriculum means that both must be given attention in the “single process” and an overemphasis of one or the other creates an unacceptable forced-choice.
- *Intellectual Passions*—Building on enthusiasm modeled by teachers to develop thoughtful mindsets, intellectual passion engages the teacher and student in a common effort. Enthusiasm has always been a motivating accompaniment of instruction, and modeling is one of the more effective methods of teaching. Engagement and modeling are clearly key elements of informal education in the family, the community, and among friends. Given the close contact of teachers and students, the passion of teachers for the process and material has to be an important feature of a rich classroom experience.

Multiple Discourse Communities

- *Teaching For Transfer*—Perception (pattern similarities depend on considerable practice with the skill or knowledge) and reflection (depends on abstraction of a principle to guide future thinking) should be developed to actively involve the student in generalizing to new situations. Dewey emphasized the importance of reflection in his “why reflective thinking must be an educational aim.”⁴⁴

By putting the consequences of different ways and lines of action before the mind, it enables us to *know what we are about* when we act. *It converts action that is merely appetitive, blind, and impulsive into intelligent action.*

Thinking makes it possible to imbue action with a conscious aim, enables systematic preparations and inventions, and enriches events and objects with meanings.

- *Metacognition*—By developing the languages of thinking, integrative mental images, and learning to learn strategies, students are empowered to take on new tasks in new contexts. Metacognition greatly enables reflection, providing it with a powerful overview of what is generalizable.

⁴³ L.N. Tanner, “The Meaning of Curriculum in Dewey’s Laboratory School (1896-1904),” *Journal of Curriculum Studies*, 23, 2 (1991): 101-117. Tanner points out that the curriculum in Dewey’s school and the teaching was “not synonymous with projects” and that Dewey would probably be critical of the problem-solving orientation of some progressive programs that do not properly contextualize the practical application of knowledge so that it contributes to the maturity of thought.

⁴⁴ Reginald D. Archambault, editor, *John Dewey on Education: Selected Writings* (Chicago, IL: The University of Chicago Press, 1974), pp. 212-217.

Distributed Intelligence

- *Social Distribution of Intelligence*—Dewey contended that the “...process of mental development is essentially a social process, a process of participation.”⁴⁵ Through social supports and group efforts, the cost of complex cognition can be reduced.
- *Physical Distribution of Intelligence*—Writing and other media reduce cognitive load and the cost of complex cognition. The Internet is rapidly becoming a rich source for research of all kinds.
- *Symbolic Distribution of Intelligence*—Helping students work with a diverse set of symbol systems increases their facility in multiple discourse communities. This includes the visualization of information, dramatic representation, literary presentations, and personal accounts provide a range of symbols so that individual differences among students have many opportunities for clarity and provide diverse experiences with different symbolic forms for all students.

A vision of a successful schooling system is necessary to steer the monitoring and evaluation process. We know enough about learning and schooling to design effective programs, as articulated above. Quality happens rarely in practice, but it’s not a function of a knowledge deficit. Schooling serves many purposes other than learning, and these functions are not always benignly interrelated. So, for a variety of reasons, effective programs remain rarities. The first step to change this prognosis is to change the priorities so that learning takes precedence in the collection of goals. Then, with a clear guiding frame, good schooling is possible. Good schooling does require resources, particularly for those countries with inadequate and deteriorating facilities and outmoded equipment and materials. When involved with LIC schooling systems, however, it becomes apparent that the wastes are significant and that few countries cannot afford significantly improved schooling. But the elimination or neutralization of politics surrounding schooling is non-trivial and unlikely to be dealt with by good intentions alone.

At the organizational level, change in schooling systems emerges from tendencies to move toward some external image. The effect is evident in Ghana, even if the result is dysfunctional.

...Ghanaian education is stretched across a great gap. On the one side are high national/international policy pictures of what education should be like and what it can contribute to national development. These ideals and standards are dominant in policy, and the perspectives involved penetrate far down into the system, so that interviews can easily evoke them from teachers and headteachers. On the other hand, local reality and achievements are very inadequate by those same standards.

Organizational decoupling and inconsistency result. Another product has been wave after wave of reform, much of it centered on creating tighter management and information arrangements. This tends to create some fragmentation, organizationally, which further loosens coupling in the system.

Loose coupling of this sort has obvious costs, but has also had advantages for Ghanaian education. It has permitted educational policy to track high national and international standards, gathering much legitimacy and many resources from national and international bodies: new international fashions and funds arrive in Ghana quickly. It has also permitted Ghana education (though of a very different quality than the standards) to

⁴⁵ Cited in Westbrook.

penetrate very far into Ghana society, and something regarded as a school appears almost everywhere with surprisingly high participation.

Given the great gaps between ideals and practical reality, orientations to information are not searches to improve decision-making. They tend to become vertically bureaucratic in character, emphasizing inspection of failures from above and claims for reasonable resources from below. Participants do not consider themselves decision-makers, but organizational functionaries trying to conform to, or create conformity to, the very high standards.

In this context, improved information systems are somewhat costly, calling attention to inconsistencies. The system has tended to resist enhanced information, the participants tend to use concrete rather than abstract information, and few participants have questions to which improved information would be an answer. A partial exception here may be the newly empowered district schooling organizations, for which information is an aid in dealing with their lateral relationships with district and community groups.⁴⁶

Accordingly, there is almost no demand for information, except for rarely occurring, external events. Everything remains at a concrete level in terms of the gaps in particular cases. In the abstract, there appears to be a universal notion of what a school is, what a teacher is, and what a student is. Almost without exception, this image entails a teacher with appropriate credentials, a student from an environment that values education, a curriculum that entails the values and substance of the society, and a schooling space, dedicated to the schooling process. Perceived deficits in these components are pathologies to be fixed for quality schooling and the system excuses these as the result of resource deficits (which they aren't entirely). At times the process and content of schooling are scrutinized. When this is the case, the contrasting special interests and theoretical positions become more apparent. The debate is difficult to abate or move to a higher level with no clear criteria for the outcome, and so there is a rapid retreat to the primary components and their inadequacies as a common source for attention, accompanied by overwhelming feelings of insufficiency to fix any situation and thus, no action or need for information on which to develop action plans.

Monitoring and evaluation systems offer no magic. When the criteria are ambiguous, then the effect degenerates into a strange loop,⁴⁷ where the vision of the monitor is overly constrained and possibly incorrectly focused, and the results of the process confusing or misleading. We might 'see' a good program even though there is little connect with real, long-term intentions. Russell, Wittgenstein, and Dewey offer a powerful set of ideas for the direction of reform and its assessment through monitoring and evaluation, translated into modern *Smart Schools* by David Perkins. We now have a sufficient theoretical base to build a monitoring and evaluation system, and we have a mechanism, the Internet, that can bring the process to life. The key elements of direction and content become dynamic, and monitoring and evaluation facilitates the reflection of practice for any education system and particularly those open to external visions (which is usually seen as a pathology in its own right).

In an event culture, like Ghana's education system, monitoring and evaluation information has little use outside of the event. The modern mantra is to engender

⁴⁶ John W. Meyer, *Organizational Linkage in Basic Education in Ghana: The Costs and Uses of Monitoring and Evaluation* (Accra, Ghana: Quality Improvement of Primary Schools Program: Performance Monitoring and Evaluation Project, 1999), p. 1.

⁴⁷ See Conrad Wesley Snyder, Jr., *Strange Loops in Education: Problems in Planning and Progress* Development Discussion Paper No. 690 (Cambridge, MA: Harvard Institute for International Development, 1999).

systemic change that is enduring and efficient to bring the system into functional form. But this is precisely a question of values. The reigning values already serve individual purposes, and the larger mission of the educational program is ignored (or dismissed as intractable anyway). Systemic change is resisted and the counter forces are securely in place. There is unlikely to be a way for large-scale change to occur top-down and all attention will remain fixed within events.

Wittgenstein emphasized personal integrity as an essential part of life and his philosophy. He depended on the “large purpose that one was true to” to sustain a person and remain uncorrupted. And for him, corruption was dependent on the qualities found within oneself. As his biographer, Ray Monk, explained Wittgenstein’s position, “If one’s soul was pure..., then no matter what happened to one ‘externally’...nothing could happen to one’s *self*. Thus, it is not external matters that should be of the greatest concern, but one’s self. The *Sorge* that prevents one facing the world with equanimity is thus a matter of more immediate concern than any misfortune that may befall one through the actions of others.”⁴⁸ Thomas Welsh presented a similar assessment to monitoring and evaluation professionals in Ghana, based on similar sentiments (but a radically different philosophy) of Bernard J.F. Lonergan, the Jesuit philosopher of the Gregorian University in Rome (this connect was very powerful because of the influence of religion on life in Ghana—familiarity with Biblical stories and metaphors is much greater than with other intellectual material). His descriptions and exhortations were met with nods and expressive agreements but no clear evidence of enduring commitment and many explanations that forebode little change. The only way to break the event culture, short of some unforeseen dramatic change, is for a bottom-up expression of ‘personal integrity’ that breaks the systemic corruption and documents the needs and conditions through a credible monitoring and evaluation system.

Monitoring and evaluation do not *impact* anything (in fact, the Newtonian causal allusion can be misleading). They provide information and value statements, but they must find or be developed by an audience that intends *actions or decisions* based on the findings. At the moment, strange loops mask apparent accomplishments in grander, misguided, hopes. The events remain circumscribed and decoupled, and individuals are lured into shady attitudes and ineffective behaviors. As Wittgenstein noted about philosophy, it “leaves everything as it is” but “what is incomprehensible is that *nothing*, and yet *everything* has changed” (this is Wittgenstein’s aspect seeing). Personal integrity is the heart of philosophy for Wittgenstein, and the intent of philosophy is to supply “perspicacious representations” that change everything! What changes with personal integrity is the perspective on events, the way we look at things and the way we react to them. Individuals have to change and only with a critical mass, where integrity can find company, will systemic changes be possible. Until that time, monitoring and evaluation describe what’s going on but have little influence in changing it. The hope is that initial affiliation can be secured through the Internet with colleagues around the world that might establish some support for effective attitudes and behavior, grounded in the enormous respect that external models are held. The Internet energizes the monitoring and evaluation process, giving it informational power to encourage new emergent patterns of managerial and professional thoughts and actions.

⁴⁸ Ray Monk, *Ludwig Wittgenstein: The Duty of Genius* (New York, NY: Penguin Books, 1990), pp. 52-53.